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LEARNING OF REACTION RATE USING INTERACTIVE MEDIA IN IMPROVING STUDENT LEARNING OUTCOMES

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Abstract

Interviews with chemistry teachers at SMA Negeri 1 Baitussalam revealed that average student learning outcomes in chemistry, particularly on reaction rate material, did not meet the 75-percent learning completeness threshold. This is due to a lack of media in learning, which makes the learning process boring and less attractive for students. Therefore, it is vital to utilize interactive media to improve student learning results. The goal of this research was to examine whether the use of interactive media improved student learning outcomes, teacher and student activities, and student replies. This study used a Classroom Action Research (CAR) design with XI MIA 2 students as research subjects. Data collection equipment included exam questions, observation sheets, and questionnaires. The findings indicated that students' learning outcomes improved from an average score of 75 in cycle 1 to 85 in cycle 2. The classical completeness of learning outcomes in cycle 1 was 58.33%, whereas it climbed to 87.5% during cycle 2. Cycle 1 had a 78% teacher activity rate, which improved to 92% in cycle 2. In cycle one, 75% of students participated, and in cycle two, it become to 85%. The percentage of student responses of up to 89.62% indicates that they are particularly interested in the use of interactive media. Based on the findings of this study, it is concluded that using interactive media to teach reaction rate curriculum can increase student learning outcomes at SMA Negeri 1 Baitussalam.

Keywords: Interactive media, learning outcomes, reaction rate, student's activity, teacher's activity.

1 INTRODUCTION

Education is an effort to cultivate personality, abilities, character, and spirit. Educational activities in human life have evolved at the human level [1]. The quality of education is determined by how successfully learning is carried out. If interrelationships and dependencies exist in everything, whether in the form of people, messages, materials, tools, or the environment, the learning system can be classified as good / appropriate, effective, with a direct impact and a positive correlation in developing and improving educational quality [2].

Learning is the process by which a person receives assistance or advice in acquiring, changing, or developing skills, attitudes, ambitions, values, and knowledge [3]. Good learning is defined as learning with clear and focused objectives. Learning objectives correspond to ideal learning, hence it is critical to achieve ideal learning in the classroom in order to accomplish learning objectives successfully and efficiently [4]. Media use is fundamentally linked to high-quality learning and creativity.

Learning experiences shape students' capacities, which are then reflected in learning outcomes. Teachers utilize learning outcomes as a criterion for achieving educational objectives. This happens when pupils understand the topic and exhibit good behavioral changes. Learning outcomes are evaluated from the perspectives of both students and teachers. Students' learning outcomes include cognitive, emotional, and psychomotor improvement [5]. For teachers, learning outcomes are defined as the completion of the subject matter [6]. A variety of teaching media are employed during the teaching and learning process. This medium helps teachers deliver topic content more effectively [7]. Learning media refers to anything that can be utilized to convey instructional content to students, whether through pictures designed using digital tools or application like Canva design [8], [9], writing, or sound like learning video using pen tablet [10], so that students can understand, read, or hear [11].

The media has a vital function in the learning process [12]. The success of learning is mostly governed by two factors: learning methods and learning material. The complexity of the material offered to pupils can be reduced with the use of media [13]. The usage of computer-assisted learning materials has a significant impact on student learning interests and comprehension [14]. Teaching materials are a collection of materials containing or learning content gathered from numerous learning resources, which are systematically created and assimilated by students through engaging learning [15]. The problem in selecting teaching media is to take into account students' learning styles. Some kids may prefer to learn through video with fast movements, whereas others prefer audio or text media like student's worksheet [16]. There are other students who prefer to learn using audio-visual medium [17]. Learning reaction rate material entails abstract concepts such as factors influencing reaction rate and collision theories [18]. The topic will be easier to understand if it is presented with animations in interactive learning media [19], [20].

According to early interviews with one of the chemistry professors at SMA Negeri 1 Baitussalam, the average value of student learning outcomes in chemistry courses, particularly reaction rate material, is relatively low, at less than 75. This problem arises because students struggle to analyze questions about elements that influence reaction rate and its relationship to collision theory. Teachers typically employ printed books as teaching media in the learning process. This makes learning feel tedious and less attractive for students, resulting in many passive learners who rely solely on the teacher. A lack of student motivation and excitement for learning might result in lower student learning outcomes.

