

The Implementation of Integrated Instagram Learning Media with STAD (Student Teams Achievement Divisions) on Increasing Learning Outcomes on The Topic Of Reaction Rate

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Abstract. The purpose of this study was to determine the increase in student learning outcomes on reaction rate material through the application of the Instagram-integrated STAD learning model with a multi-representation approach. The research design used is the *Quasi Experimental* method using the *Nonequivalent Control Group Design*. The research sample was taken using a random sampling technique from Students of class XI MIPA at one of Malang Senior High School. Data analysis of learning outcomes was carried out through statistical tests including prerequisite analysis tests, and hypothesis testing. The results showed that the *N-gain* test, the experimental class using *Instagram* integrated learning media was 0.74 and the control class with Power Point learning media was 0.59. The *N-gain* test results show that the improvement in the learning outcomes of the experimental class is greater than the control class. The *Instagram-integrated STAD* learning model is quite effective in learning chemistry reaction rate material and can increase student learning outcomes.

1 Introduction

Chemistry is one of the branches of natural science that studies related facts, concepts, laws and theories related to the nature, structure, and energy that accompany material changes of a substance [1]. One of the characteristics of chemistry is that the material is abstract, sequential, and interrelated [2]. The amount of conceptual material that is abstract and there are mathematical calculations causes difficulties for students to understand chemistry material [3]. One material that is often considered difficult to understand is reaction rate material. Based on previous research data, the difficulties experienced by students in reaction rate material include student understanding of reaction rate material which only reaches 23.27% and concept difficulties with a high enough category of 76.73% [4]. This is because reaction rate material is conceptually quite complex and interrelated so that it requires in-depth and gradual understanding through a multi-representation approach including macroscopic, sub-microscopic, and symbolic aspects [5]. Students have difficulty learning

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the reaction rate is also caused by several external factors, namely the selection of teaching methods and models by teachers, learning facilities, and learning media [6].

The selection of a variety of learning models in the current era is not enough to foster a skilled attitude in students but includes a skill of socializing and collaborating [7]. An alternative learning model that can be applied in chemistry learning is the *Student Team Achievements Division*. STAD is a type of cooperative learning designed to increase student participation, provide students with good leadership experience by making decisions in groups, and provide opportunities for students from different backgrounds to interact and learn together [8]. According to various research findings, the benefits of STAD not only result in greater academic achievement for all students, but also increase self-confidence, the opportunity to form social relationships and develop mutual trust with each other both individually and in groups, as well as the ability to help and cooperate among peers [9]. This is in accordance with the special characteristics of education in the 21st century which emphasizes creative thinking patterns, critical thinking, good communication skills, and the need for the ability to collaborate with others [10].

Students' low understanding of the concept of reaction rate material is also caused by learning media factors that are not in accordance with the conditions of students in the classroom, thus affecting students' understanding of the concept of the material being studied [11]. Along with the times, learning media that are spread outside are increasingly developing and varied. One of the learning media innovations in the digital era that can be developed is internet-based learning media. This is motivated by the dominance of the number of internet service users who come from teenagers. Based on research conducted by the Indonesian State Password College (STSN) with Yahoo, it shows that as many as 64% of the total internet users in Indonesia are dominated by teenagers aged 15-19 years. One of the real implications is the use of social media as an attractive online learning media for students due to the high intensity of social media usage in this digitalization era. One of the social media applications that can be developed into learning media is *Instagram*. This is because *Instagram can be used as a component of continuous learning that creates virtual learning groups to assist continuing education and more meaningful learning through its interesting and supportive features such as live streaming which can be used to facilitate teacher interaction in monitoring all student learning material needs, post feeds that can allow students to collect assignments and works that can be posted via Instagram, video reels that can display content in the form of videos related to the material explained with the best possible creativity, and Instagram TV which can make it easier for students to submit assignments and works in the form of videos or animations related to learning with a maximum duration of 30 minutes and a minimum of 1 minute* [12].

