

# The Effect of Using Instagram Learning Media on Student Learning Outcomes Using the Discovery Learning Model on Reaction Rate Material

Inka Pungky Rahmawati<sup>1</sup>, Sri Yamtinah<sup>1\*</sup>, Suryadi Budi Utomo<sup>1</sup>, Hayuni Retno Widarti<sup>2</sup>, Ari Syahidul Shidiq<sup>1</sup>

<sup>1</sup> Chemistry Education Study Program, Faculty of Teacher Training and Education, Sebelas Maret University, Surakarta, Indonesia.

<sup>2</sup> Chemistry Education Study Program, Faculty of Mathematics and Natural Sciences, Universitas Negeri Malang, Malang, Indonesia.

Received: February 14, 2023

Revised: April 22, 2023

Accepted: April 26, 2023

Published: April 30, 2023

Corresponding Author:

Sri Yamtinah

[jengtina@staff.uns.ac.id](mailto:jengtina@staff.uns.ac.id)

DOI: [10.29303/jppipa.v9i4.3320](https://doi.org/10.29303/jppipa.v9i4.3320)

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**Abstract:** In Era 4.0, the development of media and learning processes, such as using Instagram as a learning media, is required to make learning more meaningful. This is due to the fact that Instagram is a prominent social media network with over 400 million members. Learning models that can accommodate the skills required in the twenty-first century must be used to make learning more relevant. The discovery learning model is one of them. As a result, this study aims to evaluate the effect of using Instagram learning media on student learning outcomes using the discovery learning model on reaction rate material. A quasi-experimental design was used in this study, with an experimental class of 36 students and a control class of 36 students. This study employed ten multiple-choice questions in the pre-test and post-test to measure student learning outcomes. The N-Gain and Wilcoxon tests were then performed. The study findings demonstrate that employing Instagram learning media using the discovery learning model influences increasing student learning outcomes.

**Keywords:** Chemistry; Discovery; Instagram; Outcomes

## Introduction

In the era of the industrial revolution 4.0, education must develop learning procedures or media to make the learning experience more meaningful (Irwandani et al., 2020). This is due to the fact that learning media serves to transmit or disseminate lesson information as well as refine students' ideas, feelings, and attention, all of which aim to promote the teaching and learning process (Wahid, 2018). One of the major media innovations is the usage of digital-based media. Lin et al. (2017) have conducted research related to digital learning that shows the learning outcomes of digital learning are much higher than those of traditional learning. Digital learning can be applied using social media. Social media is online media where users can be involved to fill the existing space (Purbohastuti, 2017). Social media is consumed by many levels of society, including students, researchers, university students, and the general public, because it

can be accessed anywhere and anytime (Irwandani et al., 2016). Social media can be a driving force in supporting and maximizing learning patterns as a medium for presenting educational content (Conti et al., 2023). Users can take advantage of various features on social media sites to support educational content. Social media can be used as a platform to deliver educational or digital learning information, which can extend learning resources and enable users to exchange knowledge with other social media users (Fitriani, 2021). The most widely used social media platforms include Instagram. Since its launch in 2010, the Instagram application has had more than 400 million active users worldwide, with the most significant number of Instagram users in Indonesia, where 89% of young people use Instagram at least once a week (Prihatiningsih, 2017). In research that implements Instagram as a learning media, Novianti et al. (2020) found that in calculus, 94.44% of students had good learning outcomes, and in art learning, the use of

### How to Cite:

Rahmawati, I.P., Yamtinah, S., Utomo, S.B., Widarti, H.R., & Shidiq, A.S. (2023). The Effect of Using Instagram Learning Media on Student Learning Outcomes Using the Discovery Learning Model on Reaction Rate Material. *Jurnal Penelitian Pendidikan IPA*, 9(4), 1805-1812. <https://doi.org/10.29303/jppipa.v9i4.3320>

Instagram was very good at increasing students' motivation in presenting art. creation (Fujiawati et al., 2021). Based on previous research, the use of Instagram is more prevalent in mathematics, art, and literature. This is an opportunity to implement the use of Instagram in chemistry subjects.

