Instagram-based Learning Media and Chemistry Practicum Video Projects to Improve Students' Creative Thinking Skills

Cindy Nur Anggreani[1*], Sri Yamtinah[2], Endang Susilowati[3], Ari Syahidul Shidiq[4], Hayuni Retno Widarti[5] (iD)

[1]Chemistry Education Study Program, Universitas Sebelas Maret, Surakarta, Indonesia
[2]Chemistry Education Study Program, Universitas Negeri Malang, Malang, Indonesia
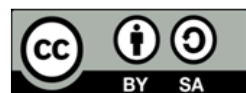
A B S T R A K

Pembelajaran kimia dianggap sebagai subjek yang kompleks karena sifatnya yang abstrak. Selain itu, hubungannya dengan kehidupan sehari-hari membutuhkan pemahaman konsep yang lebih besar seperti materi laju reaksi. Salah satu cara untuk mengatasi masalah tersebut adalah dengan menggunakan model pembelajaran yang tepat yang melibatkan siswa secara aktif mengembangkan ide-ide mereka, seperti model pembelajaran berbasis proyek terintegrasi STEM. Media pembelajaran Instagram paling berpotensi untuk digunakan sebagai media pembelajaran dalam pembelajaran berbasis proyek. Penelitian ini bertujuan untuk meningkatkan kemampuan berpikir kreatif siswa melalui proyek video praktikum kimia di Instagram. Metode yang digunakan dalam penelitian ini adalah eksperimen semu dengan rancangan nonequivalent control group design pretest-posttest. Sampel diambil dari kelas IPA pada siswa garda sebelas. Berdasarkan hasil pengujian hipotesis menunjukkan bahwa terdapat perbedaan yang signifikan penggunaan proyek video praktikum di Instagram dalam model pembelajaran berbasis proyek terpadu STEM (STEM-PjBL) terhadap keterampilan berpikir kreatif siswa. Video praktikum di Instagram ini dapat menjadi peluang untuk meningkatkan kemampuan berpikir kreatif siswa.

A B S T R A C T

Chemistry is considered a complex subject because of its abstract nature. In addition, its relation to everyday life requires a greater understanding of concepts such as reaction-rate material. One way to overcome this problem is to use an appropriate learning model involving students actively developing their ideas, such as the STEM-integrated project-based learning model. Instagram learning media has the most potential to be used as learning media in project-based learning. This research aims to improve students' creative thinking skills through chemistry lab video projects on Instagram. The method used in this study was quasi-experimental with a pretest-posttest nonequivalent control group design. The sample was from science class in elevent garade students. Based on the result of the hypothesis testing, it shows that there is a significant difference in the use of practicum video projects on Instagram in the STEM integrated project-based learning model (STEM-PjBL) on students' creative thinking skills. This practicum video on Instagram can be an opportunity to improve students' creative thinking skills.

1. INTRODUCTION

21st-century learning has become an issue in education related to students' competence in facing challenges in real life and the future. 21st-century skills are needed by students so they can compete in the future (Pangestika et al., 2020; Ridwan et al., 2021). Creative thinking skills are one of the 21st-century skills that play an essential role in preparing students to solve problems appropriately and make decisions quickly and responsibly. Guilford formulates creative thinking skills indicators: flexibility, fluency, originality, and elaboration (Mirnawati et al., 2021; Nurhayati & Rahardi, 2021). The chemistry learning process emphasizes direct giving experience to students, so if it is explained verbally, it will be difficult to understand because of its abstract nature and its relation to students' daily lives (Astuti et al., 2018;

*Corresponding author
E-mail addresses: jengtina@staff.uns.ac.id (Cindy Nur Anggreani)

