Effectiveness of Instagram Learning Media on Chemical Equilibrium Material on Learning Outcomes of Class XI Students of SMAN 1 Payakumbuh

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ARTICLE INFO

A B S T R A C T

Chemical equilibrium is one of the materials studied in class XI SMA / MA. This material is abstract and a lot of mathematical calculations, learning media is needed that can support the learning process and understanding of the concepts of students so that learning outcomes increase. Instagram learning media is available on chemical equilibrium material with valid and very practical categories but has not been tested for effectiveness. This study aims to test the effectiveness of Instagram learning media on student learning outcomes. The type of research used was pre - experimental with a one group pretest - posttest design using purposive sampling. The results showed that the percentage of N-Gain was 72% with a fairly effective category, meaning that Instagram learning media was effective enough to be used in the learning process so that it could improve the learning outcomes of students in class XI SMA N 1 Payakumbuh.

1. Introduction

Chemical equilibrium is one of the chemical materials studied in class XI SMA / MA. This material discusses reversible and irreversible reactions, homogeneous and heterogeneous equilibrium, dynamic equilibrium, equilibrium constant, factors that influence the shifting equilibrium and its application in industry. This material is abstract and there are many mathematical calculations that cause students to have difficulty understanding the concepts (Fitriah, 2019). Evidenced by the distribution of questionnaires that researchers conducted to SMAN 1 Payakumbuh, out of 92 students as many as 54% had difficulty in understanding chemical equilibrium material so that the learning outcomes obtained were below the Minimum Completion Criteria (KKM) of 67.68 with details of 18% complete and 82% incomplete. This is relevant to research that has been conducted that the learning difficulties of students on each concept in chemical equilibrium material

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are in the criteria quite difficult to very difficult (Marfu'a & Astuti, 2022). This shows that the learning process is not optimal.

Education is the most important factor in a person's life, because it can distinguish a person's ability to think (Bella, 2023).Learning aims to produce high quality learners, individuals with good attitudes, good skills and broad understanding. To achieve this, the 2013 curriculum emphasises student-centred learning. It is hoped that learners will become proactive, creative and critical thinkers. One of the learner-centred learning activities is to apply guided discovery learning model (Nuriyawati et al., 2019).

Guided discovery learning is a learning model designed to support learners in understanding concepts with teacher guidance. The application of this model also encourages active attitudes and motivation of students so as to improve learning outcomes (Smitha, 2012). This is supported by previous research that the advantages of applying guided discovery learning model in this study are: 1) maximum involvement of students in learning, 2) cooperation and team dynamics in solving problems, 3) active students in critical thinking and increasing learning activities (Sulistyowati et al., 2012). In order for the understanding of the material to be more imprinted in the memory of students, this guided discovery learning model should be combined with learning media (Ariyani et al., 2017).

Learning media is a tool used by teachers in presenting instructions and information that makes students have more interest when carrying out the learning process (Amir, 2014). Learning media also functions as learning materials that can foster students' curiosity to take part in learning process activities so as to fulfil learning objectives (Mukhlisin, 2016). Classification of learning media based on technological developments can be divided into four, namely: media resulting from print technology, media resulting from audiovisual technology, media resulting from computer technology and media resulting from collaboration of print and computer technology (Jalinus & Ambiyar, 2016). One of the learning media is audiovisual technology-based learning media. By writing, someone can express a certain goal or intention to other people clearly so that readers can understand the meaning (Inayah,2024).

Audiovisual technology-based learning media is media sourced from the internet that is captured by the senses of hearing and vision but this media does not have much element of motion. Examples are sound slides, sound film strips, and sound pages (Jalinus & Ambiyar, 2016). Social media can be an educational tool in the learning process. This is due to the ability of social media to engage, communicate and exchange information via the internet (Jalinus & Ambiyar, 2016). Thus, the more social media is used as a tool during the learning process, the more students' learning outcomes will improve. One of the social media platforms that is often used by students is Instagram (IG).

