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Research Article

Improving Students' Activities and Achievement Using the Themed Worksheets Through Discovery Learning

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Abstract.

Preliminary studies showed the low activity of students in science learning with classical learning completeness of 22%. This study aimed to improve students' learning activities and learning achievements through discovery learning assisted by themed worksheets. This study improved previous research related to the implementation of discovery learning to improve the learning quality. The research was designed using the classroom action research method and was carried out in three cycles, involving 32 second grade students of secondary school. Experts validated interview, observation, and questionnaire sheets, and the test items were validated statistically. This study showed that discovery learning assisted by themed worksheets improved the average student activity to 93% and the average science learning achievements to 71.61% with a classical completeness rate of 78%. Students also accepted the themed worksheets with very high satisfaction. This study did not examine the students' character, the correlation between activity data and student learning discovery, neither did it accommodate students with special needs. These results can be a reference for teachers to improve the quality of learning, especially for schools in rural areas that have limited technological infrastructure.

Keywords: class action research, discovery learning, learning achievements, students' activities, themed worksheets

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1. INTRODUCTION

Science learning at the secondary level needs to develop students' ability to find problems, submit proposals, manage information, research, analyze, and clarify research results [1]. Ministry of Education Regulation Number 59 of 2014 explains that science learning also needs to develop students' 21st-century skills to face global challenges. These skills consist of critical thinking skills, collaboration, communication, and creating something from the knowledge they have. For this reason, science as a subject needs to be taught through a scientific approach. A learning that stimulates students to learn more actively in constructing knowledge and skills through investigations [2].

Science subjects contain factual, conceptual, procedural, and metacognitive knowledge [3]. Thus, it needs to be taught in a scientific approach to optimize students' learning achievements [4]. In fact, science learning still relies on passive learning models, where teachers teach traditionally and do not habituate students' critical thinking skills and problem-solving abilities [5]. This learning model causes the quality of education in Indonesia left far behind other countries. Research data from the Program for International Students Assessment (PISA) in 2018 showed that Indonesian students' achievements in science were ranked 70 out of 78 countries [6].

Previous studies have shown that the low activity of students in science learning caused poor learning outcomes. Students were still passive in learning science, so they needed teachers' motivation in a learning atmosphere that allowed students to solve their problems through collaboration [7]. Teachers need to create a learning environment that helps students improve their learning activities, a learning environment that stimulates their motivation and interest in learning science [8]. Teachers can create this stimulative learning environment by utilizing appropriate learning models and media, which allow students to build their knowledge [9].

The results of previous studies are in line with the results of pre-cycle observations. Pre-cycle observations showed that the second-grade of secondary high school students had low learning activities. They were not actively giving opinions in discussions, rarely asking questions, and ignored the teacher's explanation. Students' activity scores obtained 53% or were classified as *moderate*, meaning that almost half of the students in the class have yet to be active in learning. The teacher also found low student learning outcomes in science. Based on the results of the pre-cycle test conducted by the teacher, only 7 out of 32 students (22%) achieved the Minimum Completeness Criteria (KKM) with an average test score of 43.71. Overall, student learning achievements at the pre-cycle stage scored 43% or were classified as *poor*. The researcher, who also acted as a science teacher, conducted interviews with students to find the causes of these moderate activities and poor learning achievements. The researcher found that students did not understand why they were studying science and considered science a complicated subject, so they felt bored with learning. These causes were exacerbated by the condition of classroom facilities that do not support technology-based learning.

There is a gap between the expectations of competency achievement and the condition of students' abilities in the classroom. This gap underlies the need for improvements in science learning. Science learning helps students achieve optimal learning achievements through scientific activities in acquiring knowledge. One of the improvements that can be done is the implementation of appropriate learning models, which train

students' abilities to master the expected competencies. A suitable learning model can help teachers carry out ideal learning in achieving learning goals. [10].

There are several things related to the learning model that teachers need to pay attention to, namely (1) linking learning materials with everyday life, (2) clarity in delivering material from teachers, (3) empowering group work [11], and (4) improving student interest in learning [12]. One learning model that fulfills these four things is Discovery Learning. Previous studies showed that discovery learning stimulated students' activity in groups, aroused students' interest and activity, and improved students' learning achievements [13]. The application of Discovery Learning also improved students' learning achievements in the cognitive aspect [14]; even students' learning achievements improved significantly with the help of audio-visual media [15]. Another study found that the application of Discovery Learning with visual media improved students' scientific literacy [16] and increased students' activity and learning achievements individually and in groups because it motivated students to learn [17]. Furthermore, the application of Discovery Learning could be equipped with student worksheets on specific themes so that students can understand the subject matter better [18].

Based on the description of the gap between the importance of student activities in learning and student learning achievements with the data and facts found in the field, the researcher aims to increase students' activities and learning achievements through classroom action research. This research adopts the discovery learning model assisted by themed worksheets to improve student activity and learning achievements. The researcher also aims to explain the role of the theme and the pattern of guidance on the improvement.

