



TBLA: Implementation of PjBL and Student' Collaborative Skills in Science Learning at MTs Muhammadiyah 1 Malang

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Abstract

Teachers are required to develop professional learning that can produce qualified students. Consequently, a learning model is required that enables 21st-century abilities. Each individual is supposed to master skills in the form of 21st century skills, one of which is collaboration. The Project-Based Learning (PjBL) is chosen with the consideration that it has stages that are able to encourage students to collaborate with other group members, use various thinking abilities of students individually and in groups, and improve the quality of interaction between students. This study aims to describe the implementation of learning and student collaborative skills, to describe TBLA in science learning at MTs Muhammadiyah 1 Malang, particularly in Vertical Motion material. This research method was qualitative descriptive research. The objects of study were 25 teachers and 8th-grade students of MTs Muhammadiyah 1 Malang. The research stages included designing teaching modules by using PjBL learning, implementing learning, and reflecting on learning based on the lesson study stages that consisted of a Plan Do See. The results of the study indicate that the implementation of PjBL in science learning, consisting of 6 steps, namely drawing questions, compiling project plans, compiling schedules, monitoring, testing results, and evaluating experiences, have been well described, both narratively and visually in the learning. Student collaboration skills in science learning material Vertical motion are 73.4% (high category). TBLA shows that the teacher speeches are more dominant, namely 85.94% and the students are 14.05%. It can be concluded that the implementation of PjBL learning was carried out well and students' collaborative skills were in the high category.

Keywords: Collaborative Skills, Lesson study, Project Based Learning, Science Learning

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INTRODUCTION

Education is a process that cannot be separated from teaching and learning activities, in which it can change a person through the process of experience or training (Sato, 2012). The current educational system is experiencing renewal, which is linked with innovation and quickly emerging technology that has an impact on various aspects of life, including the teaching and learning process. In the 2013 curriculum, learning emphasizes student-centered learning by encouraging the students to be active and directly involved in the learning. One of them is in science learning (IPA) which can provide students meaningful experience in carrying out learning activities by being directly involved in the learning. According to Sari and Nurussaniah (2022), science learning can provide direct experiences so that it can develop students' skills, not only cognitive thinking skills but also psychomotor skills.

Science learning is learning that discusses facts, principles, concepts, and process of discovery which allows students to discover their concepts (Mulyani et al., 2020). Middle

school science lesson material contains many concepts that are difficult for students to comprehend since it involves physics, calculations, and abstract concepts that students perceive to be similar to chemical reactions, as well as some biological concepts that are considered difficult because they are relatively new. They never received it when they enrolled in middle school. The observation results in several middle schools/SMP indicate that the use of demonstration and discussion approaches to teach middle school science curricula appears to be less than optimal in terms of promoting student involvement and interest in learning. So far, the science learning process at several schools appears to be less interesting, causing students to become bored and uninterested in science lessons, resulting in a passive classroom atmosphere in which a few students ask the teacher even when the content being taught is difficult to understand. Students will feel compelled to study in this way, stressing their souls. This condition causes irritation, boredom, and indifference, resulting in low student attention, interest, and motivation for learning. This will have an influence on students' failure to meet scientific learning objectives.

As we enter the era of globalization 4.0, the scope of education must expand to include higher-quality students and teachers. The skills being discussed in the field of education are 21st-century skills, typically referred to as 4C, namely Critical Thinking, Collaboration (cooperate), Communication, and Creativity (Husamah et al., 2019; Ramdiah et al., 2019). Educational institutions are challenged to discover the ways that enable students to be successful in work and life through mastering creative thinking skills, flexible problem-solving, collaboration, and innovation (Jariyah & Husamah, 2024; Susetyarini et al., 2022). Analyzing students' skills that has to be improved is the most important thing that educators must do so that students are ready to face the challenges of the 21st century. Education in the 21st century aims to construct the students' intelligence skills in learning so that they are able to solve problems in their surroundings (Basri et al., 2022; Yayuk & Husamah, 2020). Learning model has crucial role in this situation. Learning models are the ways, techniques, or plans that will be utilized to design learning condition in the class (Mutiani et al 2020). Based on Taufik et al (2022), innovative learning is learning that student-centered or involved the students to be active in the process. Project-based learning model is one of the innovative learning models that involved the students for being active in constructing their knowledge independently with peer mediation in groups to complete projects that have been designed by the teacher (Hidayat, 2020).