Interactive media is one of the learning tools that students can use to better grasp reaction rate information [21]. Interactive media is a sort of information and communication technology that supports teachers' and students' learning processes by containing diverse media in the form of images, animations, text, or sound [22], [23]. Interactive media is one type of enjoyable educational medium. Interactive learning media is a collection of various media, such as text, photos, graphics, sound, animation, video, interaction, and others, bundled into files [24], [25]. The study's goal is to discover how students use interactive media to improve their learning outcomes in reaction rate learning, as well as the activities that teachers and students engage in during the learning process, and to reveal the student's reaction to the usage of interactive media in reaction rate learning.

2 METHODOLOGY

This study used a classroom action research (CAR) design. According to Kurt Lewin, classroom action research consists of four stages: planning, activity, observation, and reflection [26]. Classroom action research takes the shape of a cycle. Classroom action research (CAR), which seeks to remedy a learning problem in the classroom, is conducted in two cycles. Each cycle contains four stages: planning, implementation, observation, and reflection.

This study included 24 students from class XI MIA 2 SMA Negeri 1 Baitussalam in the 2022/2023 school year, comprising 9 men and 15 females. Research instruments are means for gathering data in order to answer and solve research questions. This study's instruments include observation sheets, test questionnaires, and questionnaire sheets, all of which will be validated before being utilized in research.

This study's data collection approaches include observation, testing, and questionnaire distribution. Observation is a data collection strategy that involves observing any ongoing occurrences and taking notes, or studying objects with observation instruments. This study included observations of teacher and student activities during the learning process. The observation technique utilized in this study is structured observation, which includes 13 components. The goal of this observation is to determine whether the actions of teachers and students in the learning process have concluded or not by using interactive media learning media on reaction rate material. A test is a tool used to discover and measure something in specific ways. This study used ten multiple-choice test questions linked to the reaction rate content and was conducted after the learning was completed or at the conclusion of each material delivery. A questionnaire is a data gathering technique used to gather information about how pupils react to interactive media.

Analysis of student learning outcomes is done to find out whether the use of interactive media improves student learning outcomes for two criteria of learning accuracy namely individual and classical accuracy. The formula used to look at individual learning accuracy is as follows [27].

$$\mathrm{IA} = \frac{\mathrm{T}}{\mathrm{Tt}} \mathrm{x}\, 100\%$$

Where:

IA = Individual accuracy

T = Number of scores obtained

Tt = Total score

While accuracy is classically determined using the following formula

$$CA = \frac{ST}{N}\ x\ 100\%$$

Where:

CA = Classical accuracy

ST= Number of students

N = Total number of students

Data from the observation of teacher and student activity can be obtained from observation and analysis using the formula [28]:

$$\mathrm{Bi} = \frac{\mathrm{n}}{\mathrm{N}}\ \mathrm{x}\ 100\%$$

Where:

Bi = Percentage of teacher or students' activity

n = Number of teacher or students' activities carried out

N = Total number of teachers or students' activity

To create a range of percentages and categories of evaluation criteria, the observation results of teacher activity [29] are presented as follows:

Table 1. *Classification of teacher and student activity values*

Value (%)	Assesment Criteria
80-100	Very active
66-79	Active
56-69	Quite active
40-55	Less active
30-39	Inactive

The study of students' responses is carried out to determine whether students can accept the use of this interactive media or not, thus it must be answered in the form of a raft with certain questions. After the learning procedure is completed, the raft provided to all students is used to collect student reaction data. The purpose is to determine how students respond to the use of interactive media at the rate of reaction. The lifting spread data is examined using a percentage calculation [30], as shown below:

$$\mathrm{P} = \frac{\mathrm{f}}{\mathrm{N}}\ \mathrm{x}\ 100\%$$

Where:

P = Percentage number

f = Frequency to be sought percent

N = Number of students

As for the criteria of student response percentage [27] is as follows:

Table 2. *Distribution of student responses*

Value (%)	Assesment Criteria
80-100	Very interested
66-79	Interested
56-69	Quite interested
40-55	Less interested
30-39	Not interested

3 RESULTS

The study has been conducted in two cycles to improve the learning outcomes of 24 students of class XI MIA 2. The learning process is carried out using interactive media on reaction rate material.