Not only must learning media be developed, but so must the learning process itself (Rashid et al., 2016). This is because it is hoped that with good processes and media, the learning process will be more passionate and meaningful (Baharuddin, 2020). Conventional learning that is still often applied today can cause students to become less active in class (Sen et al., 2016). Refinements to achieve an ideal learning process require a student-centered model so that the quality of education can increase and students can be involved in discoveries in the learning process (Lestari et al., 2021). The discovery learning model satisfies these requirements. Discovery Learning is a form of learning that can assist students in developing active learning strategies through self-discovery and self-investigation. Students are introduced to a problem in order to help them find solutions by emphasizing the need to comprehend structure or other essential concepts. The active participation of students in educational activities advances a scientific discipline (Setyawan & Kristanti, 2021). This is in line with Ana (2019) that discovery learning is a student-centered learning style in which students are encouraged to solve challenges in order to become more active, creative, and inventive. Based on Prilliza et al. (2020) in science learning, the discovery learning model makes students more active, so it is more effective in increasing student understanding than conventional learning. Not only that, Atika et al. (2018) declare that the discovery learning paradigm is extremely effective in improving affective and psychomotor learning outcomes. This opens new research options to apply the discovery learning approach to chemical disciplines using Instagram learning media.

Chemistry is a science that studies a scientific approach to solving problems in everyday life (Sanova et al., 2021). However, many students still experience difficulty understanding chemistry material because of the abstract nature of the science, which makes it difficult to understand (Sari et al., 2020). Teachers feel challenged to teach abstract chemistry concepts to minimize misconceptions (Yamtinah et al., 2019). The rate of reaction is one of the many misunderstandings about chemicals. The reaction rate is a chemistry subject matter related to the level of consumption and production of a chemical substance or compound. It is necessary to understand the concepts of concentration, reaction rate constants, reaction order, and chemical calculations (Oktaviani et al., 2017). This material requires an understanding of the concept of and the

ability to operate algorithms (Lestari et al., 2021). The misconception of reaction rates is evidenced by the research of Ahiakwo et al. (2015) which found that student performance in calculating reaction rates was still low out of 200 students; only 10% of students understood the concept. As a result, students' understanding and learning outcomes became unsatisfactory. It is envisaged that this research will lead to a new breakthrough in learning media and learning models that instructors and students may use to chemistry learning materials. As a result, the purpose of this study is to evaluate the efficiency of Instagram learning media using the discovery model on reaction rate material. The combination of Instagram and the discovery learning approach is projected to improve high school students' chemistry learning success.

## Method

The approach used in this research is quantitative. This quantitative research refers to research that refers to numbers and sizes, which are usually processed using statistical methods (Firmansyah et al., 2021). This study's methodology is quasi-experimental. A quasi-experiment is a research method used to generate data and evaluate precisely controlled hypotheses; to determine the outcomes, it must be designed and then tested (Sutono & Pamungkas, 2021). This study was carried out at a high school in the Boyolali area of Central Java, with the research design shown in Table 1, in which one class (36 students) in the experimental group used the Instagram media-assisted discovery learning model, while another class (36 students) in the control group used the discovery learning model without the assistance of Instagram. Table 2 shows that 72 students from two courses were chosen as research subjects. The study was done in three 90-minute meetings.

**Table 1.** Research Design

Group	Pre-test (Y)	Treatment (X)	Post-test (O)
Experiment	Y <sub>1</sub>	X <sub>1</sub>	O <sub>1</sub>
Control	Y <sub>2</sub>	X <sub>2</sub>	O <sub>2</sub>

Information: Y<sub>1</sub> = Pre-test in the experimental class; Y<sub>2</sub> = Pre-test in the control class; X<sub>1</sub> = Treatment in the experimental group (learning using Instagram as a learning media); X<sub>2</sub> = Treatment in the control group; O<sub>1</sub> = Post-test in the experimental class; and O<sub>2</sub> = Post-test in the control class.