Project-based learning (PjBL) is learning that facilitates the students to work individually or in groups (Husamah, 2015a, 2015b; Yayuk & Husamah, 2019). In order to encourage student activity and learning results, PjBL trains students to master the material by completing projects. The PjBL learning model is proper to be implemented in vertical motion material. Learning using the Project Based Learning model referred to in this research consists of 6 stages, including (1) project determination, (2) designing project completion steps, (3) preparation of project completion schedules, (4) implementation stage, (5) preparation of reports and presentations, and (6) evaluation.

Analysis of the learning process needs to be carried out so that teachers can improve the quality of learning. Several previous studies have focused on analyzing the implementation of PjBL at the junior high school level. Erlanda et al (2023) concluded that the application of the PjBL model improved learning outcomes in local wisdom material and cultural changes in the surrounding environment. Jannah et al (2021) concluded that project-based science learning is very good to use as a learning model in emphasizing student creativity. Yanti and Novaliyosi (2023) emphasized that at junior high school level, PjBL is able to improve creative thinking abilities and increase students' learning motivation.

In the context of this research, an analysis of the learning processes should be performed so that the teacher can improve the learning quality. The analysis conducted is in the form of an examination of the learning process, whether it is teacher-centered or student-centered, through lesson study. Lesson study is a learning conducted collaboratively and sustainably by

the teachers (Aminarti et al 2020). In implementing the lesson study, there are three sections of activity, namely planning (plan), implementation, (do) and reflection (see). The main goal of lesson study is to improve the students' learning quality; the learning processes should be student-centered not teacher-centered (Budiyanto et al., 2021; Miharja et al., 2020; Sabilah et al., 2021).

According to Rahayu, (2019), learning analysis is the way to see, listen, describe, discuss, and understand the interaction between the teachers and students during the learning. To accomplish the goal, in-depth analysis should be done through an observation, recording, transcript generating, and analysis. Teachers in conducting the analysis should consider the factors relating to students, the learning environment, and the goals to be achieved. One of the analysis methods to transcribe learning in lesson study is Transcript Based Lesson Analysis or TBLA (Salsabila et al., 2022). Suwardi et al, (2021) assert that TBLA is one of the techniques in lesson study used to analyze learning situation. In the TBLA model, the teachers observe and transcribe their teaching practices, analyze and reflect on them, and discuss them collaboratively with other teachers. Thru this model, the teachers can enhance their ability to review the teaching script and their decision-making abilities and professional capital continuously. Based on the preceding background, the purpose of this study was to describe the implementation of learning and students' collaborative skills, as well as to describe TBLA in scientific learning at MTs Muhammadiyah 1 Malang utilizing Vertical Motion Material and the PjBL Model.

METHOD

Research method used in this study was qualitative descriptive research. This research method was chosen to precisely describe the facts and characteristics of the subject or object being examined. Qualitative research method was often called a naturalistic research method since the research was carried out in natural conditions (natural settings). This study was carried out on natural objects that developed as they were, not manipulated by the researcher and the presence of the researcher did not really influence the dynamics of the object (Sugiyono, 2015). The primary objective of qualitative research methods was to reveal a phenomenon as it was. Qualitative methods focused on the natural nature of phenomena in a deeper way. Qualitative descriptive study was designed to provide an overview of ongoing events or to describe a situation and its development. The stages of this study were: (1) Planning the research lesson, including: designing research question, determining the learning objectives, determining the concrete method, planning the research design, and developing the learning design, (2) Learning implementation, including: observation, reflection, transcription (instant transcript), and (3) Learning analysis using entire transcripts from audio and video recordings.

This study involved 8th grade students of MTs Muhammadiyah 1 Malang. This school was chosen since the school had been participating in lesson study activities for a long time and the school was used to carrying out the stages in lesson study activities. 25 students of 8th grade, a Science Learning teacher of SMP Muhammadiyah 1, 3 lecturers, and 3 college students were the participants of this study. This study was conducted in MTs Muhammadiyah 1 Malang.