The Instagram app is perfect for keeping teachers connected to students [13]. *Instagram* provides many learning and teaching opportunities that allow the incorporation of technology into students' learning experience [14]. Using *Instagram* in the classroom will benefit students by increasing their motivation and engagement in the learning process, as well as their ability to collaborate with other students or teachers, which are specific skills in 21st century education. *Instagram* innovations based on videos and images that become interactive learning media solutions, can attract attention and increase student motivation in learning reaction rate material [15]. Students will benefit from using *Instagram* in the classroom by becoming more motivated and involved in the learning process, and can collaborate with other students or with the teacher.

Instagram media as a learning media has the potential to increase student learning outcomes [16]. *Instagram media* can improve learning outcomes, and there are statistically significant differences between classes that are given *Instagram* media and classes that use traditional learning. Based on this description, it is necessary to implement this research which is expected to determine the increase in student learning outcomes to learn chemistry on

reaction rate material through the application of the *Instagram-integrated* STAD learning model with a multi-representation approach [17].

2 Methodology

The research conducted is a type of *Quasi Experimental* research. This research was conducted in one of the public high schools in Malang City in the odd semester of the 2022/2023 academic year. Random sampling technique was used in this study to determine the research subjects obtained from all 6 XI MIPA classes at one of Malang Senior High School and the samples used included control class XI MIPA 1 (13 male students and 20 female students) and experimental class XI MIPA 2 (13 male students and 18 female students). The design used is a control group design that is able to infer a causal relationship with the *Nonequivalent Control Group Design* type. The research design can be seen in Table 1 [18] The experimental class applied the STAD learning model with the treatment of *Instagram* media. The control class applied the same learning model, namely the STAD learning model, but was not given treatment and the learning media used was different, namely *Power Point*.

Table 1. Research Design

Group	Pretest	Treatment	Posttest
Experiment	O1	X1	O2
Control	O1	X2	O2

Description:

O1: Giving the same *pretest* questions to the experimental and control classes.

X1: The treatment of providing *Instagram* media in the experimental class.

X2: The treatment of giving *Powerpoint* media to the experimental class.

O2: Giving the same *posttest* question to the experimental and control class.

The research was conducted 3 times, where in both classes each meeting lasted 2 JP or 2 x 45 minutes. The instruments used include learning device instruments, namely lesson plans, LKPD, motivation questionnaire sheets, pretest and post test questions, each of which has been validated by experts from chemistry lecturers and chemistry teachers and shows results in the form of very valid criteria with a percentage of 89.95%, 90.1%, 91.1%, 88.73%, and 89.53% respectively. At the beginning of learning activities, the pre test was given to measure students' initial understanding of the reaction rate material. The provision of *Instagram* media as a form of treatment in the experimental class, but the control class was not given the media but used *Powerpoint* media. At the end of the learning session, a *post test* was conducted after learning in the experimental class and control class. This is to measure the increase in learning outcomes of the experimental class given treatment using *Instagram* social media, compared to the control class.

The data processing technique for student learning outcomes using prerequisite analysis and hypothesis testing assisted by the SPSS 26 for Windows application. The prerequisite tests carried out include normality test and homogeneity test which determine the further steps of using hypothesis testing methods using parametric tests. This hypothesis test was conducted to determine whether or not there was a significant difference between the experimental class that used *Instagram* media and the control class that did not get the learning media. The *N-Gain* test was also conducted to see the effectiveness of the research conducted based on the results of the pretest and posttest [19]. The *Standard Gain* value obtained from the results of the SPSS 26 for Windows application is then interpreted in accordance with Table 2 [20].