Action research that implements the discovery learning model to improve student activity or learning achievements has indeed been done by many previous researchers. However, researchers have yet to find the integration of themed worksheets for the actions taken. This themed worksheet addresses the lack of classroom facilities, and facilities students own to support technology-based learning. In addition, the researcher considers it important to conduct this study regarding the actual problems in the classroom. If the problem is not solved immediately, students will have difficulty mastering science material and other subject matter with conceptual relevance.

This research is expected to help students increase their exploration in terms of improving learning activities and achievements, help instill awareness and habituation of the need to cooperate, provide input for teachers to continue to improve professionalism in science learning, and provide inspiration for teachers to continue exploring various problems in science learning as an effort to improve education.

2. METHOD

This research was a classroom action research (CAR) that focused on increasing student activity and science learning achievement on the subject of 'Pressure and Its Application in Daily Life'. A total of 32 students of class VIII F of SMP Negeri 1 Juwangi for the academic year 2021/2022, consisting of 15 boys and 17 girls, were selected purposively as samples. The research was conducted from 5 to 29 January 2022 in three cycles (Cycle 1, Cycle 2, and Cycle 3), where each cycle consisted of two meetings. Each cycle consisted of four stages, namely (1) planning, (2) implementation, (3) observation, and (4) reflection [19].

Pre-cycle activities were taken on January 5 and 7, 2022, including implementing pre-tests and observations. Pre-cycle activities were carried out to collect initial data. Cycle 1 took place on January 12 and 14, 2022, with the matter of *Pressure on Solids and Pressure on Liquids*. Cycle 2 took place on January 19 and 21, 2022, with material on *Archimedes' Law and Pascal's Law*. Cycle 3 took place on 26 and 28 January 2022, with material on 'Applying the Concept of Pressure in Daily Life'.

Data were collected through tests, interviews, observations, and questionnaires. Pre-cycle written test was given as initial data on learning achievements with the material *Works Concepts, Simple Planes, and Their Applications in Daily Life*, considering the similarity of the characteristics of the material. After studying the material, written tests were given to students individually. The pre-cycle test instrument consisted of 10 multiple-choice questions and five essay questions. The test instrument for the Cycle 1 test consisted of 12 multiple-choice questions and five essay questions. Cycle 2 test questions consisted of 15 multiple-choice questions and five essay questions. Cycle 3 test questions consisted of 15 multiple-choice questions and five essay questions. The test instrument was validated quantitatively based on the results of other linear classes using *Pearson's Product Moment* (significance level 5%) and tested for reliability using *Cronbach's Alpha* test. All test instruments based on statistical tests were declared valid and reliable. The results of the statistical test of the test items are presented in Table 1.

Students did the test at the end of Cycle 1, Cycle 2, and Cycle 3. Student test results were given a score, and then the criteria for student learning achievements were determined based on the *SMP e-report application version 2.2*, as presented in Table 2. The number of students who completed KKM and those who did not meet KKM in Cycle 1, Cycle 2, and Cycle 3 was expressed as a percentage. The overall learning achievements criteria were expressed in percentages and categorized based on the reference criteria in Table 2.

Table 1: Statistical test results of test question instruments.

Cycle	Question Type	Validity Test (r)	Reliability Test (α)	Criteria
Pre-cycle	Multiple-choice	0.678	0.950	Valid and reliable
	Essay	0.893	0.960	Valid and reliable
Cycle 1	Multiple-choice	0.682	0.990	Valid and reliable
	Essay	0.997	0.800	Valid and reliable
Cycle 2	Multiple-choice	0.699	0.995	Valid and reliable
	Essay	1.389	0.850	Valid and reliable
Cycle 3	Multiple-choice	0.712	0.885	Valid and reliable
	Essay	0.686	0.980	Valid and reliable

Table 2: Reference criteria for student learning achievements [20].

Percentage	Criteria
$90 \leq \bar{x} \leq 100$	Very Good
$80 \leq \bar{x} < 90$	Good
$70 \leq \bar{x} < 80$	Moderate
$60 \leq \bar{x} < 70$	Low
$0 < \bar{x} < 60$	Very Low

This study used an instrument for observing student activities which were developed according to the indicators (1) giving question and answer, (2) expressing opinions, (3) interacting with other students, (4) paying attention to teacher explanations, and (5) doing assignments. Each of these indicators was developed into two sub-indicators for the objectivity of the assessment. Each sub-indicator scored *1* if the activity appeared and scored *0* if the activity did not appear [21].

Experts validated the instrument for observing student activities, consisting of the principal and two fellow science teachers. The observation instrument was declared valid. The teacher observed during learning in Cycle 1, Cycle 2, and Cycle 3. The scores obtained by students are added up, then converted into percentages to determine how high the student activity was in the learning process. Percentages were categorized based on the reference criteria in Table 3. Observational data were also described to illustrate students' activities and science learning achievements.

Table 3: Reference criteria [20].