Research activities commenced in March 2022, with the confirmation of the Research Team Decree, assignment letter, and research permit letter. This qualitative research employed triangulation as a data collection technique. Triangulation was a data collection technique by combining various data collection techniques and existing sources. Data collection technique was carried out based on the Lesson Study stages (design, observation, and reflection). Data collection in this study used 3 methods, namely documentation (Video, voice recordings of teachers, students), Observation (Field notes during plan, do, see), and discussion (voice recording, video).

Data analysis technique used the learning analysis model of Transcript Based Learning Analysis (TBLA). The learning pattern analysis would focus on the learning implementation

(do) stage, since the purpose of this study was to gain an overview of learning patterns (Learning Patterns) that occurred in science learning in class VIII, MTs Muhammadiyah 1 Malang, on vertical motion material. Learning patterns were determined using procedures.

The analysis in this study could not be conducted directly during learning, but rather by recording all teacher and student activities, as well as observations made by observers. Through this analysis, the researchers were able to see how the implementation of lesson study based on Transcript Based Lesson Analysis in the learning process, whether it was Teacher-Centered Learning (TCL) or Student-Centered Learning (SCL), in which it was reflected in the many dialogues that arose between teachers and students; these dialogues in implementation were represented in a graph of number of words. The instruments of qualitative research could be in the form of tests, interview guidance, and questionnaires. Collaborative Skill Indicators is presented in Table 1 (Meilinawati, 2018) and the category of Collaboration Skills criteria is presented in Table 2 (Riduwan, 2013).

Table 1. Collaborative Skill Indicators

No.	Indicators	Observed Aspects
1.	Positive interdependence	Working on shared duties and interdependence rather than working individually. Using learning resources (internet or books) to complete assignments. Avoiding to separate oneself from the group of classmates.
2.	Face-to-face interaction	Running on cellphones (opening YouTube or playing games) while working as a team.
3.	Accountability of individual personal responsibility	Accepting responsibility for completing tasks on time. Performing the greatest effort to finish allocated duties on time.
4.	Communication skill	Discussing with group friends about carrying out assignments. When you have a problem, asking help from your friends.
5.	Skills working in groups	Being active to participate in completing tasks. Completing tasks according to SOP.

Final results of collaborative skills were calculated by using the following Formula 1

$$\% = \frac{n}{N} \times 100\% \quad (1)$$

Where n: score obtained; N: sum of all scores; and %: percentage of collaboration skills.

Table 2. Category of Collaboration Skills Criteria

Criteria	Percentage (%)
Very High	81-100
High	51-80
Moderate	41-60
Low	21-40
Very Low	0-21

RESULTS AND DISCUSSION

The research activities at MTs Muhammadiyah 01 Malang have been carried out. The study focused on scientific learning, class VIII, vertical motion materials, and the PjBL learning model. The research findings are as follows: (1) Visualization of Learning Activities & Implementation of PjBL in Science Learning with Vertical Motion material; (2) Learning Transcript (Audio) of Science Learning in Vertical Motion material; (2) TBLA graphics and Learning Approach of Science Learning in Vertical Motion material; (3) Teacher & Student conversation index (%); and (3) Percentage comparison of the number of letters spoken by teachers and students (%), Collaborative abilities and student learning outcomes. Implementation of PjBL and Visualization of Learning Activities in Science Learning using Vertical Motion Materials were in Table 3 and Figure 1.

Table 3. The PjBL steps in Science Learning, particularly in Vertical Motion material

No.	Steps	Implementation
1.	Step 1. Problem determination for fundamental questions	✓ Core activities step 1
2.	Step 2. Designing the Project Plan	✓ Core activities step 2
3.	Step 3. Planning the schedule	✓ Core activities step 3
4.	Step 4. Monitoring students and project progress	✓ Core activities step 4
5.	Step 5. Testing the evaluation	✓ Core activities step 5
6.	Step 6. Evaluation of experience	✓ Core activities step 6