3.1 Students' learning outcomes on reaction rate learning using interactive media

Students' learning outcomes are determined both individually and classically. Individual and classical accuracy formulas were used to examine students' learning outcomes data derived from test results. The minimal accuracy value for reaction rate material is 75. Learning is considered complete if the learning outcome meets the classical learning accuracy standard (KKM) of greater than 85%. Table 3 shows the students' learning outcomes at cycle I.

Table 3. *Students' learning outcomes in cylce 1.*

Criteria	Number of Students		Percentage of Accuracy
	Qualified	Not Qualified	
Individual accuracy	14	10	58.33%
Classical accuracy	14	10	58.33%

Table 3 shows that 10 students do not meet the stipulated qualifying criteria (KKM) with a score of < 75, despite passing up to 14 exams. The first cycle pupils have a classical learning qualification of 58.33%. According to the requirements of classical education, a school is regarded qualified if 85% of pupils graduate classically. As a result, we can conclude that cycle I did not reach classical precision. For the next meeting, the teacher must improve the learning so that it reaches the full student body and address any existing weaknesses so that the student can better understand the content provided to supplement what has already been learned. After cycle 2, the collected student learning outcomes are shown in Table 4 below.

Table 4. *Students' learning outcomes in cylce 2.*

Criteria	Number of Students		Percentage of Accuracy
	Qualified	Not Qualified	
Individual accuracy	21	3	87.5%
Classical	21	3	87.5%

accuracy

Based on table 4 it is known that in cycle 2, there are 3 students who are declared not qualified with a score that is < 75 in accordance with the qualifying criteria (KKM) that have been applied and 21 other students were declared qualified. The classical accuracy rate of students in the second cycle was 87.5%. According to the criteria of classically accurate learning in schools is considered accurate when 85% of students accurate classically. Therefore, it can be concluded that cycle 2 has achieved classical accuracy.

Based on the results of the test on cycle 2 showed that students better understand the speed of reaction material using interactive media. These findings are confirmed by the increased learning outcomes of students [31]. The results of this study were also supported by Sugiharto [32] who that students' learning outcomes improved well. In cycle 1, 22 students achieved a classical percentage of completion of 78.57 per cent and increased to 96.43 per cent in cycle II. This proves that interactive media as a learning medium plays an important role in improving student learning outcomes [28]. For example, using Kahoot as game-based learning media improved learning outcome of laboratory management workshop [33].

3.2 Teacher's activity against interactive media application on reaction rate learning

This research aims to reveal how the teacher's activity in applying interactive media to the reaction rate learning process. The teacher's activity was observed in two cycles including 13 observation indicators based on observation guidelines. The teacher activity data that appears on cycle 1 is presented in Table 5 below.

Table 5. *Teacher activity during the learning process of cycle 1.*

	Teacher Activity Observed	Score
1	Provide questions (apperception)	3
2	Provide motivation	3
3	Provide learning objectives	4
4	Provide teaching materials using interactive media	4
5	Guidance of students to form learning groups	3
6	Provide problems in the form of student worksheet	3
7	Guiding students to work on the results of student worksheet	3
8	Guided students to discuss the outcomes of the group	3
9	Guided students to present the outcome of the discussion	3
10	Give questions to students	3
11	Answer every student's question	3
12	Provide reinforcement of the material	3
13	Conclude the learning material	3

	Number of Scores	41
	Percentage	79%

Table 5 shows that teacher activity in cycle 1 achieved a percentage of 79% with good criteria. However, based on the observations of each indicator in the cycle I, teachers need to consider a few things. There are 10 students who have not yet reached the maturity of their learning outcomes. Besides that, teachers need to increase appreciation for students so that students are more enthusiastic in learning. Teachers should also be better able to answer questions asked by students who have not yet understood the material of reaction rate. At cycle 2, the teacher's activity in implementing interactive media became better and increased compared to the previous cycle. This can be observed in Table 6 below.