Instagram is a social media application that allows users to take photos and videos, add effects to photos, and share them with all social media users (Mahendra, 2017). In Indonesia, there are more than 30 million active Instagram

users who are dominated by 16 - 25 years old (Yanuarita & Wiranto, 2018). Instagram is used as a learning media because this media is close to the lives of students and is played for a long time. Instagram application has benefits such as facilitating learning activities because it can be used to browse a variety of information and share thoughts with others, the use of Instagram social media has an impact on learning outcomes because it can facilitate the process of learning activities of students (Khairuni, 2016). Another factor is that students have more interest when accessing Instagram than opening books. This is relevant to previous research that people will have more interest when looking at pictures in which there are several sentences than reading books (Rohim & Yulianti, 2020). There is Instagram learning media on chemical equilibrium material that has been developed by Aftikah and Suryelita (2023) which is valid with an average index value of V = 0.90 and very practical with a percentage of 90% of teachers and students. However, the level of effectiveness has not been tested. effectiveness can be interpreted as influencing the success of an action that is able to achieve certain goals or objectives (Mesiono, 2018).

Relevant research related to the effectiveness test of Instagram learning media has also been conducted by Rahmawati, et al (2023) on testing the effectiveness of the discovery learning learning model assisted by Instagram learning media on reaction rate material, and it was found that the right learning model and media will make learning more directed, efficient and effective with an average experimental N-gain of 61.37 and control class N-gain of 48.73. Further research obtained that Instagram learning media is effectively used in learning English (Martarini et al., 2021). However, testing the level of effectiveness of Instagram learning media on chemical equilibrium material as one of the XI IPA class chemistry materials has not been done.

This study aims to determine the effectiveness of Instagram learning media on chemical equilibrium material. Instagram learning media is expected to be effectively used in learning activities and increase interest and motivation to learn so that it can improve student learning outcomes. And can help future researchers to conduct further research.

2.   Methodology

The research was conducted in April - May 2024 and took place at SMAN 1 Payakumbuh. The type of research used is pre experimental with One Group Pretest - Posttest Design research design which can be seen in Table 1.

Table 1. One Group Pretest - Posttest Design

Class	Pretest	Treatment	Posttest
Eksperiment	O_1	X	O_2

The research population is all research targets (Sugiyono, 2011). The population in this study were all students of class XI IPA SMAN 1 Payakumbuh even

semester of the 2023/2024 academic year consisting of 8 classes. The sample in the study was class XI IPA 7 SMAN 1 Payakumbuh as many as 36 students taken with purposive sampling technique through special consideration. Samples were selected from existing classes by not randomising the research population (Arikunto, 2015).

Variables are research targets or things that are the centre of attention of a study (Arikunto, 2015). Variables in research are grouped in three parts, which include independent, dependent and control variables. The independent variable in this study is Instagram learning media in the experimented class. The dependent variable is the learning outcomes of students in the form of pretest and posttest scores, on chemical equilibrium material in class XI IPA SMAN 1 Payakumbuh academic year 2023/2024. And the control variables are the teacher who teaches, time allocation, pretest and posttest questions.

There are two types of data used in the study, firstly primary data (data obtained directly from researchers) obtained through prestest and posttest scores. Second, secondary data (data taken indirectly) which is achieved through data on students' test scores before entering the material to be studied. This research procedure consists of the preparation stage, namely determining the place and time of research and preparing the test instruments used, then the implementation stage, namely before learning the sample class is given a pretest as a form of initial evaluation then given treatment using Instagram learning media and then the final stage students are given a posttest to analyse the ability of students after being given Instagram learning media.

The research instrument is a measuring tool for students' understanding and achievement in learning which consists of pretest and posttest in the form of multiple choice questions with five answer options as many as 20 items. The instrument in the study was a knowledge test instrument in the cognitive domain. The test questions given have been made and carried out validation tests, reliability tests, differentiating power and question difficulty indexes (Defista et al., 2022). Pretest and posttest data were analysed quantitatively. Data analysis techniques to obtain research results using statistical tests include the N-Gain test to determine the effectiveness of the Instagram learning media used. The N-gain formula is as follows:

$$N - Gain = \frac{nposttest\ score - pretest\ score}{100 - pretest\ score}$$
$$Average\ N - Gain = \frac{\sum N - Gain\ student}{Number\ of\ student}$$

The criteria for determining the effectiveness of Instagram learning media with the implementation of the intervention are as follows Table 2.

