

## IMPROVING LEARNING OUTCOMES IN CHEMICAL CHANGE TOPICS THROUGH PRACTICUM ACTIVITIES

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**Abstract:** 21st-century learning requires teachers to be more creative and innovative in determining learning that activates students. The classroom action research aims to improve learning outcomes of chemical change topics through practicum activities. The research was conducted in two cycles with an achievement indicator of 85% of students having mastered concepts above the minimum completeness. The subjects studied were students of grade ten high school SMAN 5 Mataram, 35 students. Learning outcome data were collected using test and non-test instruments. The test instrument collects cognitive data, while the non-test instrument or observation sheet collects affective and psychomotor data. Achievement indicators for cognitive if 85% of students have achieved minimum completeness criteria scores ( $\geq 74$ ), while affective and psychomotor are said to be successful if 85% of students have achieved good categories. The results showed that in cycle 1, the cognitive results had not reached the target. Only 25 (78%) students achieved minimum completion, while affective and psychomotor had reached the target. In improving learning cycle 2, the number of students who achieved minimum completion increased to 33 (94%). In conclusion, learning chemical changes through practicum activities can improve learning outcomes.

**Keywords:** Learning Outcomes, Chemical Changes, Practicum

### INTRODUCTION

A common problem teachers complain about in the school environment after the Covid 19 pandemic is the difficulty of conditioning students to learn face-to-face. Students learning outcomes have also decreased compared to the learning situation before the covid 19 pandemic. This condition requires teachers to be creative and innovative according to 21st-century developments to motivate students to learn. Learning must be designed to provide the widest possible development of students' self-potential to gain direct experience that can even be applied in everyday life. Hasanah et al. [1], in the learning process, learning strategies are needed that align with the principles of a scientific approach to develop students' potential.

Chemistry is one of the subjects in the science group that requires good mastery of concepts in problem-solving. Most students consider chemistry a difficult subject because the material studied is abstract. Active, creative, and fun learning is needed so that students' views about chemistry that is difficult can be broken. Teachers must be creative in developing teaching materials in practicum or experimental activities. During the Covid 19 pandemic, chemistry learning did not carry out practicum activities, so it did not provide direct experience, and learning was not student-centered. 21st-century learning is required to develop students' critical, creative, collaborative, and communication thinking potential. Education must consider student psychology so that students must be seen as subjects who will develop according to their growth and development [2].

Practicum activities can support student self-development if designed by the syllabus and curriculum that apply at school. Sometimes schools have adequate infrastructure but are not put to good use by teachers for fear of being wrong, or conversely, there are schools whose infrastructure needs to be improved. Still, teachers don't want to start being creative and innovative, so learning goes on without much change.

21st-century learning requires teachers to be facilitators and motivators; however, if learning is not designed to provide the widest possible experience, students will be passive. The teacher has a strategic position in developing creativity according to the era. Especially if the limited school conditions are the first step to fostering teacher creativity. For example, low student learning motivation will make teachers think creatively. They are looking for alternative ways to increase students' willingness to learn. Likewise, the limitations of learning facilities will make the teacher think about how to modify simple tools, even utilizing what is in the classroom as learning media. Student involvement is important in the learning process as evidence that students are trying to develop their cognitive abilities and knowledge [3]. In addition, student involvement in learning will affect cognitive success and character development.

Based on observations in the process of learning activities carried out by the teacher, the following problems can be identified: a). Students need more interest/interest in chemistry lessons; b). Low student learning outcomes (below minimum completeness criteria); c). Students need to be more

skilled in carrying out practical activities. This problem arises because the method used by the teacher needs to be more innovative and carry out practicum. Chemical change material is very close to students' daily activities at home and school, so delivering this material will provide direct experience with practicum. Supriadi's research [4] concluded that learning using the practicum method could improve chemistry learning outcomes in electrolyte and non-electrolyte materials. Ningsyih et al. [5] concluded that the application of guided inquiry-based practicum learning affected students' critical thinking abilities and learning outcomes. Sapitri et al. [6] concluded the effect of local wisdom-based practicum on students' scientific literacy skills and learning outcomes.

Classroom Action Research is an effort for self-development because PTK aims to improve the quality of learning while at the same time increasing teacher professionalism. Classroom Action Research results from reflection on the learning program carried out; (a). Improving the quality of learning practices in the classroom (perceived problems); (b). Perform actions that are believed to be better; (c). Solve real problems in class, improve the quality of learning, and look for scientific answers to why it is solved by the chosen action [7]. This classroom action research aims to improve the learning outcomes of chemical change material through practicum activities. Learning is made fun so that learning outcomes can increase.