Percentage	Criteria
$80\% < \bar{x} \leq 100\%$	Very Good
$60\% < \bar{x} \leq 80\%$	Good
$40\% < \bar{x} \leq 60\%$	Moderate
$20\% < \bar{x} \leq 40\%$	Low
$0\% < \bar{x} \leq 20\%$	Very Low

Interviews with students were conducted by teachers using interview guidelines in an atmosphere that was not too formal. It was intended that students freely expressed their opinions about the implementation of the discovery learning model and themed worksheets that have been carried out. Interviews were also conducted to obtain some data that were not obtained through observation and tests. The results of the interviews were analyzed qualitatively and descriptively.

Questionnaires were prepared to collect information about students' satisfaction with using themed worksheets. In each cycle, questionnaires were given to students containing statements on a *Likert Scale* with a scale score of five. Scores of *5* to *1*, respectively, for the criteria of *Strongly Agree (SS), Agree (S), Disagree (KS), Disagree (TS), and Strongly Disagree (STS).* The questionnaire instrument was validated by experts and declared valid. After the score was calculated as a percentage, student satisfaction in using themed worksheets was categorized based on the same criteria as student activities in Table 1.

The criteria for the success of this study consisted of three indicators, namely (1) a minimum of 75% of class VIII F students had test scores reaching or passing the Minimum Completeness Criteria (KKM), (2) the criteria of student activity in class VIII F was at least *good*, and (3) the criteria of student satisfaction towards the use of worksheet themed at least *good* [20], [22], [23].

3. RESULTS AND DISCUSSION

3.1. Results

Researchers observed student learning activities in each cycle in this study. The expert-validated observation sheet was used to observe the ten activities described in the previous section. The results of observing students' science learning activities at the Pre-cycle, Cycle 1, Cycle 2, and Cycle 3 stages are presented in Table 4. Table 4 shows that the most prominent student activities at the Pre-cycle stage were participating in group discussions. A total of 1 person (3%) had activities that were classified as *very good*, 6 people (19%) were classified as *good*, 11 people (34%) were classified as *moderate*, and 14 people (44%) were classified as *low*. This result means that a total of 25 (78%) students of class VIII F still have *moderate* or *low* science learning activities.

Table 4: Results of observation of students' science learning activities.

No	Observed Student Activities	Pre-cycle	Cycle 1	Cycle 2	Cycle 3
1.	Questions and answers between students	17 students (53%)	25 students (78%)	26 students (81%)	29 students (91%)
2.	Questions and answers with the teacher	13 students (41%)	26 students (81%)	27 students (84%)	33 students (100%)
3.	Questions and answers in class	12 students (38%)	23 students (72%)	25 students (78%)	30 students (94%)
4.	Question and answer in groups	18 students (56%)	26 students (81%)	27 students (84%)	31 students (97%)
5.	Class discussion	14 students (44%)	24 students (75%)	26 students (81%)	28 students (88%)
6.	group discussion	21 students (66%)	24 students (75%)	26 students (81%)	27 students (84%)
7.	Pay attention to the teacher's explanation	19 students (59%)	28 students (88%)	29 students (91%)	30 students (94%)
8.	Pay attention to the teacher's instructions	21 students (66%)	24 students (75%)	26 students (81%)	30 students (94%)
9.	Carry out a task	17 students (53%)	26 students (81%)	28 students (88%)	32 students (100%)
10.	Carry out teacher's instructions	14 students (44%)	27 students (84%)	28 students (88%)	31 students (97%)

There were several activities in the planning stage of Cycle 1, namely the preparation of lesson plans, preparation of worksheets according to the theme in the class VIII textbook published by the Ministry of Education and Culture 2017, preparing instruments for observing student activities, preparing test questions for understanding mathematical concepts in Cycle 1, and preparing learning media. Researchers coordinated with colleagues to ask for input for careful planning.

Actions in Cycle 1 focused on core activities, including implementing worksheets and discovery guidance patterns in discovery learning. At the stimulus stage, students were directed to find the concepts of *Solid Substance Pressure and Liquid Pressure* based on the theme of the school environment. Students discussed in groups according to the directions in the themed worksheet to find concepts based on their initial knowledge of the school environment, followed by a short presentation to share information in large groups. The pattern of discovery activities guidance was made classically. Students' activities in doing worksheets were divided into several stages. The teacher checked

periodically according to the sequence of activities. If students encountered difficulties at a certain stage, the teacher stopped student activities and asked all students to pay attention to the teacher's directions. This arrangement aimed to ensure that each discovery activity ran evenly in each group.

Observations were carried out in each learning stage, from the stimulus to the generalization phase. Students quickly started learning at the stimulation stage because the material came from things close to their lives (school environment). The teacher carried out the abstraction process by giving questions that stimulated students' curiosity. School environmental-themed student worksheets were carried out in group discussions, containing the identification process, data collection, and data processing. Based on observations in Cycle 1, student activities began to improve. They started actively asking and answering questions from group members.

Table 4 shows the most prominent student activities at the Cycle 1 stage: paying attention to the teacher's explanation. It can be seen that all student activities in the indicators increase. Only three students (9%) still have activities classified as *moderate*, and one (3%) is classified as *low*; other students are classified as *good* and *very good*. Overall, students' activity scores increased to 78%.