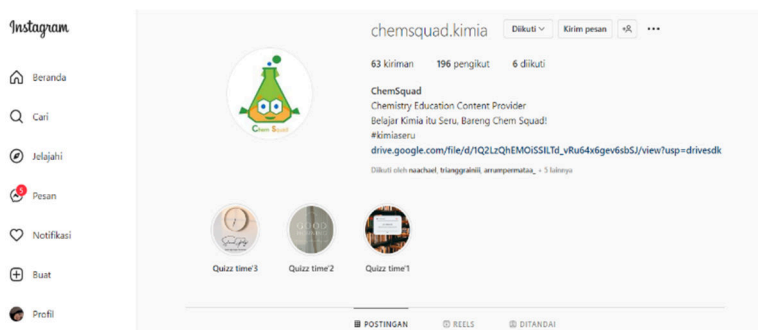
Table 2. Interpretation of Normalized Gain Effectiveness Interpretation

Normalized <i>Gain</i> Value	Interpretation
$< 0,40$	Ineffective
$0,40 < g < 0,55$	Less Effective
$0,56 \leq g < 0,75$	Effective Enough
$> 0,76$	Effective

3 Result and Discussion

3.1 Application of Instagram-Integrated STAD Learning Model

The implementation of learning through the utilization of *Instagram* social media as a learning media was conducted in class XI MIPA 2 consisting of 31 students. The class is heterogeneous, because it consists of both female and male students. The reaction rate material was taught in three times per meeting, with two 45-minute sessions. The research was conducted in September 2022. The implementation of the STAD learning model was used in the experimental and control classes, but the use of learning media was differentiated in the experimental class using *Instagram* media and the control class using *powerpoint* media. Learning media using the *Instagram* application is integrated in the @chemsquad.kimia account which can be accessed through various devices such as laptops, smartphones, tablets or others. The content presented includes reaction rate material in the form of infographics and videos. Each sub-material contains examples and problems in everyday life, material explanations, sample problems, and discussions. The following is the appearance of the @chemsquad.chemistry *Instagram* account used in the learning process presented in Figure 1.

**Fig. 1.** Front View of @chemsquad.kimia Instagram Account

Learning using *Instagram* integrated learning media developed utilizes several features such as exposure to teaching media for reaction rate material in the *feeds* feature as shown in Figure 2.

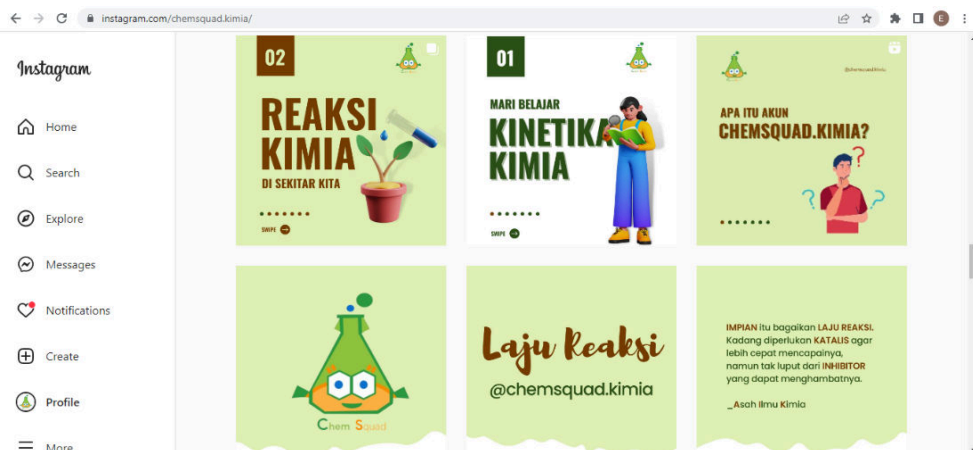


Fig. 2. Display of Material Presentation on Instagram Feeds Feature

In the *Instagram Feeds* feature, students can load infographics in the form of images with the capacity of the amount of content that can be uploaded in one post reaching a maximum of 10 images. The content or material presentation in it can also be equipped with additional information in the form of a brief narrative as outlined in a feature called *caption*. Each post is also equipped with a comment feature, where students can provide comments related to the material presented or ask questions to the teacher regarding material that they feel is not understood, and other students have the opportunity to collaborate with others to answer questions contained in the comments column as shown in Figure 3. This will train students to be more courageous in expressing opinions in public spaces and train students to learn independently (*self learning*) during learning or outside of learning.