Table 2. Criteria for Determining the Level of Effectiveness

Percentage (%)	Criteria
> 76	Effective
56 – 75	Quite Effective
40 – 55	Less Effective
< 40	Ineffective

(Sukarelawan et al., 2024)

3.   Results and Discussion

Results

This study aims to analyse the effectiveness of Instagram learning media on chemical equilibrium material on the learning outcomes of students in class XI SMA Negeri 1 Payakumbuh. To analyse the initial ability of students was given an initial test in the form of a pretest. Initial knowledge aims to assist the teacher in estimating the part of the material that will be taught further so that the time used in the learning process is more effective. At the end of learning the sample class was given a posttest to analyse the ability of students in the cognitive domain.

The final test (posttest) is carried out after the last meeting for 2 hours of lessons to see how students' mastery of the material on the learning objectives of the material that has been taught. The pretest and posttest questions of the sample class are made the same so that it can be measured whether learning is better, the same or lower. According to Latisma (2011), a posttest that has a higher value than the pretest indicates that the learning process is going well. Figure 1 shows the average value of pretest 21.94 and posttest 77.77. Figure 1 is a data analysis conducted on the sample class, but the average posttest result has a significantly higher increase than the average pretest result. This can be seen in Figure 1.
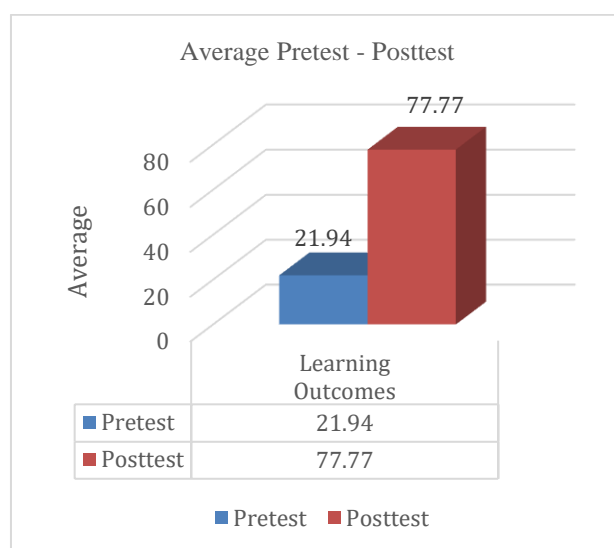

Figure 1. Average Result Chart Pretest – Posttest

The acquisition of posttest results of students is higher than the pretest results. This can occur because students who participate actively in the process of searching for knowledge. Learners are able to find their own way of finding concepts, so they have no difficulty in understanding concepts and mastering the material. This is in line with previous research, that the learning outcomes of students have increased by using Instagram (Rahmi et al., 2019). The N-Gain test aims to determine the effectiveness of Instagram learning media by calculating the amount of improvement before and after learning using the N-Gain formula. The average percentage value of the N-gain of the sample class can be seen in Table 3.

Table 3. Average Percentage Value N-Gain

Number of Learners	Average Pretest score	Average Posttest score	Percentage N - Gain	Category
36	21,94	77,77	72 %	Quite Effective

The results of the N-Gain calculation show that the average percentage value of N-Gain in the sample class obtained an N-Gain value of 0.72 with a fairly effective category. This can be interpreted that Instagram learning media has a sufficient level of effectiveness to improve student learning outcomes on chemical equilibrium material.