Cycle 2 planning involved students in determining the sports theme. Activities in the planning stage of Cycle 2 included improving the lesson plan (classical mentoring pattern into a small group mentoring pattern), preparing sports-themed worksheets, preparing instruments for observing student activities, preparing test questions, and preparing learning media.

The implementation of the actions in cycle 2 focused on the core activities, namely the use of worksheets and the pattern of guiding discovery/investigation. At the stimulus stage, students were directed to determine the concept of *Archimedes' Law and Pascal's Law* based on the theme of sport. The use of sports-themed worksheets followed this stimulus. Students discussed in groups according to the directions in the worksheet to find procedures based on their initial knowledge of sports and then followed by a short presentation in sharing information in large groups. The teacher gave guidance per small group. The teacher monitored one group to another, observing if there were difficulties that each group encountered. Each active group asked in turn and tended to raise questions or broad responses from other groups.

Observational data in Cycle 2 showed that all student activities in the indicators increased significantly. Each group actively discussed solving problems in the worksheet, asked questions, collected information, and answered questions. Students were

active in collaboration. They helped others in solving problems, even the other discussion group. Student activity was classified as *good* and *very good*, with an average activity of 83% in the *very good* criteria. The four students who had *low* activity in Cycle 1 also increased activity in Cycle 2. However, one student still had *low* activity. The results of Cycle 2's reflection showed that students seemed more enthusiastic since the preliminary activities, so it was easier for teachers to direct attention to the stages of learning. The process of planting concrete concepts into abstract ran faster than Cycle 1. In general, the indicators of research success had not been met, so the cycle continued to Cycle 3.

In Cycle 3, the teacher and students discussed that the chosen theme is *family*. This theme was chosen for consideration of benefits, proximity to the environment, and easy access for students to connect what they already know and what will be learned. The family theme in Cycle 3 was determined through the teacher's analysis which was discussed with the students. The activities carried out in the planning stage included improving the lesson plans (improvement of classical mentoring patterns into small group mentoring patterns), preparing family science worksheets with the theme of family science, preparing instruments for observing student activities, preparing test instrument, and doing documentation.

In cycle 3, students learned in a discovery learning model assisted by a family-themed worksheet. The material studied was *Applying the Concept of Pressure in Daily Life*. In the stimulation phase, students were given verbal explanations and illustrations related to family themes, such as a family trip to the museum, followed by giving, working on, and discussing the family theme worksheet. The teacher conducted a mentoring pattern per small group by monitoring one group to another to find any difficulties that may be encountered. Like in Cycle 2, each active group asked in turn and tended to raise carrom questions from other groups. The questions that arose were even more numerous, with wider themes than those in Cycle 2.

The data in Cycle 3 generally showed an improvement in student activity and science learning achievements compared to the results in Cycle 2. It can be seen that all student activities in the indicators increased significantly. All students have *good* and *very good* activities, with an average activity of 93% in the *very good* criteria. In Cycle 3, students improved their activity and reached the successful criteria. The reflection of Cycle 3 showed that students are more relaxed and enjoy the learning process. They discussed and did the tasks in the worksheet faster than the estimated time. However, in Cycle 3, the apperception process needed more attention because the series of concepts must be linked again them make the more meaningful learning.

Researchers collected data on student learning achievements and students' satisfaction using themed worksheets at the end of each stage. Researchers used test items and statistically validated questionnaires described in the research method. Pre-cycle test results were used as initial research data on the low learning achievements of science students. The data on average learning achievements, classical completeness, and student satisfaction with the use of worksheets are presented in Table 5.

TABLE 5: Science learning achievements and student satisfaction with worksheet each cycle.

Cycle	Average Score	Classical Completeness	Satisfaction with Worksheet
Pre-cycle	43.71 (low)	22% (low)	Not calculated
Cycle 1	54.60 (low)	28% (low)	13.50 (very high)
Cycle 2	63.31 (low)	50% (low)	13.56 (very high)
Cycle 3	71.61 (moderate)	78% (good)	13.75 (very high)

Pre-cycle test data showed an average class score of 43.71, with the highest score of 82.5 and the lowest of 12.5. A total of 7 students (22%) had a score of 70 or more and were categorized as *complete* (passing KKM), while the other 25 (78%) were incomplete. This data showed that the science learning achievement for class VIII F of SMP Negeri 1 Juwangi in the 2021/2022 school year still needed to be improved. Based on the score criteria, there were no students who were classified as *very good*, 2 students (6%) were classified as *good*, 5 students (16%) were classified as *moderate*, 5 students (16%) were classified as *low*, and 20 students (63%) were classified as *very low*. This data strengthened that this research needed to be done to improve the students' activity and learning achievements. After the actions in Cycle 1, Cycle 2, and Cycle 3, students' science learning outcomes increased significantly. The improvement in students' science learning outcomes was shown by the increase in the number of students who achieve KKM, as shown in Figure 1.