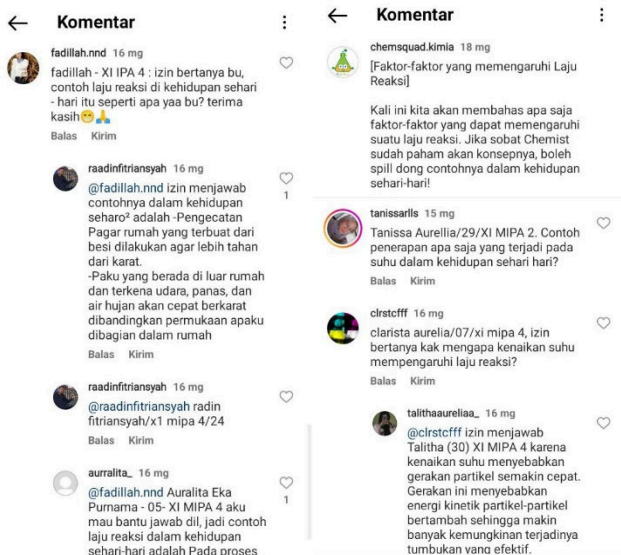


Fig. 3. Display of Comment Columns on Various Posts

Material is also provided through the *Instagram Reels* feature as shown in Figure 4. This feature contains short videos with a maximum duration of 2 minutes. The video uploading system in the *reels* feature is slightly different from the *feeds*, where a maximum of one video

can be uploaded per upload. Student interaction with the teacher can still be established, where students can also provide comments or ask questions through the comments column.

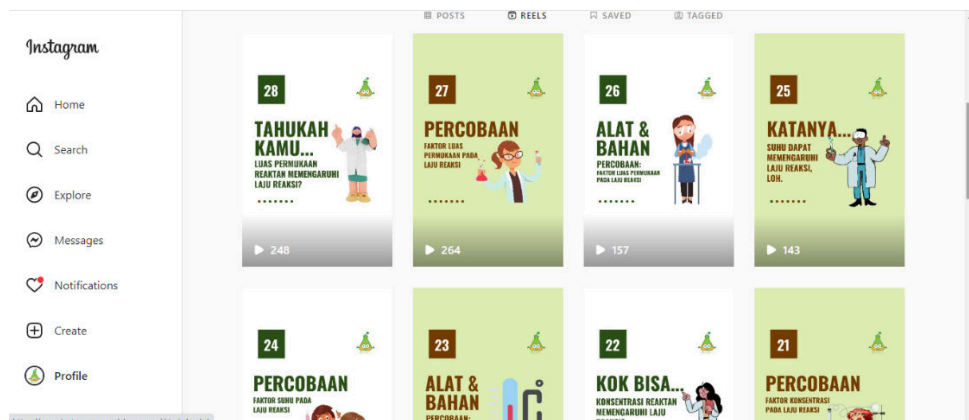


Fig. 4. Display of Material Presentation on Instagram Reels Feature

Two things that are considered in the implementation of learning through social media on *Instagram* are the amount of improvement in student learning outcomes and motivation on reaction rate material. Learning motivation is an important factor in achieving student learning goals. This learning motivation factor comes from within each individual student. Likewise, the high or low learning motivation that each student has is also different. Many internal and external factors affect learning motivation, so students can be motivated to learn for various reasons. Students who have a strong desire to learn will try harder to achieve their learning goals. When learning motivation is low, the effort required to achieve learning goals is also low.