Supriono & Rozi, 2018). One of the topics related to everyday life but abstract in chemistry lessons is the rate of reaction. Reaction rate material has characteristics in conceptual understanding and is applicable, so many students think that reaction rate material is complex. This material requires high levels of creative thinking skills. Through an experiment on reaction rates, students can directly observe the phenomenon of reaction rates in everyday life. In observing, students' creative skills will appear as they observe changes in reactants and reaction results during experiments (Qomariyah, 2017; Sari, F. R., Fadiawati, N., & Tania, 2015). One way to overcome this problem is to use an appropriate learning approach involving students actively developing their ideas, such as the STEM (science, technology, engineering, and mathematics) approach. STEM is a learning approach in which teachers can show their students concepts, principles, science, technology, engineering, and mathematics that are integrated into the development of products, processes, and systems that can be used in everyday life (Baran et al., 2021; Oktaviani et al., 2022). Integrated learning with STEM can provide opportunities for students to think creatively.

The learning process can be carried out through model stages integrated with the approach. STEM has been integrated into various learning models, such as the project-based learning model (Capraro et al., 2013; Han et al., 2016; Kuo et al., 2019; Lely et al., 2020). The project-based learning model involves project production and is practice-oriented to fulfill engineering skills in the STEM approach (Afriana et al., 2016; Kartimi et al., 2021; Shidiq et al., 2020; Slough & Milam, 2013). Therefore, project-based learning is considered one of the most appropriate learning models for developing existing skills in the STEM approach (Çevik, 2018; Shidiq et al., 2021). STEM-PjBL encourages students to be active and creative in producing products from a project. Students will construct their knowledge through project activities related to everyday life (Kipfer, 2021; Mirnawati et al., 2021). The STEM-PjBL learning model can improve students' creative thinking skills in redox and electrochemical materials, environmental pollution, and biodiversity (Mamahit et al., 2020; Rokhim et al., 2020; Sukmawijaya et al., 2019).

For learning activities to run optimally, the application of appropriate learning models must also be accompanied by using relevant learning media. Currently, internet-based learning media have great potential to be developed, one of which is social media such as Youtube, Twitter, Facebook, Line, Pinterest, Path, Tumblr, TikTok, and Instagram. Previous study state TikTok can improve student learning outcomes on retail business advertising materials (Hutamy et al., 2021). Then other study found the use of Youtube as a learning medium with the PjBL learning model can foster the creativity of students in learning chemistry (Haryanto et al., 2021). At the same time, using video projects on Instagram can improve students' creative thinking skills in biology learning, especially in material about environmental pollution. Instagram is a social media with the most potential to be used as a learning media in project-based learning (Messner et al., 2016; Utami et al., 2015). There has been research on the application of Instagram learning media (Abdillah et al., 2021; Irwandani et al., 2020; Pramesti et al., 2022) and the STEM-PjBL learning model (Bulu & Tanggur, 2021; Pramesti et al., 2022). Where the results are equally successful to improve creative thinking skills. However, there is no research that combines the application of Instagram media and the STEM-PjBL model in chemistry learning. This gap opens up research opportunities on using video projects on Instagram to improve students' creative thinking skills. This research is important to do because high levels of creative thinking skills are needed in the material on the rate of reaction, which demands an understanding of abstract concepts and terms in one basic competency (Sihaloho et al., 2022; Suliastifah & Timur, 2023). Therefore, this study aims to improve students' creative thinking skills using chemistry lab video projects on Instagram coupled with the STEM-PjBL learning model. This research is expected to be a reference for future research, primarily regarding using practicum videos on Instagram to improve students' creative thinking skills.