Discussion

This study aims to determine the effectiveness of Instagram learning media on chemical equilibrium material on the learning outcomes of students in class XI SMA Negeri 1 Payakumbuh. The effectiveness of learning media is seen based on the average percentage value of N-gain of student learning outcomes before and after the use of learning media. Table 4 shows that the average percentage value of N-gain of the sample class after being given treatment using Instagram learning media on chemical equilibrium material is in the moderately effective category. Analysis of the pretest - posttest values of the sample class can be seen in Figure 2.
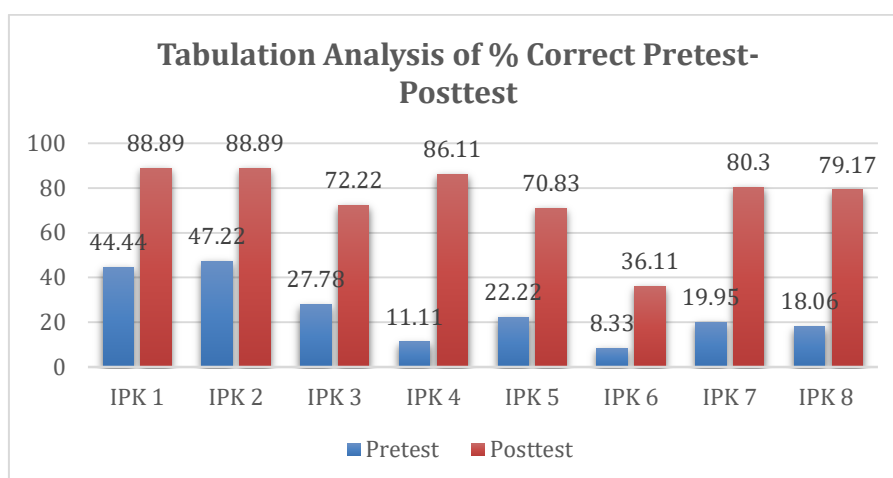

Figure 2. Tabulation Analysis of % Correct Pretest- Posttest Sample Class

In Figure 2, it can be seen that there was a significant increase between the pretest - posttest scores of students in each lesson. Basic Competency (KD) 3.8 explains equilibrium reactions in the relationship between reactants and reaction products, is reduced to six Competency Achievement Indicators (IPK), namely 1) distinguishing irreversible and reversible reactions, 2) explaining the meaning of dynamic equilibrium, 3) distinguishing homogeneous and heterogeneous equilibrium, 4) explaining the relationship between reactants and reaction products in equilibrium, 5) determining the equilibrium constant of an equilibrium reaction, 6) analysing the relationship between Kc and Kp, while KD 3. 9 analysing factors that affect the direction of equilibrium shift, is reduced to two IPK, namely 1) analysing the effect of changes in concentration, volume, pressure, temperature and the addition of catalysts on chemical equilibrium, 2) explaining the application of the principle of equilibrium shift in industry.

The posttest learning outcomes of the sample class on IPK 1) distinguishing irreversible and reversible reactions and IPK 2) explaining the notion of dynamic equilibrium had the highest percentage of correct answers with a value of 88.89. Overall in each IPK, the posttest learning outcomes of students are higher than the pretest scores. This difference occurs because students have been taught chemical equilibrium material using Instagram learning media. In addition, during the learning process, students are trained to think systematically and analytically. Learners can discuss in their groups, exchange ideas, create and submit work. Facing students with a new question at the beginning of learning makes students challenged and curiosity increases. This is in line with the principles that must exist in learning activities, namely learners as the centre of learning and presenting varied learning experiences (Warlinda & Yerimadesi, 2020).

Figure 3. IPK 1 And 2 Display on Instagram Learning Media

The lowest posttest learning outcomes of experimental class students were in IPK 6) Analyse the Kp Kc Relationship. This is caused by students who are unable to distinguish between the formula for the chemical equilibrium constant based on concentration (Kc) and the equilibrium constant based on pressure (Kp) so that the students' answers are not correct and cause low learning outcomes. During the learning process, students do every exercise on Instagram learning media quite well. However, due to the limited time they have, coupled with the lack of

chemistry lesson time due to the same time as the dzuhur break, causing learning activities using Instagram learning media to be less than optimal. In addition to limited learning time, other obstacles are also caused by learning using smartphones so that some students already have their smartphone batteries lowbat during chemistry learning so that learning is less effective. In addition, each step of guided discovery learning requires more time for students to find and understand concepts. However, researchers always try to manage time so that the learning process can run smoothly as it should.

Research conducted by Priliyanti (2021), states that the factors causing chemistry learning difficulties in understanding chemical material are caused by internal and external factors. Internal factors include intelligence in terms of understanding of chemistry material and low ability to remember students, while external factors include the school environment in terms of teaching methods applied by teachers and learning time during the day that is less conducive and peers. External factors are the most dominant in causing students' learning difficulties.

