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Efforts to Improve Science Process and Collaboration Skills with the Implementation of the REACT Learning Model on Students

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Abstract: Education is an effort to improve the quality of individuals, directly or indirectly to become the basis and keep pace with the development of Science and Information Technology. Science process skills and collaboration skills are two of the few skills that can be mastered by students to keep up with the Times. However, this skill is still not fully mastered by all students. As the problem in this study is still low skills of science process and collaboration skills of Class XI students at SMAN 1 East Kampar. The purpose of this study was to determine the improvement of science process skills and collaboration skills of students through the application of the REACT learning model. The method used is Class Action Research (CAR) which is carried out as many as 2 cycles. Samples in this study were students of Class XI MIPA 4. Data collection was done through collaboration skills observation sheet and science process skills test assessment. The results of this study found that there was an increase in science process skills and collaboration skills of students of Class XI MIPA 4 SMAN 1 Kampar Timur after the application of the REACT learning model.

Keywords: Collaboration; REACT Model; Science Process

Introduction

Education in Indonesia until now is not clear about goal. The government is still confused about what will be expected and prepared to go to the learning community. Changing the curriculum can be a progressive step but also not a problem-solving path. Curriculum change is a natural cycle that occurs in the world of Education (Rahayu et al., 2023). This is based on the renewal, development, and improvement of the previous curriculum.

The education curriculum that is being implemented in Indonesia today is the 2013 curriculum. In the 2013 curriculum, educators are not the center of learning (Teacher Centered), both sources of knowledge and learning activities, but students are the center of learning (Student Centered) (Firmansyah & Jiwandono, 2022; Mujahida, 2019; Muliarta, 2018; Wulandari et al., 2022). Ulum (2018) explained that an educator must have competence as an educator which includes understanding learners, planning learning, implementing learning, conducting research, and evaluating learning processes and outcomes. Educator is important to be able to master the learning model that will be implemented in the classroom so that learning theory is conveyed well through the applied learning model (Abidin, 2019; Kaif et al., 2022; Meilyza, 2021).

Physics as a branch of science does not only study facts and theories (Bunge, 1982; Kragh, 1998; Russell & Martin, 2023). Science also requires investigation activities to discover new facts, both through observation and experimentation, as part of scientific work that involves science process skills (Latifah & Kusyeni, 2017). Science process skills are skills needed to acquire, develop, and apply the concepts of principles, laws and theories of science, in the form of mental skills, physical skills, and social skills (Darmaji et al., 2019; Saputra, 2020). In his research, Antrakusuma et al. (2017)

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found that there is an influence of active learning to develop science process skills.

In addition to having science process skills, learners must also master collaboration skills. This is because collaboration skills relate to a person's ability to work together to achieve a common goal (Saleh et al., 2022). In studying physics that not only learns about facts or theories, but also learns in the process of discovery. The discovery process is what requires students ' collaboration skills so that they can discover something new.

The results of early observations in SMA Negeri 1 Kampar Timur showed that in the learning process has not been able to show good science process skills and collaboration skills. From the observations that researchers do, the implementation of learning is still monotonous and focused on the teacher. Then, the method used in the learning process is still not optimal to improve the skills of the science process and student collaboration skills. As a result of the lack of maximum learning methods used in the classroom, it causes the emergence of weaknesses in students, namely students become passive, The Boring learning process can even cause students to be sleepy, there is an element of compulsion to listen, and there is no clear student achievement point because students only listen without active participation (Sulandari, 2020).

One of the learning models that can be applied to improve students ' science process skills and collaboration skills is the REACT (Relating, Experiencing, Applying, Cooperating, and transferring) (Feri, 2022; Junaidah et al., 2022) learning model described by CORD (Center of Occupational Research and Development) in America (Lisnawati, 2019). REACT model is one of the learning models with a contextual approach. Contextual learning is a learning process that involves students in important activities that help them relate academic lessons to the real-life contexts they face (Trisniawati, 2015). A series of phases of the REACT learning model is seen as able to improve the science process skills possessed by students. The REACT learning model is considered to have great effectiveness in developing and training optimal science process skills (Hartini, 2017).

The REACT (Relating, Experiencing, Applying, Cooperating, transferring) learning Model is a student-centered learning model (Prihandhika, 2017). One component of the REACT learning model (Relating, Experiencing, Applying, Cooperating, transferring) is Cooperating where at this stage, students are asked to communicate concepts that have been obtained previously with groups that have been formed or with other group members (Taufik et al., 2010). In this stage, it can show collaboration between students because students can transfer knowledge so that it can increase their activity.