2. METHOD

The research method used was quasi-experimental with the research design (Miller et al., 2020; Thyer, 2012). The experimental class will be given treatment by applying a practicum video on Instagram in the STEM-integrated project-based learning model (STEM-PjBL). In the control class, learning was carried out using the commonly used learning media, namely PowerPoint and textbooks, with the STEM-PJBL. Both classes will be given a pretest and a posttest. The data obtained will be processed and analyzed to determine the effect of practicum videos on Instagram with the STEM-PjBL learning model on creative thinking skills in the Reaction Rate material. This research was conducted in three meetings, where each meeting was held for 90 minutes and followed the syntax of the STEM-PjBL learning model. In this study, the project given to the experimental and control classes was making a practicum video about the factors that affect reaction rates. One class is divided into eight groups so that each group gets a different subtitle or reaction rate factor. Each group is free to determine the tools, materials, and practicum work procedures, where the tools and materials used are simple materials and items in everyday life. The

project was uploaded on Instagram for the experimental class, while for the control class, the project was uploaded on Google Drive.

The population of this study was all students of class XI MIPA at SMA Negeri 3 Sukoharjo in the 2022–2023 academic year, which consisted of five classes with 180 students. Samples were taken using the Cluster Random Sampling technique. Of the five classes, one was randomly selected to be sampled. The first randomization was conducted to determine the experimental class that would receive treatment using a practicum video on Instagram in the STEM-PjBL learning model, namely class XI MIPA 1, which consisted of 36 students with ten male students and 26 female students. The second randomization was conducted to determine the control class that used conventional media (textbooks and PowerPoint) with the STEM-PjBL learning model, namely class XI MIPA 2, which consisted of 36 students with 10 male and 26 female students. Students in this study have agreed to be used as research subjects, and the data is taken for later analysis. The instruments used in this study were pretest and posttest questions in the form of essay questions used to measure students' creative thinking skills about reaction rates. The questions are prepared based on Guilford's creative thinking skills indicators: fluency, flexibility, originality, and elaboration as shown in Table 1.

Table 1. Indicators of Creative Thinking Skills According to Guilford

Indicator	Sub Indicator	Number of questions
Fluency	Predict answers fluency and quickly to a problem	
	Plan and use various solutions strategies when facing problems	2
Flexibility	Provide various interpretations of a picture, story or problem	
	Provide a variety of different ways to solve problems	2
Originality	Combine parts or elements	
	Provide a strategy for solving other problems from others	2
Elaboration	Adding or detailing the details of an object	2
	Take detailed steps to find a more in-depth meaning of the answers	

To find out the validity of the contents of an instrument met the requirements or not, the Gregory formula was used by two panelists. Based on the Gregory formula, the instrument can be used if CV > 0.7. However, revisions or improvements were made according to the panelists' suggestions. The results of the validity test are presented in Table 2.

Table 2. Summary of Content Validity Instrument Results

No	Instrument	CV
1	Lesson plan experimental class	1.00
2	Lesson plan control class	1.00
3	Student Worksheets experimental class	1.00
4	Student Worksheets control class	1.00
5	Grids of pretest questions	0.88
6	Grids of posttest questions	0.88

Before the hypothesis test was conducted in this study, the N-Gain test was first carried out to see the effectiveness and how much improvement in creative thinking skills after being given different treatments. Then the difference between post-test and pretest results is used for hypothesis tests. The hypothesis test in this study uses an independent sample t-test with a significance level $\alpha = 0.05$ in the SPSS 24 IBM software.

3. RESULT AND DISCUSSION
Result

The homogeneity test and normality test are prerequisite tests used in this study. Before testing the hypothesis, it is necessary to test for normality. The normality test in this study used the Shapiro-Wilk test in the SPSS 24 application because the number of samples in each class was less than 50. The sample was said to be normally distributed if the significance level was ≥ 0.05. If the normality test results are normally distributed, then the hypothesis test can be carried out with a parametric test. The normality test results from the difference between the posttest and pretest of creative thinking abilities can be seen in Table 3.

Table 3. Normality Test Result

Class	Sig	Dec
Experimental	0.074	Normal
Control	0.090	Normal

Based on the normality test results as show in Table 3, the difference in pretest and posttest scores for creative thinking skills in the experimental and control classes, it can be seen that all classes have a significance value of ≥ 0.05. Therefore, it can be concluded that the data is normally distributed or the sample comes from a normally distributed population. The homogeneity test aims to find out whether or not the variances of a number of populations are the same. The following is the result of the homogeneity test from the difference between the pretest and posttest of creative thinking abilities in the experimental class and the control class in Table 4.