In order to support the implementation of the learning process with Instagram media, researchers use the stages of the guided discovery learning model which consists of six learning steps, namely stimulation, problem statement, data collection, data pocessing, verification and generalisation (Yerimadesi, 2017). The guided discovery learning model is a learning model that frees students in investigating a concept and can motivate student learning, besides that the application of literacy strategies with the help of guided discovery learning models can improve students' cognitive scores (Warlinda & Yerimadesi, 2020). The implementation of guided discovery learning has a positive impact that can improve student learning outcomes (Adhim & Jatmiko, 2015).

The learning process was carried out for 6 meetings, the first meeting students worked on pretest questions for 1 lesson hour (45 minutes) then continued the material. However, some students were ready to work before the time ended. The learning time provided for 2 lesson hours is equivalent to 2 x 45 minutes. The time available is effective enough for teachers to give pretest questions, explain how to use IG media and enter the material. The first material is equipped with prerequisite material (pre knowledge) so that students can recall the material related to chemical equilibrium material. The learning process goes well according to the stages in the guided discovery learning model.

Learning begins with orientation where the teacher prepares students to learn such as giving examples in everyday life as motivation for students to learn, conveying learning objectives and linking previous material with the material to be learned. The first stage in guided discovery learning is stimulus and problem presentation. In this step, students are given questions that can be a stimulus for students to think critically. Then learners will be given the opportunity to make questions based on their observations and guided to formulate temporary answers to these questions. Learners who have high enthusiasm and make good observations will be able to carry out every instruction, although still under the guidance of the teacher. However, during the research, researchers still found learners who did not

work on the instructions given, so the role of the teacher is needed to be able to provide understanding and guide learners to work and learn seriously (Yerimadesi, 2017).

The next stage is data collection and data processing. At this stage, students are given the opportunity to answer questions on Instagram learning media by collecting information related to the material being asked. This information collection can be done through the stages of observation of objects on Instagram media or reading material descriptions. This data collection stage goes hand in hand with the data processing stage. Learners process data and interpret data through teacher guidance and group discussions. At this stage, learners will begin to build concepts about the material in question and prove the hypotheses that have been made before. The results made by students are then compared with the hypothesis that students have made to draw conclusions. The process of proving this hypothesis is called the verification stage. The last stage in the guided discovery learning model is the closure stage. At this stage, learners with the guidance of the teacher conclude the concepts obtained into actual concepts (Yerimadesi, 2017).

After the learning process is carried out, students are given a final test (posttest). The posttest was carried out after the last meeting for 2 hours of lessons to see how the students' mastery of the material on the learning objectives of the material that had been taught. The pretest and posttest questions of the two sample classes were made the same so that it could be measured whether the learning was better, the same or lower. A posttest that has a higher value than the pretest indicates that the learning process is going well (Latisma, 2011).

The scores obtained by students reflect the concepts obtained after learning (Coletta & Steinert, 2020). Students take the pretest before having an understanding of the concepts contained in the chemical equilibrium material so that it can be said that they still rely on their initial understanding. Then a posttest is conducted to measure the extent to which students understand the concepts that have been learned. The high posttest value reflects the number of concepts that have been mastered by students (Lenggogeni & Mawardi, 2022).

This finding is in accordance with research that looks at improving student learning outcomes on the volume of space building material using Instagram which shows an increase in student learning outcomes after being treated (Khasana et al., 2020). Similar research also implemented Instagram in physics subjects which showed student learning outcomes were superior compared to conventional learning (madn). Another study that measured the effectiveness of the discovery learning model assisted by Instagram learning media on reaction rate material found that learning the right model and media will make learning more directed, efficient and effective with an average N-gain experimental 61.37 and N-gain control class 48.73 (Rahmawati et al., 2023). Reinforced by research conducted by Ramadani, et al (2023) that the LSLC-based guided discovery learning model can improve the learning outcomes of experimental classes with an N-gain of 0.71 and control classes with an N-gain value of 0.60. Based on the

results obtained in this study in line with previous findings, it was found that Instagram learning media on chemical equilibrium material was effective enough to improve the learning outcomes of students in class XI SMA Negeri 1 Kota Payakumbuh.

4.   Conclusion

Based on the results of research and data analysis, it can be concluded that the use of Instagram learning media on chemical equilibrium material is effective enough to improve the learning outcomes of students in class XI SMAN 1 Payakumbuh. So the author suggests that the use of Instagram learning media on chemical equilibrium material can be applied in learning at school to improve student learning outcomes.

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