**Table 2.** Research Participant Data

Experiment Class	Control Class		
	Female	Male	
Female	Male	Female	Male
26	10	23	13

The instruments used for investigation are then described in Table 3. This study utilized pre-test and

post-test measures of student learning outcomes. The pre-test is also used as a guideline to ensure that the experimental class and the control class have the same abilities prior to receiving treatment, so that the success of the applied learning method can be appropriately determined. The post-test is administered after the experimental class and the control class have received treatment. Quantitative data is derived from the data collected with this instrument. Each of the pre- and post-tests consisted of ten multiple-choice questions with five possible responses. @chemsquad.kimia is the Instagram handle used in this study. This study utilized computer statistics SPSS software for data analysis, with pre-test and post-test values used to calculate the N-Gain value to determine the increase in student learning outcomes, and analysis of variance to test the hypothesis that Instagram media had an effect on the learning outcomes of reaction rate material. The hypothesis used in this study is in Table 4.

**Table 3.** Research Instruments

Measured indicators	Question Type	Number of pre-test questions	Number of post-test questions
Student learning outcomes	Multiple choice with 5 answer options	10	10
Total		10	10

**Table 4.** Research Hypothesis

H <sub>0</sub>	H <sub>1</sub>
There is no effect of using Instagram learning media on discovery learning models on reaction rate material	There is an effect of using Instagram learning media on the discovery learning model on the reaction rate material

## Result and Discussion

Instagram derives from the word "insta," which was first derived from the word "instant," compared to a Polaroid camera, which was referred to as a "instant photo" during its time. Instagram has a similar appearance to Polaroid, which can show pictures right away. The word "gram" is derived from the word "telegram," and the telegram itself functions by sending information to other people fast (Mahendra, 2017). Instagram, or IG, is a social media platform that is usually used by someone to share photos and videos on their accounts to get likes and comments from fellow users who are friends. The friendship system is also called "following" (accounts that are followed) and "following" (accounts that are followed). However, over time, Instagram has been considered very suitable as a learning media because the Instagram application is very easy to use and is a very well-known platform among the millennial generation (Mufidah et al., 2021). Instagram as a learning media is supported by quite a

few features. The common features on Instagram include (Sunardiyah et al., 2022): 1) a camera that can be used to take photos of an object or make videos directly; 2) Editing is used to edit photos, both live and existing ones in the gallery; 3) Feeds are used to show photos that have been uploaded on Instagram; 4) Instastory, namely uploads that will disappear by themselves within 24 hours; 5) Live on Instagram is used if you want to communicate directly via chat; 6) Direct Message (DM) is used if you want to chat or have private conversations with fellow Instagram users; and 7) Reels is used as a place to share videos. There are also other features such as Highlight, which is used to save Instagram stories on Instagram profiles; Save, which is used to save posts; Share, which is used to share posts; and Share profile, which is used to share profiles in the form of a QR Code with other users. These are some of the advantages of Instagram, which we hope can be used as a learning medium.

The technique for collecting data begins with a pre-testing phase, during which both the control group and the experimental group are evaluated. Before moving on to more advanced concepts, it is important to evaluate the students' current skill levels using a pre-test such as this one. Following that, the learning process was carried out in both the experimental and control courses in line with the Learning Implementation Plan that had been prepared in advance. Students are also provided student worksheets that offer directions and methods for completing a task that is by the fundamental competencies to be attained in order to increase their understanding of the learning content. Learning employs the syntax of discovery learning. The reason for selecting discovery learning as a method of instruction is that this method regards students as both subjects and objects of learning. As a result, discovery learning requires students to take an active part in the activities that are associated with the process of learning (Ardyansyah et al., 2020). In the discovery-based learning paradigm, the content or educational resources are not provided in their completed form to the students. However, students are strongly encouraged to first choose what it is that they are interested in learning, then do information searches on their own, and, ultimately, structure or arrange what it is that they have learned and absorbed (Prilliza et al., 2020). The discovery learning syntax is utilized in this investigation in the forms of stimulation, problem description, data collecting, data processing, verification, and generalization (Wicaksono, 2022). During the three meetings, the two classes participated in reaction rate learning using the discovery learning model. The difference was that the experimental class utilized Instagram learning media, whereas the control class did not. The teacher stimulation syntax, which can take the form of readings, images, and stories based on the learning material to be