Transkrip Pembelajaran

Waktu		Pembicara	Indeks	Ucapan	Situasi	Steps
Menit	Detik	Guru / Siswa				
0	3	Guru	1	Assalamualaikum Warahmatullahi Wabarakatuh		Pembuka
0	7	Siswa-Siswa	2	Waalakumsalam Warahmatullahi Wabarokatuh		Pembuka
0	12	Guru	3	Gimana kabarnya anak-anakku sekalian		Pembuka
0	14	Siswa-Siswa	4	Alhamdulillah baik		Pembuka
0	15	Guru	5	Ya Alhamdulillah		Pembuka
0	16	Guru	6	Coba sekali lagi seperti biasa cek kanan kiri kira-kira ada yang tidak masuk hari ini		Pembuka
0	22	Siswa-Siswa	7	Ada		Pembuka
0	23	Guru	8	Siana?		Pembuka
0	24	Siswa-Siswa	9	Tasya		Pembuka
0	26	Guru	10	Jadi 1 orang saja ya?		Pembuka
0	27	Siswa-Siswa	11	Iyaa		Pembuka

Figure 1. Layer capture of Science Learning Transcript for Vertical Motion Material

Figure 1 illustrates the transcript analysis process based on the specified format. LS activities in learning, in addition to being an effort to motivate students, have an impact on teachers. They can examine teacher performance, strengthen students' academic and critical thinking abilities, and build a cautious and responsible attitude toward learning. The LS will be observed and reflected together with the observer and model teachers (Mutiani et al, 2020; Wahyuni et al, 2015; Wahyuni et al, 2019). Table 3 contains the example of displaying a transcript of a verbal dialogue between a teacher and a student in Science learning. The obtained transcript, then, will be analyzed the construction patterns of students' knowledge that occurs in Science learning using Transcript Based Lesson Analysis (TBLA) method. To comprehend the characteristics of learning contexts within a single class hour, the researchers separate learning into multiple segments for investigation (Sarkar, 2017). By dividing the

learning into multiple segments, the participants can carry out learning analysis in more details, able to reveal What motivation should teachers do to encourage the learning process or to see how actively students are involved in learning.

According to Elliott (2016), several focus points as a basis for analysis that refer to various analytical perspectives and learning categories are appointed. The researchers subsequently perform a deep investigation and investigate numerous settings in the learning process from an analytical perspective. Analysis on learning transcript are focused on the students' dialogues in the learning and then it is classified based on response type as a communicative function that represents students' knowledge construction. After conducting a learning transcript, number of letters spoken by the teacher and students are counted by using the Formula of "LEN ("E11") and formula for calculating text in Excel between teacher and student using the IF formula (C11= "G", H11, -H11).

Figure 2 depicts a number of words graph generated via transcript analysis during implementation. This graphic depicts a discourse between the model teacher and students during the learning process at the implementation stage (do), the top of the graphic is the model teacher conversation session and the bottom of the graphic is the student conversation session. Model teacher conversation and students are limited by the time for each word formed as described (Amintarti et al., 2020), The horizontal line on the graphic that restricts the instructor and student conversation sessions represents the index of the conversation as recorded in the full transcript. This index is a sequence of time (in minutes) when learning occurs.