The closed-book test was carried out at the second meeting of Cycle 1. Students were assigned to prepare for the test. They studied by reading textbooks and other learning resources before the test. Based on the evaluation of Cycle 1, the average class score was 54.60, with the highest score of 85 and the lowest score of 30. A total of 9 students (28%) scored 70 or more and were categorized as *complete*, while the other 29 (72%) did not pass KKM. The data showed that the science learning achievements of Class VIII F SMP Negeri 1 Juwangi for the academic year 2021/2022 increased compared to the Pre-cycle, although they still needed to be improved. Based on the score criteria, there were no students who had *very good* grades, 1 student (3%) was classified as *good*, 8 students (25%) were classified as *moderate*, 7 students (22%) were classified as *low*,

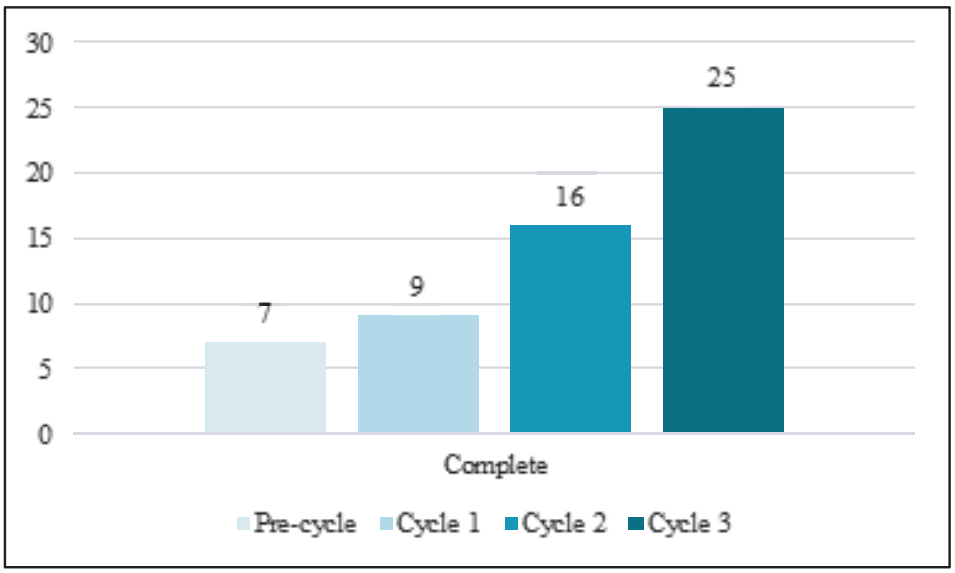

Figure 1: Number of students who achieved KKM in each cycle.

and 16 students (50%) were classified as *low*. The score of students' satisfaction with using the worksheet was 13.50 (very high criteria).

After the treatment in Cycle 2, an evaluation test was conducted. The results of the Cycle 2 evaluation showed an average class score of 63.31, with the highest score of 82.5 and the lowest score of 40. A total of 16 students (50%) had a grade of 70 or more and were categorized as *complete*, while the other half was *incomplete*. The data showed that the science learning achievements for class VIII F SMP Negeri 1 Juwangi for the academic year 2021/2022 were much improved compared to Pre-cycle and Cycle 1 but had yet to reach the indicators of research success. Based on the score criteria, there were no students who had *very good* grades, 1 student (3%) was classified as *good*, 15 students (47%) were classified as *moderate*, 11 students (34%) were classified as *low*, and 5 students (16%) were classified as *very low*. The score of students' satisfaction with using the worksheet was 13.56 (very high criteria). The overall score of science learning achievements in Cycle 2 was 68% or classified as *good*.

Based on the evaluation results of Cycle 3, the average grade value was 71.61, with the highest score of 90 and the lowest score of 47.5. A total of 25 (78%) students had a score of 70 or more and were categorized as *complete*, while the other 7 (22%) were *incomplete*. The data showed that the science learning achievements of class VIII F SMP Negeri 1 Juwangi for the academic year 2021/2022 were much improved compared to Pre-cycle, Cycle 1, and Cycle 2 and had achieved indicators of research success. Based on the score criteria, 1 student (3%) was classified as *very good*, 7 students (22%) were classified as *good*, 17 students (53%) were classified as *moderate*, 5 students (16%) were

classified as *low*, and 2 students (6%) were classified as *very low*. The score of students' satisfaction with using the worksheet was 13.75 (very high criterion). The overall score of learning achievements in Cycle 3 is 71% or was classified as *good*. In general, the indicators of success had been met so that the cycle stoped in Cycle 3 and the action research was declared complete.

4. Discussion

The results of observations at the Pre-cycle stage showed that the dominant students were active in participating in group discussion activities and paying attention to the explanations from the teacher with an average of 66% (21 students). These results indicate that the activity of students in the classroom tends to be low. They were used to paying attention to the explanation of the material from the teacher. In discussions, students did not dare to express opinions in large groups. There was no motivation to be active in lessons because students thought science learning needed to be more attractive. The discussions were also limited to following teachers' instructions; not all students were engaged in group discussions or class discussions. The low obedience of students in carrying out instructions and doing assignments could be caused by the teacher's lack of clear explanations and facilitation; it opened up opportunities for undisciplined behavior [24].