3.2 The Effect of Instagram Media on Increasing Learning Outcomes Average Analysis of Student Learning

The research focused on the use of *Instagram* media to increase learning outcomes. Based on the research data, a pretest and posttest was given to experimental class students who received treatment in the form of using *Instagram* as a learning media as many as 31 students. The data from the learning motivation questionnaire are data on learning motivation before and after using *Instagram-based* media. *Instagram* media can be said to have an effect if there is an increase in results between before and after the use of media in learning outcomes. The learning outcomes increase in experimental class that using *Instagram* is presented in Figure 5.

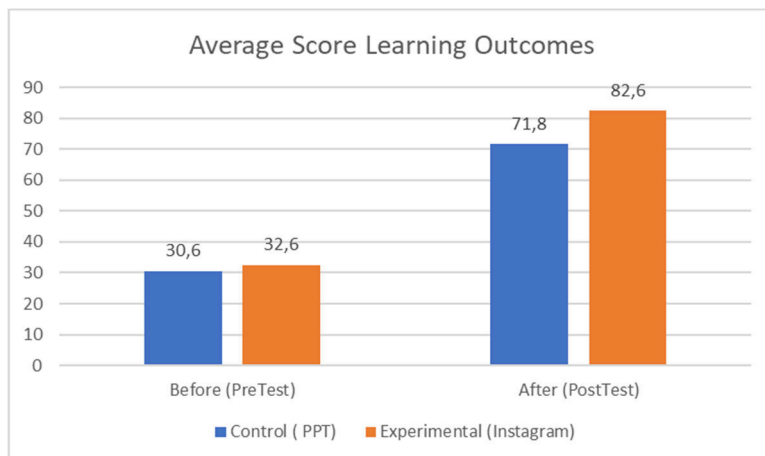


Fig. 5. Average Score Learning Outcomes

Based on this data, it was found that the knowledge of reaction rate material in the experimental class after using Instagram integrated learning media had a significant increase compared to the class that only used learning media in the form of power points. An increase in student learning motivation after using Instagram learning media as an independent learning resource based on the acquisition of a Z value of -3.300 with an asymp. sig (2 tailed) value of 0.001 [19]. Instagram social media which has various features can be used as an alternative learning media innovation that is more meaningful to students in chemistry learning.

3.3 The Effect of *Instagram* Media on Improving Learning Outcomes Data on Students' Initial Understanding

Initial ability data is used to identify the understanding of students in both sample classes whether the initial understanding of students is the same or not. Based on result the mean value of the experimental class pretest (32.58) is greater than the control class (30.61). The lowest score obtained by the control class (20) was greater than the experimental class (10). The highest score between the experimental and control classes was the same (50). The descriptive analysis results that have been obtained are followed by a normality test using the *Kolmogrov-Smirnov* test and a homogeneity test using the *Levene Statistic Test*.

The normality and homogeneity test of initial understanding data was carried out using *pretest* data in the control class and experimental class and processed with the help of the *IBM SPSS 26 for Windows* application. Based on the results of the normality test conducted, a significance value of <0.05 was obtained. Based on the decision-making criteria in the normality test, it can be concluded that the data on students' initial understanding is not normally distributed. With this, the data will be processed further with non-parametric statistics (*Mann-Whitney Test*).

The next prerequisite test is the homogeneity test which aims to determine whether the research sample comes from a homogeneous population or not. The following are the results of the homogeneity test conducted with the help of the *IBM SPSS 26 for Windows* application. Based on these data, the resulting significance value > 0.05 so it can be said that the data is homogeneous. The data obtained is not normally distributed, but is homogeneous so that the Mann Whitney hypothesis test is carried out.

Hypothesis testing was carried out using the Mann-Whitney Test, the results of the prerequisite tests that have been carried out show that the data analyzed are not normally distributed. Hypothesis testing is assisted by the IBM SPSS 26 for *Windows* application. Hypothesis testing using the IBM SPSS 26 for *Windows* application is presented in Table 3.