## RESEARCH METHODS

This research is a classroom action research, with research subjects in class X.4 SMAN 5 Mataram for the 2022/2023 school year, which will be conducted in July-August 2022. The research was carried out in two cycles, each consisting of planning, implementing, observing, and reflecting [8]. The object studied results from cognitive, affective, and psychomotor learning.

Data on cognitive learning outcomes were collected using test instruments, and affective and psychomotor learning outcomes were collected by non-test using a Likert scale 1-4: 1 = not good, 2 = not good, 3 = good enough, and 4 = good [9]. The effective observation sheet includes activeness in conducting experiments, seriousness, independence, cooperation, and discipline in conducting practicums. Observation sheets for psychomotor skills include skills in using material tools, observing, expressing opinions, presentations, answering questions, and accuracy. The data sources used are teachers and students, apart from that also from events or behaviors experienced by students while carrying out teaching and learning activities in class [10], as well as documents or archives and test results.

Data analysis techniques using qualitative descriptive analysis [11]. Indicators of research achievement are said to be successful if 85% of students achieve the indicators that have been set. The indicator for cognitive learning outcomes is 85% of students achieving minimum completeness criteria scores. Pujiyanto [7], Minimum Completeness Criteria is a completeness criterion carried out by educational units referring to graduate competency standards, student characteristics, subject characteristics, and educational unit conditions. The minimum completeness criteria for Chemistry at SMA 5 Mataram is 74. Indicators of affective and psychomotor learning outcomes, if 85% of students achieve good grades.

## RESULTS AND DISCUSSION

The results of learning in cycle 1 showed that most students were very enthusiastic about participating in learning. The material presented was about chemical changes, including characteristics, aspects, and examples of chemical changes in everyday life. The aspects assessed on affective and psychomotor had been achieved. As many as 32 (90%) students showed effective results in the good category, and psychomotor results as many as 31 (88%) students in the good category in learning through the practicum. In cycle 1, a practicum was carried out to prove chemical changes to form new substances. All students have tried, but the results of the cognitive evaluation showed that as many as 10 (28%) students had not reached the minimum completeness criteria score, and as many as 25 students or 72% (Table 1). Table 1 shows that the affective and psychomotor aspects have reached the target. Practicum can generate motivation to learn science, develop experimental skills, as a vehicle for a scientific approach, and support students' understanding of the subject matter [12].

Further explained, the experience gained by students through practicum, in the form of direct experience, the more concrete the material studied, the more experience gained. Emha [13] added through practicum, students are trained to fulfill their curiosity and desire to be able. Students are also trained to experiment, so they can train students to make careful observations, use tools and measure accurately, and make interpretations. Table 1 shows cognitive learning outcomes have not reached the target. The cognitive aspect has yet to be achieved because there are still many characteristics, aspects, and examples of chemical changes in everyday life that can be done through the practicum. It still needs to be done because there is still a need for more time in the learning process cycle 1. In addition, students may still need to develop themselves to seek information about the chemical change. For this reason, even though

the affective and psychomotor aspects have reached the achievement targets, learning is continued in cycle 2. In cycle 2 the theme or material presented is the same as in cycle 1 but different for the activities carried out through practicum.

The cycle 2 learning process shows that all students remain enthusiastic and enthusiastic in carrying out practicum. All students try to try to prove the characteristics of chemical changes that are formed from a mixture. Students are very motivated to complete all the practicum activities because they can be applied in everyday life. Sardiman [14] mentioned that high motivation from students can activate their learning activities. High motivation can be seen from the quality of involvement and student efforts to maintain or maintain their motivation. During the learning process, all students improved in all three assessment aspects. Learning outcomes in the cognitive aspect show that as many as 33 (94%) students have reached the minimum completeness criteria, and there are still 2 (6%) students who still need to complete it. Affective and psychomotor results also increased. All students (100%) showed results in the good category (Table 2).