The most prominent student activity in the Cycle 1 stage was paying attention to the teacher's explanation. The teacher in Cycle 1 used interactive presentation learning media that was not in the Pre-cycle stage. The use of attractive presentation media and clear and concise explanations interested students in the teacher's explanation [25]. It could be seen that all student activities in the indicators improved. Only three students (9%) still had activities classified as *moderate*, one student (3%) was classified as *low*, and the others were classified as *good* and *very good*. Overall, students' activity scores improved to 78%. Based on the interviews with the homeroom teacher and the students concerned, it was known that the three students with low activity were quiet students. They needed special attention in learning because they had family problems. This finding encouraged researchers to pay more attention to learning, considering that such students required learning adjustments, special assistance, and special services [26].

The teacher determined the theme of the school environment in the worksheet used in Cycle 1, considering that the school environment was close to students. However, this seemed to be too boring for students. As an improvement, in Cycle 2, students would be

involved in determining the worksheet theme. This worksheet's theme determination allowed students took responsibility for using worksheets. Students were expected to be more actively engaged in learning because they participated in planning and implementation. These findings followed previous research, which showed that the involvement of students in learning, including the selection of materials, could increase students' sense of responsibility for learning [27]. The students chose the sports theme for the worksheet, which would be used in Cycle 2.

The classical guidance pattern in Cycle 1 was known to have shortcomings regarding students' freedom. This pattern limited the movement of smart students because they had to listen to the teacher's explanations, which they already understood. Mentoring in large groups did not facilitate differences in students' abilities and could potentially cause biased and off-target information [28]. This mentoring resulted in a decrease in students' enthusiasm to continue activities.

Data from observations and interviews also supported the results of the above data analysis. Some previously very passive students in Cycle 1 had started to actively discuss and ask questions, even though some still tended to be passive in learning. Based on the interviews with the concerned students, it was known that they did not understand the instructions at the beginning, so they were hesitant about learning activities. Other students admitted that they weren't feeling well, and others were having personal problems. The data concerned researchers to prepare for learning more maturely so that students pay better attention to instructions. Researchers also needed to understand students' characteristics better to facilitate students with special needs.

The teacher applied a mentoring pattern per small group in Cycle 2. The teacher monitored one group to another, observing when there were difficulties that each group encountered. Each active group asked in turn and tended to raise questions or broad responses from other groups. This high activity showed that students' curiosity was stimulated by discovery learning, which indicated the success of discovery learning [23]. However, for the sake of learning to remain effective in achieving learning objectives according to the time allocated in planning, the teacher made a question queue rule.

Observations were carried out in each stage of learning, from the stimulus to the generalization phase. At the stimulation stage, students easily started learning because the material presentation came from their proposals and was compiled. After consulting with colleagues, the teacher also prepared the worksheet with the theme of biology subject matter. The teacher also inserted the current viral theme. The abstraction process was carried out with the help of asking questions from the teacher.

The process of identification, data collection, and data processing were carried out by students using biology-themed worksheets, which were carried out in group discussions. The cooperative attitude was observed to be better than in Cycle 1, where the question-and-answer activities and knowledge transfer were more intensive than in Pre-cycle. Data from Cycle 2 calculations generally showed an improvement in activity and science learning achievements, where student activity was classified as *good* and *very good*, with an average activity of 83% in the *very good* criteria. There was only one student whose activity was classified as *low*. Interviews conducted on these students showed that the students concerned had family problems, namely parental separation. Based on psychology, family problems significantly impact students' activities, motivation, and learning achievements [29]. This finding became a note for researchers to provide more motivation to these students.

Most of the students were observed to have better interactions with their group mates. Students were more flexible in communication with fellow members and teachers, and the class atmosphere became more lively. These findings align with previous research, which showed that discovery learning could improve students' attitudes [30]. Collaborative learning in groups gave students a new approach to doing school assignments. They felt more relaxed and motivated in doing tasks [31]. The high activity showed that the students' curiosity was getting higher. Students were also observed to be more enthusiastic and motivated in learning. This finding aligns with previous research, which showed that learning with the discovery learning model stimulated students' motivation to be more active in learning [22]. Responding to this, the teacher made a turn to ask questions for each group. Each group also needed teacher approval before responding to other groups' answers so that learning remained conducive.

All students had activities classified as *good* and *very good*, with an average activity of 93%, *very good* criteria in Cycle 3. Attitudes toward cooperation in groups were also observed to increase, indicated by the higher discussion and collaboration activities of students in groups. The teacher reminded students to discuss effectively to avoid deviating from the learning objectives according to the set time allocation. This step follows previous research that teachers needed to facilitate discussions and act as regulators so that discussions ran effectively where learning objectives were still achieved [32]. Based on these data, it could be concluded that in Cycle 3, students' activity improved better compared to Cycle 1 and Cycle 2 and had reached the success criteria.