Table 3. Hypothesis Test Results of Students' Initial Understanding

Class	N	Mean	Mann-Whitney Test Results (sig. (2-tailed))
Control	33	30,62	0,384
Experiment	31	34,50	

Based on the results of the Mann Whitney Test on students' initial understanding, it produces a *2-tailed* significance value of 0.01 which indicates that the value obtained is 0,384 that means the result more than 0.05. The value obtained is included in the decision-making criteria in the Mann Whitney test which states that there is no difference in initial understanding between classes using *Instagram* learning media and *Power Point* media. This is because the learning process obtained between the experimental class and the control class is the same using the STAD learning model. Cooperative learning involves students actively in learning so that it will affect concept understanding.

Concept understanding data is used to identify student understanding using student posttest score data. The average value of the experimental class *post test* (82.58) is greater than the control class (71.82). The lowest value obtained by the experimental class (60) is greater than the control class (50). The highest value between the experimental class and the control class is the same (100). The descriptive analysis results that have been obtained are followed by a normality test using the *Kolmogrov-Smirnov* test and a homogeneity test using the *Levene Statistic Test*.

The normality test of initial understanding data was carried out using *posttest* data in the control class and experimental class and processed with the help of the IBM SPSS 26 for *Windows* application. Based on the results of the normality test conducted, a significance value of <0.05 was obtained. Based on the decision-making criteria in the normality test, it can be concluded that the data on students' concept understanding is not normally distributed. With this, the data will be processed further with non-parametric statistics (*Mann-Whitney Test*). The next prerequisite test is the homogeneity test which aims to determine whether the research sample comes from a homogeneous population or not.

The homogeneity test used is the Levene test with a significance level of 0.05. The homogeneity test of students' concept understanding data was carried out using *posttest* data in the control class and experimental class and processed with the help of the IBM SPSS 26 for *Windows* application. Based on these data, the resulting significance value > 0.05 so it can be said that the data is homogeneous. The data obtained is not normally distributed, but is homogeneous so that the Mann Whitney hypothesis test is carried out.

3.3.1. Hypothesis Test Results of Students' Concept Understanding

Hypothesis testing was carried out using the Mann-Whitney Test. The results of the prerequisite tests that have been carried out show that the data analyzed are not normally distributed. Hypothesis testing is assisted by the IBM SPSS 26 for *Windows* application. Hypothesis testing using the IBM SPSS 26 for *Windows* application is presented in Table 4.

Table 4. Hypothesis Test Results of Understanding Concept

Class	N	Mean	Mann-Whitney Test Results (sig. (2-tailed))
Control	33	40,47	0,01
Experiment	31	25,02	

Based on the results of the Mann Whitney Test on student learning outcomes, it shows a 2-tailed significance value of 0.01 which indicates that the value obtained is less than 0.05. The value obtained is included in the decision-making criteria in the Mann Whitney test, so it can be concluded that hypothesis H_0 is rejected and hypothesis H_a is accepted. This shows that there are differences in learning outcomes between classes that use *Instagram* learning media and *Power Point* media. It can be concluded that *Instagram* social media can improve student learning outcomes on reaction rate material.

The use of *Instagram* integrated learning media has an impact on increasing student learning outcomes, because it can facilitate teaching and learning activities where students can get material in the form of videos and images on the *feeds* and *reels* feature. *Instagram* can also be useful for learning activities because it can be used to obtain information and exchange opinions with others. The ease of use of *Instagram* attracts students' attention during learning [20]. It is easier for students to see pictures as well as a few sentences in a photo rather than having to read a whole book that contains more writing. *Instagram* offers benefits that can be used as a learning tool [21]. *Instagram* is used to promote users have the opportunity to communicate their experiences by selecting photos of subjects and manipulating and presenting them in various ways [22]. It is suitable for students who enjoy drawing [23]. In general, students have positive attitudes and beliefs about the use of social media in education [24]. Which is favored by the younger generation for comparative character studies [25]. *Instagram-assisted* creative learning can provide meaningful and authentic learning experiences for students. *Instagram-integrated* learning can also practice creative problem solving and critical thinking skills, as well as an opportunity for students to explore, understand and appreciate themselves, as well as make a direct contribution to their community [26]. *Instagram* can stimulate potential talents and interests, by paying attention to the characteristics of creative learning that are relevant to. The higher the relevance of teaching to students' real life, culture, and interests, the more likely students will have control over their own learning process, and learning outcomes will also increase [27].