The increase in results in cycle 2 showed that students were able to analyze what was practiced and make conclusions from what was practiced. Students also develop material by utilizing technology in the 21st-century era. Students search for material related to the characteristics and examples of chemical changes via the internet. Sutrisno's opinion [15] states that computer technology devices in the era of globalization, if used properly, will make it easier for students to learn quickly and accurately. The practicum conducted trains students to develop 21st-century skills. Students think critically, collaborate, and creatively, which can be seen when learning in groups. Students conduct experiments, then observe all the processes that occur, make observation tables and analyze the results of observations and draw conclusions. Apart from that, it also trains students to communicate to express opinions by presenting the results of the practicum that has been carried out. As stated by [16], the practicum method allows students to experience themselves, carry out a process, observe an object, analyze, and draw conclusions. Miyarsa [17] added that 21st-century learning must develop critical thinking, collaboration, creativity and communication skills.

Table 1. Learning Outcomes of Cycle 1

Aspects assessed	Achievement (%)	Achievement Target (%)	Category
Cognitive	72	85	Not yet reached
Affective	90	85	Achieved
Psychomotor	88	85	Achieved

Table 2. Learning Outcomes of Cycle 2

Aspects assessed	Achievement (%)	Achievement Target (%)	Category
Cognitive	94	85	Achieved
Affective	100	85	Achieved
Psychomotor	100	85	Achieved

Table 2 shows an increase in learning outcomes in the cognitive domain. As much as 94% of students have achieved the target above the minimum completeness criteria score. It is understandable because the learning practices that are carried out improve what has not been done in cycle 1, so that students become more prepared in terms of material and practicum implementation processes, so that time becomes effective and learning outcomes increase. Affective and psychomotor results are also the same. Even though cycle 1, classically, students have reached the target, there are still some students who still need to reach the target. In cycle 2 all students have completed all processes, and all students reach the good category. It is understandable because, with proper preparation, everything planned will be

carried out properly. The teacher's task at school is not only to teach but also to educate. Through practicum activities, students are also trained to develop attitudes and skills such as discipline, independence, conscientiousness, honesty, cooperation, expressing opinions, and so on. As [18] argues, education is an effort to help someone master knowledge, skills, attitudes, and values from family and society. Educating is an act of realizing one's innate potential and has a positive influence.

The increase in learning outcomes from all domains is also due to the practicum method used according to the student's learning style so that students carry out activities with full awareness to achieve the best results. As [19] argues, learning style is a way that students choose to receive, organize and process information from information

providers. The report on the results of the student learning style test at SMAN 5 Mataram shows that most students are dominant in the kinesthetic learning style [20]. The kinesthetic learning style uses more physical activity than hearing and seeing, such as moving/moving places, doing things with hands, touching things they find, and so on. As [21] argues, students with a kinesthetic learning style carry out their learning activities physically by moving, touching/touching, and doing.

Improving cognitive learning outcomes is greatly supported by the development of material carried out by teachers and students. Material about chemical changes includes the meaning, characteristics, and examples of chemical changes that occur in everyday life. Students search for material on the internet themselves. Thus students also get hands-on experience so that it is easier to understand when learning is carried out both in class and in the laboratory. According to Abdul [22], chemical changes are irreversible changes. The characteristics of a chemical change include temperature change, color change, odor formation, precipitate formation, and gas/bubble formation. Examples of chemical changes in everyday life include burning leaves/wood, yogurt, and tape, while examples in the industry include candle wicks, gas stoves, cement manufacture, and so on. Ahmad [23] and Kusuma [24] added examples of chemical changes in everyday life are rusting iron, rotting food, exploding firecrackers, cheese making, milk turning sour, soybeans turning into tempeh, decomposition garbage, decaying wood burning gasoline, burning sugar, wounds treated with alcohol, oil turning rancid and so on.

Cognitive learning results show that 2 (6%) students still need to complete or have yet to reach the minimum completeness criteria. Students who have yet to reach the minimum completeness criteria will be remedial by being them the task of finding as many examples of chemical changes in everyday life as possible and analyzing the process by which these changes occur. Students who have yet to reach the minimum completeness criteria are given remedial activities, which must be designed to help students understand difficulties and solve them by improving strategies and attitudes [7]. The learning method in remedial is adapted to the nature, type, and background of the difficulties experienced by students.

## CONCLUSION

Learning chemical changes topic through practicum activities can improve learning outcomes in grade ten high school students of SMAN 5 Mataram for the 2022/2023 academic year. The findings indicated that cycle 1's cognitive results had fallen short of the desired level. Only 78% of students met the required completion rate, although

affective and psychomotor skills were at the desired level. The proportion of pupils who completed learning cycle 2 at least minimally rose to 94%.

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