Student activities, science learning achievements, and student satisfaction with themed worksheet on Pre-cycle, Cycle 1, Cycle 2, and Cycle 3 are presented in Table 6. Table 6 shows that all indicators of research success have been achieved.

TABLE 6: Student activities, science learning achievements, and student satisfaction with themed worksheet.

Cycle	Activity	Learning Achievement	Students' Satisfaction
Pre-cycle	53% (moderate)	43% (moderate)	Not calculated
Cycle 1	78% (good)	54% (moderate)	90% (very good)
Cycle 2	83% (very good)	68% (good)	90% (very good)
Cycle 3	93% (very good)	71% (good)	92% (very good)

Table 6 shows the improvement of student activity from the initial state, Cycle 1, Cycle 2, to Cycle 3, respectively 53%, 78%, 83%, and 93%. Students in the initial state tended to be passive in learning and gradually got used to cooperative learning that involved students actively. In Cycle 1, students were still unfamiliar with discovery learning, but the activity was still increasing. Students who were still passive and tended to do other activities unrelated to the material were motivated to be more active in learning, given more direction and attention, and given more opportunities to learn. Students began to enjoy learning in Cycle 2 and Cycle 3. Students began to get used to carrying out discovery learning and were trained to be actively involved in the process of building knowledge in groups.

The results are in accordance with the characteristics of the discovery learning model, which involves students actively learning through joint discovery activities. This activity trains the ability to think quickly and a sense of responsibility. Learning like this follows constructivism, where knowledge is obtained through students' efforts and experiences directly, not just by transferring knowledge from teachers to students [33].

All 32 students had learning activity scores classified as *good* to *very good* at the end of Cycle 3. These results indicate that the discovery learning model has succeeded in increasing students' activity in science learning. These results strengthen previous studies where the discovery learning model can improve students' activity in learning because it stimulates students to utilize the five senses in seeking information and finding their knowledge [34].

Student activities in learning stimulate and develop students' talents and hone students' abilities in critical thinking so that students are trained to solve problems in everyday life [35], arouse learning motivation, increase interaction so that it creates a sense of pleasure when learning [36], affects students' critical thinking skills [37], and affects student learning achievements [38]. In addition, student activities in learning also train students' abilities to master various social attitudes that are indispensable in facing global challenges, even in limited conditions such as learning during a pandemic [39].

Through teacher guidance, students actively involved in learning naturally carry out exploration activities, seek and question a material concept, build knowledge independently, and collaborate with other students. Through these activities, students unconsciously develop their potential and learning capacity and improved their abilities, knowledge, and skills [35].

The explanation follows the results of this study, where student learning achievements improved in Cycle 3 compared to the initial state. In the initial state, students had an average learning achievement of 43.71, with only 22% of students achieving or exceeding the KKM. Giving action in Cycle 1 improved student learning achievements, from an increase in the average test score to 54.60, with 28% of students successfully reaching or passing the KKM. Student learning achievements can be improved better through giving actions in Cycle 2. This finding can be seen from the increase in students' average test scores to 63.31, with 50% of students achieving or exceeding the KKM. At the end of Cycle 3, this learning achievement increased to 71.61, with 78% of students completing or passing the KKM.

The improvement in activity tends to be slow but reached the *very good* criteria in Cycle 3. The increase in learning achievements reached the *good* criteria with an average score of learning achievements that was thin above the KKM of 71.61. This improvement in student learning achievements may be less satisfying. However, the increase in students' science learning achievements is very significant based on the initial data on learning achievements. The average initial score of only 43.71 was successfully increased to 71.61, with classical mastery increasing from 7 students (22%) to 25 students (78%). The slow increase was caused by the students' unfamiliarity with implementing discovery learning. Students needed to become more familiar with discovery activities to build knowledge independently. This result follows previous research, which showed that students accustomed to conventional learning would be confused with scientific learning. They needed habituation to feel the benefits of scientific learning [40]. However, students' scientific activities will increase and improve with the use of media that stimulates students to be active in learning. Scientific activities encourage students to actively build their knowledge to feel comfortable learning [21].

Seven students (22%) did not reach the KKM. Based on the interviews, the seven students stated that (1) they were less interested in science subjects because they felt more talented in social, religious, art, and sports subjects, and (2) they had personal and family problems. This result also strengthens previous research where interest in learning significantly affected learning achievements [41]. Interest was influenced by many factors but could be influenced by using appropriate learning models and media.

Family factors were also important in influencing student learning achievements, so families had to carry out their role as the first education for students [29]. Interviews with homeroom teachers also revealed that the three students needed special attention in learning because they had less material absorption in each lesson. Researchers had to be able to pay more attention to learning, considering that such students required learning adjustments, special assistance, and special services [26]. Data on the completeness of students' science learning achievements are presented in Table 7.

Table 7: Data of students' science learning achievements completeness.