discussed, is typically used to elaborate the discovery learning syntax in meetings one through three. Then, in problem identification, students are required to find out what problems are encountered in learning; they are given the experience to ask questions, observe, seek information, and try to formulate problems. Next step, students gain experience searching for and obtaining data that can be utilized to develop alternate solutions to the issues they encounter during the data collection stage. At this stage, the experimental class uses Instagram as a learning medium and information seekers, while the control class only uses learning books. Then the next stage is data processing. This data processing activity trains students to try and explore their conceptual abilities so that this activity trains logical and applicable thinking skills. Then, during the verification step, students are instructed to use a variety of techniques to ascertain the veracity and accuracy of the data processing results. These techniques include asking peers, engaging in discussion, looking for and comparing other relevant sources, and drawing conclusions. The last syntax is a generalization. In this activity, students are led to generalize the results of their conclusions on a similar incident or problem, so this activity can also train students' metacognitive knowledge. Everything that is used is still adjusted to the material's reaction rate, which will be discussed at each meeting.

Then, after entering the first through third meetings, both classes were post-tested to determine the learning outcomes of the reaction rate for three meetings. Differences in the learning outcomes of students who use Instagram as a learning media and those who are not seen are based on the pre-test and post-test scores measured using N-Gain. In this study, N-Gain values are classified into four categories. If the N-Gain value is less than 40%, then it is considered ineffective; if it is between 40-55%, then it is less effective; 57%-76% is quite effective; and if it is more than 76%, then it is considered effective (Langngan et al., 2021). This study's N-Gain value is depicted in Figure 1, where the average N-Gain score for the experimental group is 61.3790, or 61%, which places it in the category of being quite effective. In contrast, the average N-Gain score for the control group was 48.7313, or 48.7%, placing it in the category of being less effective. This is consistent with research by Susetya et al. (2022) that demonstrates the use of Instagram as a learning medium can enhance science student learning outcomes. The higher N-Gain score for the experimental class is attributable to the fact that Instagram's features that elucidate students' visuals can encourage learning. For instance, the feed post feature is useful for providing an overview of quickly-reacting content. Each Instagram feed post on the @chemsquad.kimia account is assigned a port number to make it simpler for students to

organize educational content. In addition, a reel feature is useful for providing videos related to reaction rate practicum, and a save feature is useful for storing posts related to reaction rate content. As a result, students in the experimental class comprehended the material more readily than those in the control class. This is consistent with Mufidah et al. (2021) assertion that Instagram's updates pique students' interest, and this application also reflects the characteristics of millennials who are attached to and immersed in the digital world, particularly their smartphones. In the control class, the results were ineffectual due to the lack of use of other learning media, students only learned through discovery learning, which was inefficient due to its lengthy learning process. Therefore, the process of imparting and assimilating information will be hindered if learning media are not utilized. This is consistent with the findings of Sari et al. (2017), which indicate that the implementation of discovery learning requires a considerable amount of time and, if not guided or directed, can result in disorder and a hazy understanding of the material being studied. Then, after determining the N-Gain values of the control and experimental groups, the normality of the data was examined as a prerequisite for testing the hypothesis' validity (Fauziah et al., 2018).

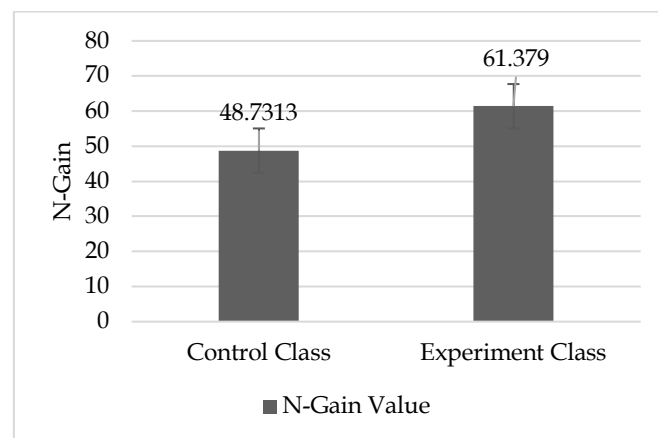


Figure 1. N-Gain Value

Based on the normality test in table 5, the post-test experimental class and control class sig values are less than 0.05, indicating that the data are not normally distributed. The data is not normally distributed because the values are not evenly distributed, so the parametric test cannot be used to analyze it (Quraisy, 2022). Due to the non-normal distribution of the data, the SPSS non-parametric test was conducted using the Wilcoxon test, with the table 4 hypothesis. If the Wilcoxon test results in table 6 have a p-value 0.05, then using Instagram learning media has an effect on the discovery learning model for the reaction rate material. Moreover, based on the preceding table, the Sig value is 0.000, indicating that H<sub>0</sub> is rejected and H<sub>1</sub> is accepted. Consequently, the