Method

This study uses the method of classroom Action Research (PTK). This research is a reflective form of certain actions in order to improve classroom learning practices effectively and efficiently and professionally (Salahudin, 2015). According to Ul-Khoiriyah (2019) there are four stages in Class Action Research (PTK), namely planning, implementation, observation, and reflection.

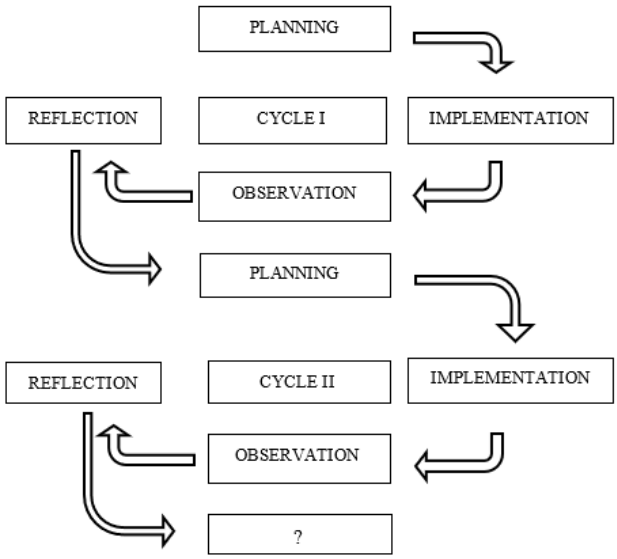

Figure 1. Class Action Research Design

This research will be carried out at SMA Negeri 1 Kampar Timur in the even semester of the 2022/2023 academic year. The subject of this study is Class XI MIPA 4, a total of 25 students with details of 11 male students and 14 female students.

The data collection technique used in this study is through observation. The research instruments used were science process Skill Test, collaboration skill observation sheet, and learning tools (syllabus, lesson plan, and student worksheet).

This study begins with a preliminary analysis. In this initial analysis, the researcher identifies the problem through observation to determine the problem so that it can design a class action research that will be conducted. Action research this class will be divided into 2 cycles, each cycle includes planning, implementation, observation, and reflection. Data analysis techniques in this study using qualitative data that is descriptive statistical analysis in the percentage of each cycle to calculate the results of the science process skills test and student collaboration skills observation sheet.

Result and Discussion

Cycle I

The planning phase of the first cycle begins with the preparation made by researchers in conducting the learning process with the REACT learning model to improve science process skills and collaboration skills possessed by students. The preparation is done by preparing research instruments such as syllabus, learning implementation plan, students worksheet, science process skills test questions, and observation sheets of student collaboration skills that have previously been validated before being used. Cycle I was held as many as 3 meetings with the allocation of time for each meeting is 2 x 45 minutes. With the material taught in cycle I is a mechanical wave.

The implementation phase of the class action in the form of application of the REACT learning model (Relating, Experiencing, Applying, Cooperating, and transferring) at each meeting with learning materials about mechanical waves. The three learning meetings in the first cycle will contain five elements in the REACT learning model, namely Relating, Experiencing, Applying, Cooperating, and transferring (Harmin et al., 2020; Taraufu et al., 2020).

Meeting 1 in cycle I will contain mechanical wave material about wave description, wave characteristics, and differences in transverse waves and longitudinal waves. Meeting 2 in cycle I will contain mechanical wave material about analyzing the quantities in the wave. Meeting 3 in cycle I will contain mechanical wave material about wave properties. Each meeting will contain 3 activities, namely preliminary activities, core activities, and closing activities in accordance with those in the lesson plan.

Observations made took place during the implementation of the action through the implementation of the REACT learning model implemented. The observation was conducted by the researcher with the help of the observer teacher. This is done to determine the improvement of science process skills and student collaboration skills. Observations made in the first cycle is an observation of the science process skills and collaboration skills of students.

Observation of science process skills was conducted to determine the extent to which students ' mastery of science process skills during learning activities with the application of the REACT learning model took place in Grade XI students of MIPA 4 SMAN 1 Kampar Timur. Observation of science process skills is done by giving science process Skill Test Questions to students as many as 10 Questions. The results of the science process skills test of students in the first cycle can be seen in Table 1.