Learning Achievement Criteria	Pre-cycle	Cycle 1	Cycle 2	Cycle 3
Passing the KKM	7 students (22%)	9 students (28%)	16 students (50%)	25 students (78%)
Not Passing the KKM	25 students (78%)	23 students (72%)	16 students (50%)	7 students (22%)

In addition to providing assistance and special services, teachers can also do several things to stimulate student activity in learning. These things include always allowing students to carry out all learning activities, compiling interesting and interactive learning media, managing classes optimally, instilling good social attitudes in students through habituation activities, and guiding students to study effectively [36].

Learning achievements are something someone obtains after learning activities, which are consciously carried out to meet their needs [42]. With an average value of 78.38 and a level of completeness reaching 91%, the class action was declared to have met the target so that it did not require the next action cycle. The increase in student learning achievements is caused by two factors, namely internal factors and external factors. Internal factors are related to students' motivation and genetic factors that encourage students to obtain optimal learning achievements through various efforts. External factors are related to environmental influences, including the use of learning models to create a learning atmosphere that is fun, supportive, and actively involves students [43].

The discovery learning model can help students increase activity in the learning process and help improve learning achievements. Activities in small groups can help students work together and discuss more effectively to make students more active. The discovery learning model encourages the ability to cooperate, interact, and think quickly, which can only be obtained if students are always active. Implicitly the results of this study prove that increasing student learning activities can improve student learning achievements. Although the correlation was not tested in this study, this conclusion

is supported by previous research data, which have proven a correlation between student activity in learning and student learning achievements [38]. Other research also reveals that learning achievements are obtained through a series of student activities, so activities affect learning achievements indirectly [44].

The use of themes in discovery learning can provide a certain atmosphere. The coloring theme of learning starts at the stimulus stage. Themes can focus students' attention functionally. The manifestation of the implementation of the theme in this study is a verbal explanation of the story related to the material. Themes can be followed up through worksheet media with similar themes. Themes make it easy for students to build meaning through their perceptions. However, the theme does not play a significant role when it is at the stage of problem identification, data collection, and data presentation. At the generalization stage, abstract conclusions should be transferred to other different contexts or themes. This stage is helpful so that the student concept is broader and not limited to one theme.

Themed content leads students to realize that scientific facts can be extracted from life phenomena. Themed content is mixed through skills, attitudes, and knowledge. Themed content in discovery learning can serve as a source of problems that make it easier for students to access well-known everyday facts [45]. Stimulus in the form of problems can train students' thinking habits [46]. This theme began to underlie the process in the stimulus phase, the problem identification phase, and the worksheet work phase.

Based on the presentation of the results of this study, it can be concluded that learning using the discovery model assisted by themed worksheets, which was carried out for three cycles, succeeded in increasing science learning activities and improving science learning achievements for class VIII F students of SMP Negeri 1 Juwangi in the 2021/2022 academic year on the subject of *Substance Pressure and Its Application in Daily Life*.

5. CONCLUSION

Science learning needs to grow 21st-century skills as a provision for students to face global challenges, which consist of critical thinking skills, collaboration, communication, and creating something from the knowledge they have. For this reason, Science as a subject needs to be taught through a scientific approach, learning that learns to be more active in constructing knowledge and skills through investigations to find facts from an event. Unfortunately, in the Pre-cycle observations during learning in class VIII

F of SMP Negeri 1 Juwangi in the 2021/2022 academic year, the researcher found that students had a low learning activity in asking or answering questions. In addition, it was found that students were not actively giving opinions in discussions and ignored the teacher's explanation. The researcher also found that students did not understand why they were studying Science and considered Science a complicated subject, so they felt bored with learning. These causes are exacerbated by the condition of classroom facilities that do not support technology-based learning.

Based on the description of the gap between the importance of student activities in learning and student learning achievements with the data and facts found in the field, the researcher aims to increase students' activities and achievements through classroom action research. This research adopts the discovery learning model assisted by themed worksheets to improve student activity and learning achievements. The researcher also aims to explain the role of the theme and the pattern of guidance on the improvement.

Based on the description of the results and discussion, the conclusions obtained are (1) learning the discovery learning model assisted by themed worksheets can increase the average student activity to a value of 93% or classified as very good, (2) learning the discovery learning model assisted by themed worksheets increases the average learning achievements Science became 71.61 with a classical completeness rate of 78%, (3) The themed worksheets were well received by students in learning with an average score of satisfaction up to 13.75 (very high), and (4) the theme in the stimulus discovery learning phase played a role in helping focuses students' attention, helps students abstraction process, and helps students construct meaning.

This study has limitations in terms of the absence of initial data on students' character, a correlation test between activity data and student learning achievements, and not preparing for learning that accommodates students with special needs. These limitations also become suggestions for further research. Student character data can be used to determine the most appropriate action. The correlation test between activity data and student learning achievements can strengthen research results. Learning that accommodates students with special needs is needed to facilitate students with low absorption of material or other special needs. The results of this study can be a reference for teachers to implement the discovery learning model with the help of themed worksheets to improve students' activities and learning achievements. In addition, this research also illustrates the condition of the low activity and learning achievements of students' history so that it can be taken into consideration by related parties to improve the overall quality of learning.

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