3.4 Gain Score Comparison of Experimental and Control Class

The improvement of learning outcomes in the control and experimental classes was carried out with the *N-gain* test with the help of the *SPSS 26 for Windows* application. The results of the *N-gain* test in the control and experimental classes are presented in Table 5.

Table 5. N-Gain Test Results

Class	N-Gain Test Results			Category
	Maximum	Minimum	Average	
Experiment	1,00	0,33	0,74	Effective Enough
Control	1,00	0,29	0,59	Effective Enough

The increase in student learning outcomes in the experimental class was higher than the control class. This is based on the preliminary test results which state that there is no difference in initial understanding between classes using *Instagram* learning media and

Power Point media because the learning process obtained between the experimental class and the control class is the same using the STAD learning model. Based on the results of the *N-gain score* test calculation, it shows that the average value of the *N-gain score* in the experimental class using *Instagram* integrated learning media is 0.74 and is included in the moderately effective category with a minimum *N-Gain score* of 0.33 and a maximum of 1.00. In the control class that uses *Powerpoint* learning media, the average *N-Gain score* is 0.59 which shows that it falls into the moderately effective category with a minimum *N-Gain score* of 0.29 and a maximum of 1.00. This shows that the experimental class using the STAD learning model integrated with *Instagram* has a higher level of effectiveness than the control class using the STAD learning model integrated with conventional media in the form of *Powerpoint*.

Student learning outcomes in classes that use the STAD learning model show a higher increase due to its application in learning which shows the consistency of effective and efficient student activeness. This is indicated by students who are able to be more active to work together with their friends in groups to solve their problems, which is very visible in the presence of a fairly high learning motivation during learning. The STAD cooperative learning method can increase student participation in higher learning [30] Interaction between students in their respective small groups can help them to more easily understand and find solutions to material concepts that are considered difficult [31] The STAD learning model can also foster creativity, train critical thinking patterns, and increase tolerance between students in their groups consisting of members with diverse abilities, gender, race and ethnicity [32] The increase in student learning outcomes using the STAD learning model is reinforced by the findings of previous research which states that the STAD type cooperative learning model with multimedia can improve learning outcomes [33]. Student involvement during the learning process using the STAD method can increase student learning motivation so that it will show results that are directly proportional to the demonstration of increased understanding and student learning outcomes because students experience every learning activity themselves. They get this experience by practicing more often working on problems given by the teacher, so that if they find difficulties they will ask friends or teachers. The implementation of the *Instagram*-integrated STAD learning model in this study is expected to create more effective learning, so as to improve higher student learning outcomes in reaction rate topic.

4 Conclusion

Based on the results and discussion of the research, it can be concluded that the use of *Instagram* application can increase student learning outcomes. The results showed that student learning outcomes were analyzed using hypothesis testing in the form of the Mann-Whitney Test conducted to get a significance value of 0.01 indicating a difference in learning outcomes in the *post* test. Based on the *N-gain* test results, the experimental class using *Instagram* integrated learning media was 0.74 and the control class with *PowerPoint* learning media was 0.59. The *N-gain* test results show that the improvement in the learning outcomes of the experimental class is greater than the control class. The *Instagram-integrated* STAD learning model is quite effective in learning chemistry reaction rate material and can increase learning outcomes. Recommendations for further research include using *Instagram* applications in chemistry learning in other materials and exploring more deeply which *Instagram* features are more effectively used in the chemistry learning process.

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