Table 6. *Teacher activity during the learning process of cycle 2.*

	Teacher Activity Observed	Score
1	Provide questions (apperception)	4
2	Provide motivation	4
3	Provide learning objectives	4
4	Provide teaching materials using interactive media	4
5	Guidance students to form learning groups	3
6	Provide problems in the form of student worksheet	4
7	Guiding students to work on the results of student worksheet	3
8	Guided students to discuss the outcomes of the group	4
9	Guides students to present the outcome of the discussion	4
10	Give questions to students	3
11	Answer every student's question	4
12	Provide reinforcement of the material	3
13	Conclude the learning materials	4
	Number of Scores	48
	Percentage	92%

Based on the observation data in table 6, it can be explained that there has been an increase in the teacher's activity in applying interactive media to the learning material of reaction rate in cycle 2. This is proved by achieving a teacher activity percentage of 92% with very good criteria. According to observation indicators, the teacher is able to perform each step of learning better than in the cycle I. This is realized by the teacher by implementing regular learning steps according to the plan of learning. Thus, it can be said that there is an increase in teacher activity in the application of interactive media from cycle 1 to cycle 2.

3.3 Activities performed by students on reaction rate learning using interactive media

Students are involved in the process of reactive learning using interactive media. Therefore, this study describes how student activity emerges in the learning process. The student's activity was observed in two cycles based on 13 observation indicators. Students' learning activity successfully observed by the observer at cycle 1 and 2 is presented in Table 7 below.

Table 7. *Activities shown by students in the learning.*

	Activity Shown by Students	Score	
		Cycle 1	Cycle 2
1	Answering questions (apperception) from teachers	3	4
2	Paying attention to the motivations presented by teachers	3	4
3	Listening to teachers communicating learning objectives	3	4
4	Simplifying teachers' explanations of materials using interactive media	3	4
5	Forming learning groups	3	3
6	Paying notice to problems in LKPD	3	3
7	Concluding problems and results in LCPD	3	3
8	Discussing in groups	3	4
9	Presenting discussion results	3	4
10	Skilled asking questions	3	3
11	Answer arguments	3	3
12	Listen to the responses given by teachers	3	3
13	Summarize learning materials	3	3
	Number of Scores	39	45
	Percentage	75%	87%

We can find a comparison of student learning activity that appears in learning of cycles 1 and 2 based on research data in table 7. Student activity successfully observed in cycle 1 achieved an average score of 75% with a good predicate. Meanwhile, student activity at cycle 2 increased to 87%. At this cycle, student learning activity can excellent predicates in learning using interactive media. This is demonstrated by increased student interaction in groups. Besides that, at the 2nd cycle students are also more adventurous in presenting the results of the discussion. These findings indicate that the use of interactive media in learning can improve student learning activity [22].

3.4 Responses of students to interactive media in the learning of reaction rate material

Once students engage in the process of learning reaction-speed material using interactive media, they are given the opportunity to fill in the response lift. Students are invited to provide their responses to the interactive media used in the study of reaction speeds. The student's response to this learning is presented in Table 8 below.

Table 8. *Student's response to interactive media in the learning.*

	Indicator requested	Percentage of response (%)
1	Can the application of interactive media encourage you in learning?	96.0
2	Do you feel the pleasure of following chemistry learning using interactive media?	96.0
3	Is it easier to understand reaction rate material by using this interactive medium?	96.0
4	Is this application of interactive media motivating you to learn more?	91.7
5	Are you interested in using other materials using interactive media?	100.0
6	Does the application of interactive media make the learning atmosphere more interesting in learning?	96.0
7	Can the application of interactive media increase your learning interest in studying reaction rate material?	79.0
8	Is learning by applying interactive media something new to you?	71.0
9	Do you feel any difference when learning using interactive media with previous learning?	87.5
10	Can you develop learning intelligence by applying interactive media to reaction rate material?	83.0
	Average of Percentage	89.62%

The data presented in table 8 shows that students who have followed learning by applying interactive media on reaction rate material responded with an average percentage of 89.62%. This means, students are very interested in applications of interactive learning media. This is demonstrated by their responses that can more easily understand the reaction rate material using the interactive media. Consequently, Indonesia has many online learning platforms which supported in providing interactive learning media associated with in video questions [34].

4 CONCLUSIONS

The use of interactive media can improve students' understanding of reaction rate material. This is proven by pupils' greater accessibility by classical accuracy, which reaches 87.5%. The use of interactive technologies has also increased instructor activity in classroom practice. Teachers are very effective at implementing the learning process in accordance with the learning plan. Furthermore, using interactive technology to teach can increase student engagement in the learning process. Students can work well in groups and are better at providing discussion outcomes. Learning using interactive media can greatly increase learning results, teacher and student engagement. Students are particularly interested in using interactive media to learn about reaction rates.

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