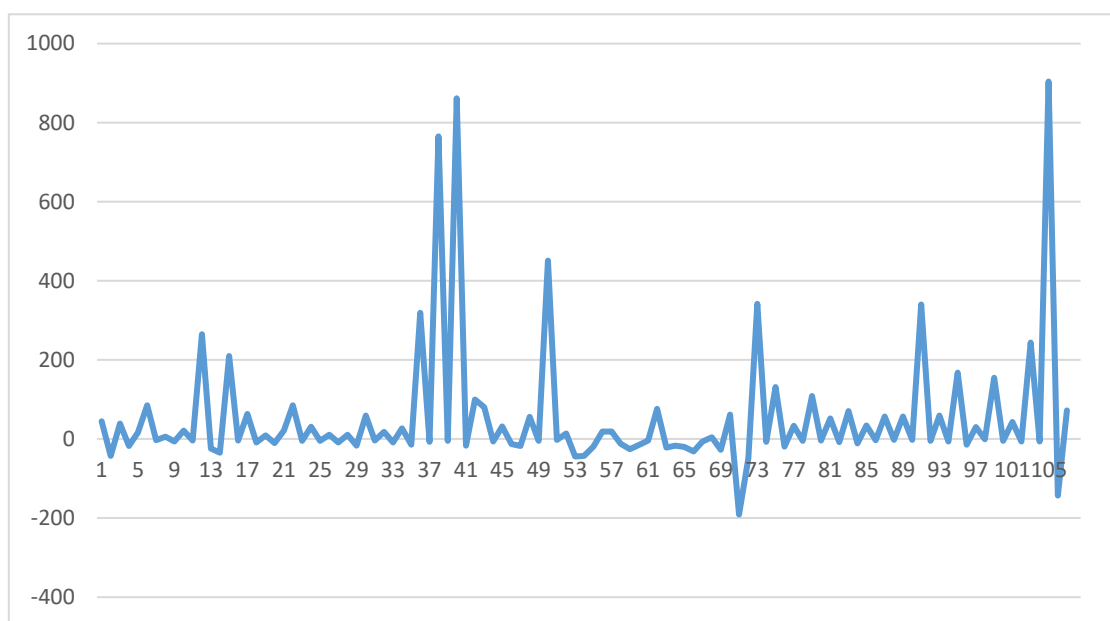


Figure 2. Vertical Motion Graphics

The learning model will be carried out using scientific approach with Project based learning model that is combined with cooperative Jigsaw approach. It is intended that by displaying a motivational video depicting someone parachuting, the students will be more eager to learn more about the vertical movement topic. Furthermore, the students are divided into group to conduct a discussion about problems/ problems presented by the teacher in accordance with the Worksheet or problems and making products given by the teacher. After a group discussion and project making, product practice is conducted and it is continued by classroom presentation. The group representatives present the discussion's findings. There is a conversation among friends in the group, followed by a class discussion. The teacher fosters class discussions and directs student-generated issue resolution. The session closes with the teacher reinforcing the vertical motion details with practice questions based on the learning objectives.

Learning activities have been prepared well based on planning (plan) that has been carried out together with the lecturers and Science teachers. The information taught during the open class focuses on vertical mobility. According to the science teacher, 8th-grade of MTs Muhammadiyah 1 Malang is a class that participates actively in the learning process. In the implementation stage (do), the students seemed to follow the learning well. In the learning, the results obtained are in accordance with the learning design. Students are active in responding to the model teacher. Learning is carried out by using a group discussion between students so that the communication between students is built as seen from conversations in discussions. The graph above depicts the findings of the transcript data analysis, which reveals that the students' responses are good based on the number of word units in the conversation. Overall, this learning activities run well in accordance with the planning stage (plan), as evidenced by the model teacher's achievement in accomplishing the learning objectives. Nevertheless, there are still students who are passive in learning and do not respond in any way, whether by speech or physical movements.

This may occur due to a lack of student interest in learning, and motivation to learn varies per student, since at the start of learning, the model teacher encourages students and requests them to be active participants. According to Yasin (2015), student inactivity in the learning process can be caused by a variety of factors, some of which originate within the student (internal factors), such as psychological or physical disorders, which cause students to lose interest in learning and become lazy and unwilling to express their opinions. Moreover, the external factors are from the teachers such as the teacher's presence is unexpected, from the subject, from the learning model used, as well as from the classroom and school situation.

According to Figure 3 and Figure 4, percentage of teachers and students' speech and the percentage number of teachers, students, teachers and students' speaking is still dominated by the teachers' speaking. The learning in 8th grade is still dominated by the model teacher, in which the teachers' roles are needed to explain in details about the vertical motion of Science learning in 8th-grade; moreover, it is categorized as teacher-centered learning. However, this teacher dominance is not obvious when students engage in group discussions or work on projects.