Table 4. Homogeneity Test Result

Class	Sig	Dec
Experimental	0.000	Not Homogeneous
Control	0.000	Not Homogeneous

Based on Table 4, a significance value of < 0.05, namely 0.000, is obtained so that it can be concluded that the data has a non-homogeneous variant. Even though the data is not homogeneous, it is normally distributed, so testing the hypotheses from the pretest and posttest results can be done using a parametric test. The independent sample t-test is used to determine whether there is a difference in the mean of two unpaired samples. The main requirements in the independent sample t test are that the data be normally distributed and homogeneous (not absolute). Independent sample t-test results can be seen in Table 5.

Table 5. Independent Sample T-Test Results

Pretest-Posttest	Sig	Dec
Creative thinking skills	0.000	H_0 was rejected

Based on the results of the Independent Sample T-Test Pretest-Posttest in **Table 5**, which obtained a significance value (2-tailed) < 0.05, which is 0.000, then H_0 is rejected, so it can be concluded that there is a significant difference in the use of the Instagram Practicum Video project against students' creative thinking skills. Achievement indicators of the ability to think creatively in the experimental class and control class can be seen in Table 6.

Table 6. Percentage Achievement (%) Pretest and Posttest Creative Thinking Skills

Indicator	Sub Indicator	Pretest		Posttest	
		Experimental class (%)	Control class (%)	Experimental class (%)	Control class (%)
Fluency	Predict answers fluency and quickly to a problem	34.03	27.08	73.61	50.00
	Plan and use various solutions strategies when facing problems	46.53	41.67	78.47	62.50
Originality	Provide various interpretations of a picture, story, or problem	40.23	34.03	68.75	59.03
	Provide a variety of different ways to solve problems	29.86	27.08	98.61	65.97
Flexibility	Combine parts or elements	43.75	45.14	81.25	77.78
	Provide a strategy for solving other problems from others	29.86	32.64	91.67	76.39

Indicator	Sub Indicator	Pretest		Posttest	
		Experimental class (%)	Control class (%)	Experimental class (%)	Control class (%)
Elaboration	Adding or detailing the details of an object	22.92	29.86	86.81	61.11
	Take detailed steps to find a more in-depth meaning of the answers	25.69	23.61	92.36	77.08
	Average	**34.11**	**32.64**	**83.94**	**66.23**

The N-Gain test is used to find out how much the ability of students' learning outcomes increases after being given treatment and also the effectiveness of learning media. The results of the N-Gain test analysis can be seen in Table 7.

Table 7. Result in N-Gain Score

Indicator	Sub Indicator	Experimental class	Control class
Fluency	Predict answers fluency and quickly to a problem	0.60	0.31
	Plan and use various solutions strategies when facing problems	0.60	0.36
Originality	Provide various interpretations of a picture, story, or problem	0.48	0.38
	Provide a variety of different ways to solve problems	0.98	0.53
Flexibility	Combine parts or elements	0.67	0.59
	Provide a strategy for solving other problems from others	0.88	0.65
Elaboration	Adding or detailing the details of an object	0.83	0.45
	Take detailed steps to find a more in-depth meaning of the answers	0.90	0.70
	Average	**0.76**	**0.51**