Table 1. Science Process Skills Test Results Cycle I

Item	Total
Number of students	25
Top score	90
Lowest score	40
Average	68,80
Number of completed students	16
Number of students not completed	9
Percentage of Completeness	64%

Based on Table 1. it can be seen that in the mechanical wave material taught in the first cycle in Class XI MIPA 4 with a standard value of physics is 70, then there are 16 students who completed and 9 students who have not completed. The average score obtained is 68.80 with the percentage of class completeness is 64% and is still in the category of less. This result is still insufficient standards because the class completeness is still below 100%. Based on the test results, students are still difficult to work on problems with indicators to classify, communicate, measure, and conclude. In classifying indicators, this is because students still do not understand the science process skills, so students still have difficulty in grouping. For communicating indicators, it shows that students are still unable to convey the meaning of the images provided in the problem. As for measuring indicators, students still do not understand what is measured to obtain the desired result. Then to conclude indicators, students still can not draw conclusions from the questions given. Deficiencies in the results of the first cycle of the science process skills test can be corrected in the second cycle with teachers should be more practice the ability to classify, communicate, measure, and conclude students.

Observations made on students collaboration skills are carried out to find out how students are able to work together or collaborate with their classmates in solving a problem or to find a solution to a problem (Kembara et al., 2019). Collaboration skills are observed through observation sheets by researchers assisted by observer teachers. The results of observations on student collaboration skills cycle I can be seen in Table 2.

Table 2. Results of Observations of Collaboration Skills Cycle I

Meeting	Percentage (%)	Category
Meeting 1	48.67	Simply Collaborative
Meeting 2	53.80	Simply Collaborative
Meeting 3	59.40	Simply Collaborative
Average	53.96	Simply Collaborative

Based on Table 2. it can be seen that the percentage of students' collaboration skills has increased in each meeting in the first cycle although the increase is still not significant. From Table 2. it can also be seen that the

average percentage of students' collaboration skills is 53.96% with a fairly collaborative category. So it can be concluded that the students 'collaboration skills in the first cycle is still not satisfactory and needed improvement in the second cycle with more intensive teacher guidance so that students' collaboration skills can increase.

Reflection phase in the first cycle based on the results of the teacher's discussion with two observer teachers who produce results such as student confidence is still lacking or there are still doubts in the students, there are still some students who feel uncomfortable or object to the group formed by the teacher, almost all students have not been actively involved in group activities and work together with, some students still tend to be selfish by not respecting the opinions of their classmates, the courage of students in communicating the results obtained is still quite low, and the results of the science process skills obtained in the first cycle are still not in the good category.

Based on the results of the first cycle of reflection, then prepared some planning or improvement that can be done in the second cycle, including teachers should be able to create a learning process atmosphere as attractive as possible to attract the attention of students in the learning process (Sylvia et al., 2021), teachers should be able to provide a positive apperception to students so that students can be more responsive, teachers can make some efforts such as giving appreciation to students, guiding students more intensively, and provide understanding to students using language that is easy to understand.

Cycle II

The planning phase of Cycle II is done by preparing for the implementation of the REACT learning model. By preparing research instruments such as syllabus, learning implementation plan (RPP), student worksheets, science process skills test questions, and student collaboration skills observation sheets that have previously been validated by three validators before being used. The validation results, it is known that the research instruments used are feasible to be used in the second cycle. Cycle I held 3 meetings. The time allocation given for each meeting is 2 x 45 minutes. Researchers plan the exposure of the material about the traveling waves and stationary waves in the second cycle.

Phase II action implementation cycle with the application of learning models REACT (Relating, Experiencing, Applying, Cooperating, and transferring) at each meeting with learning materials about the running wave and stationary waves. Each learning meeting in the second cycle will contain five elements in the REACT learning model, namely Relating, Experiencing, Applying, Cooperating, and transferring. In addition, the implementation of Cycle II is also based on the results of the reflection of cycle I.

Meeting 1 in the second cycle will contain the material of running wave and stationary wave about explaining the running wave. Meeting 2 in Cycle II will load the material of walking wave and stationary wave about free end stationary wave. Meeting 3 in Cycle II will load the material of walking wave and stationary wave about stationary wave bound end. Each meeting in the second cycle will contain 3 activities, namely preliminary activities, core activities, and closing activities in accordance with those in the lesson plan.

The observation phase in the second cycle will observe the skills of the science process and student collaboration skills during the learning process. The results of observations on science process skills can be seen in Table 3.