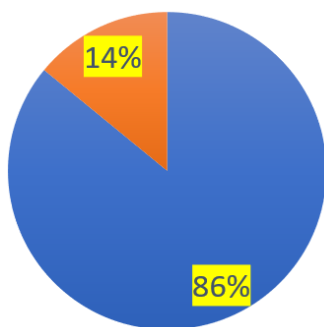


Figure 3. Percentage of Teacher and Students' Speech (Blue: teacher; orange: student)

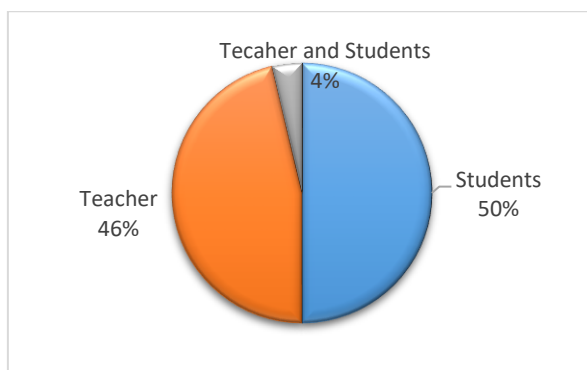


Figure 4. Percentage of Teachers, Students, Teachers and Students' Speaking

During practical activities, the teacher only observes and occasionally responds to questions from students or group members. Project work activities are quite conducive. Almost all group members are actively interested in the project and completed the LKPD (worksheet) assigned by the teacher to collect data. This is also due to recording videos, the students' voices when working on the project and completing the LKPD (worksheet) are not particularly audible; thus, a recording device positioned on the table when discussing project completion is required to ensure that the voices can be heard clearly in the video. Data of Collaborative Skills presented in Table 4.

Table 4. Data of Collaborative Skills

No.	Indicators	Mean of P1	Mean of P2
1.	Positive interdependence	81	82
2.	Face-to-face interaction	75	85
3.	Accountability and responsibility	80	90
4.	Communication skill	30	40
5.	Skill working in groups	65	70
	Total	331	367
	Mean	66,2	73,4

According to Table 4, students' collaborative skill data of MTs Muhammadiyah 1 Malang, particularly in the 8th grade of vertical motion material is still categorized as high, namely 66,2 and 73,4 (in the range between 61-80).

Good collaborative skills reflect a person's ability to interact and work together with other people in a team or work environment. This involves important aspects such as effective communication, openness to new ideas, and joint problem solving. People with good collaborative skills also have the ability to adapt to change, share responsibilities, give and receive feedback constructively, and manage conflict in a productive way. Trust, recognition of others' contributions, and the ability to work harmoniously to achieve common goals are also important elements of successful collaborative skills.

Collaborative skills are not only useful in increasing productivity and the quality of team work, but also building a positive work environment and supporting individual development. Being able to adapt to team dynamics, respecting each team member's unique skillset, and actively contributing to a common goal are key traits of someone who has good collaborative skills. In an era of work that is increasingly connected and focused on teamwork, developing collaborative skills is the key to success in both career and personal development.

CONCLUSION

Based on the findings and discussion, it can be concluded that the Science learning process using the lesson study model of Project-Based Learning (PjBL) in the vertical motion material is properly implemented based on the three lesson study stages, namely planning (plan), implementing (do), and reflection (see). The implementation of this study is in 8th grade students of MTs Muhammadiyah 1 Malang. Based on the learning transcripts (TBLA) which are then made in the form of a word unit graph, it can be seen that the learning process is still dominated by the teacher or it is Teacher Centered Learning (TCL). The implementation of PjBL in Science learning of vertical motion material of 8th grade students in MTs Muhammadiyah 1 Malang consists of 6 stages, namely determining questions, preparing project plans, preparing schedules, monitoring, testing results, and evaluating experience. Students' learning experiences are described narratively and visually, while the steps for creating project plans and schedules are less obvious. Students' collaborative skill in science learning of vertical motion material are 73,4 and 66,2, in which these are categorized as high (in the range of 61-80). The TBLA indicates that the teachers' speech is dominant (85,94%) and the student is 14,05%. This is caused by the students' communication while completing

the projects or group tasks does not sound well so that a recording device can be utilized at each student's desk.

RECOMMENDATION

For the researchers, learning analysis through lesson study based on the TBLA (Transcript Based Lesson Analysis) is very well done since the conversation between the teacher and students can be created in as much detail as possible and then analyzed. For the teacher, this study is very good to improve future learning. According to the findings of this study, teachers should include transcript-based lesson analysis in their teaching to make it easier for them to assess students' abilities individually. The results of this study can be used as a first step to carry out studies in designing effective learning to change the learning process in the form of Student-Centered Learning (SCL).

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