findings of this study demonstrated that there was an effect of using Instagram learning media on the discovery learning model for reaction rate material, where Instagram was quite effective at enhancing student learning outcomes for class XI reaction rate material. The results of this study are the same as the research of Rindawati (2020) that the learning process with Instagram-assisted discovery as a sociology learning media has a positive effect because the use of Instagram in learning can make it easier for students to find sociological concepts that are abstract to become more concrete. This proves that social media can support the learning process (Khan et al., 2016). The use of social media also provides positive value to learning (Ye et al., 2018).

**Table 5.** Pre-test and Post-test Normality Test

Class	Kolmogorov-Smirnov			Shapiro-Wilk			
	Statistic	df	Sig.	Statistic	df	Sig.	
Reaction Rate Learning Outcomes Experiment with Media	Pre-test	.123	36	.187	.965	36	.309
	Post-test	.412	36	.000	.674	36	.000
	Pre-test Control	.186	36	.003	.955	36	.151
	Post-test Control	.157	36	.024	.942	36	.059

**Table 6.** Wilcoxon SPSS Test Results

	Post-test experiment- Pre-test experiment	Post-test Control- Pre-test Control
Z	-5.259b	-5.277b
Asymp.Sig. (2-tailed)	.000	.000

The benefits of using the social media platform Instagram as a learning medium are demonstrated via classroom tests that demonstrate increased activity compared to class controls during the learning process. According to study conducted by Orús et al. (2016), the use of social media by students can boost their engagement in the learning process. This finding is consistent with their findings. The pupils' awareness of reaction rates is also increased as a result of their use of Instagram. This is backed by the proposal made by Ramadhani et al. (2019) that making use of the internet in the learning process is required in order to increase the quality of learning and access to supporting material in the learning process. This is bolstered by the fact that most students nowadays have smartphones, making it simple for them to use the many different digital programs that are utilized for educational purposes (Sunardiyah et al., 2022). What's more, several cellular

operators provide various internet quota promos for using internet access such as Instagram to make it more economical. The school also provides free internet facilities (WiFi) that can be accessed by all school members. Learning to use Instagram learning media is also more fun because the visuals are attractive (Salehudin et al., 2020). In addition, the use of Instagram media is very flexible, this is in line with Yamtinah et al. (2022) that media that can be accessed on smartphones makes it easier for students to access the material anytime and anywhere.

Meanwhile, the weakness of using Instagram as a learning medium, in general, is that students become dependent on internet connections, and difficulty accessing signals will also hamper the learning process (Haryanto, 2018). The use of Instagram also makes learning take place faster, as a result of which the classroom situation becomes more conducive. Not only that, learning using Instagram can distract students from looking for other things outside of learning content. This is because the contents of Instagram are related to lessons and other things outside of learning, so to access this application, students must have supervision (Ambarsari, 2020).

### Conclusion

The conclusions drawn from this study are that learning processes and media are needed to improve student learning outcomes and make learning more meaningful. The process of media-assisted learning and the appropriate model will make learning more targeted and efficient. Research on learning media aided by Instagram social media and the discovery learning model on reaction rate material has proven to be a viable alternative to learning chemistry because it is simple to access and increases student engagement. There is also the influence of student learning outcomes, with students who use Instagram as a learning medium achieving higher learning outcomes than those who do not. However, this requires teacher supervision during the learning process to ensure that students remain focused on the course material and are not distracted by Instagram.

### Acknowledgments

The authors would like to express their gratitude to the Sebelas Maret University and Malang State University for their support through Riset Kolaborasi Indonesia 2022.

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