Table 3. Science Process skills Test Results Cycle II

Item	Total
Number of students	25
Top score	100
Lowest score	80
Average	88,4
Number of completed students	25
Number of students not completed	0
Percentage of Completeness	100%

Based on Table 3. it can be seen that in the material of walking waves and stationary waves taught in the second cycle in Class XI MIPA 4 with the standard value of physics is 70, all students are declared to have been completed. The average score obtained is 88.4 with the percentage of class completeness is 100% and is in a good category. This result has reached the standard of class completeness of 80%. This is because students have been able to understand every indicator of science process skills. So that students do not have difficulty in answering the questions given properly and correctly. Comparison of science process skills of Class XI MIPA 4 students in cycle I and Cycle II based on the percentage of class completeness can be seen in Figure 2.

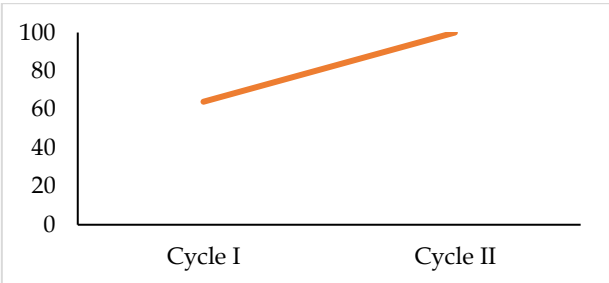

Figure 1. Observation Results Completeness Class Cycle I and Cycle II

The results of observations for collaboration skills in the second cycle can be seen in Table 4.

Table 4. Results of Observations of Collaboration Skills Cycle II

Meeting	Percentage of Collaboration Skill (%)	Category
Meeting 1	66.20	Collaborative
Meeting 2	77.80	Collaborative
Meeting 3	88.73	Highly Collaborative
Percentage	77.58	Collaborative

Based on Table 4. it can be seen that the percentage of student collaboration skills has increased in each meeting in the second cycle with a significant increase. From Table 4. it can also be seen that the average percentage of students ' collaboration skills is 77.58% with the collaborative category. This result has increased compared to the results of collaboration skills in cycle I. So it can be concluded that the improvements made in Cycle II based on the results of reflection cycle I can be declared successful. Comparison of collaboration skills of students of Class XI MIPA 4 in cycle I and Cycle II can be seen in Figure 3.

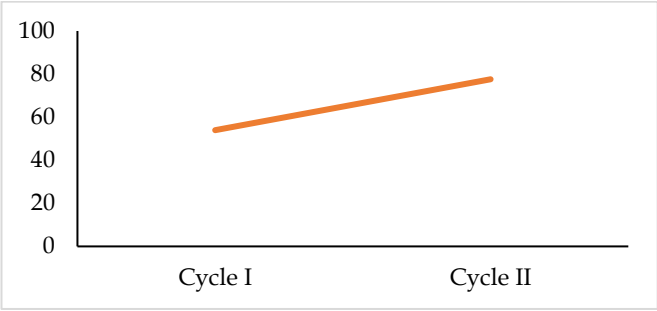

Figure 3. Obersevastion results of Collaboration Skills Cycle I and Cycle II

Reflection phase in the second cycle, the results obtained that the application of learning with REACT model to improve the skills of the science process and collaboration skills of students of Class XI MIPA 4 SMAN 1 Kampar Timur has been better than the first cycle. This is shown by the assessment of science process skills with the value of class completeness in the second cycle is 100%. As for collaboration skills, it has also experienced a significant increase when compared to cycle I.

In the second cycle, students also become more active in learning activities compared to the first cycle. Students are no longer hesitant and more confident in expressing their opinions in discussions. Students' understanding is also improved which is shown by the test results. So there is no need to do the next cycle.

Conclusion

The implementation of the REACT learning model in students of Class XI MIPA 4 SMAN 1 Kampar Timue, students ' science process skills increased from cycle I to Cycle II. Shown by the results of the science process skills of students through the assessment of the science process skills test and class completeness of students from cycle I with the category of moderately increased in Cycle II with the category of very good. Collaboration skills of students of Class XI MIPA 4 SMAN 1 Kampar Timur increased after the implementation of the REACT learning model. This is shown by the results of research on collaboration skills in cycle I with the category of collaborative enough to increase to collaborative in Cycle II. Based on the results of research, the implementation of the REACT learning model in students of Class XI MIPA 4 SMAN 1 Kampar Timur can improve science process skills and student collaboration skills.

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The authors declare no conflict of interest.

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