Discussion

Instagram is one of the social media platforms that is widely enjoyed by the community, not only among teenagers but also among adults. According to the study's results, most students use Instagram for entertainment, style, finding friends, following technological developments, obtaining information, and updating their daily activities (Cahyadi & Setiawan, 2020; Mahendra et al., 2017). Instagram features include photos and videos. The facility will be designed to generate interesting feeds and reel designs as learning media so that students will be interested in learning chemistry. Based on the results of the N-Gain test, the score for creative thinking ability showed that the experimental class was in the "high" category with a value of 0.76, while the control class was in the "medium" category with a value of 0.51. Therefore, it can be concluded that there is an increase in learning outcomes and students' creative thinking skills in both the experimental class and the control class. However, the experimental class has increased learning outcomes and higher creative thinking skills compared to the control class. This is in line with the results of research conducted where the results of his research show that there is an increase in better student learning outcomes in the experimental class compared to the control class, which uses conventional learning media (Suarsini et al., 2020). There are differences in student learning outcomes before and after using Instagram as a learning medium. This is because Instagram makes students more interested in learning and makes it easier for them to understand learning material. Instagram is a social media platform that can provide information such as learning materials with very good category information characteristics (Ambarsari, 2020; Suarsini et al., 2020).

Instagram is an appropriate application to be used as a learning medium. Instagram has the potential to improve student learning outcomes (Messner et al., 2016; Rohim & Yulianti, 2020). The results of research stated that Instagram can improve student achievement (Nugroho & Ruwanto, 2017). This happens because Instagram contains content in the form of illustrated pictures or videos that can make it easier for students to understand the material, increase students' interest in independent learning, and increase student curiosity. This is in line with the results of research conducted which states that the results of the N-Gain test score for the experimental class are higher, namely 0.73, compared to the control class, namely 0.61, which means that Instagram learning media can improve results in learning (Rohim & Yulianti, 2020). This is in line with previous study states that digital media can improve

students' cognitive aspects of learning outcomes (Bower, 2017). In addition, during the implementation of learning, there are also differences in student attention. Students in the experimental class are more active when participating in learning activities compared to the control class. They were very enthusiastic when understanding the material using Instagram media. This is in accordance with the results of research which stated that Instagram can attract students' attention when learning (Budge, 2017; Jatmiko, 2016). This is because Instagram contains visual content such as pictures and videos to illustrate learning material. The application of the STEM-PjBL model with the help of Instagram learning media can make students more active and can motivate student learning better (Afriana et al., 2016; Marianti & Rahayuningsih, 2022). Implementation of learning will motivate students to be more active and facilitate students understanding of concepts better by promoting projects rather than reading material in books. Material uploaded to Instagram makes it easier for students to learn material because they can access it anytime and anywhere. Students are more interested because the material is presented in the form of pictures and videos, making it more interesting than reading text. These results are in line with research who found that the STEM-PjBL model can motivate students to learn and improve their creative thinking skills (Lestari et al., 2018).

The experimental class obtained higher results than the control class. This was influenced by Instagram users in the experimental class. They did their best to carry out the project because they realised that their project would be uploaded on Instagram. This can increase the motivation and competitiveness of students between groups. The Instagram-assisted STEM-PjBL learning model affects creative thinking skills. The STEM-PjBL learning model provides opportunities for students to investigate, plan, design, and reflect on projects. This is in line with previous study, basically, creativity is the result of the ability to think creatively to produce something new (Diawati et al., 2023). It is to solve a problem or situation. The STEM-PjBL learning model used in this study uses Instagram as a learning medium. The use of Instagram as a learning medium can shape student behaviour to be wise in using social media and can build creative and responsible character from uploaded content (Irfan, 2022; Lam et al., 2022).

The first indicator is fluency. Fluency is the skill of generating many ideas or questions (Guilford, 1988; Rasnawati et al., 2019). Fluency indicators can be seen when students give opinions about a problem presented at the beginning of learning, ask lots of questions during learning, and provide answers when working on student worksheets. Projects carried out by each group can also foster the skills to think fluently, where students can find tools, materials, and how to work regarding the project in the form of a practicum that will be carried out. This is because the practical implementation of each group has different subtitles, and the practicum is free to determine the tools, materials, and work methods of the practicum, where the tools and materials used are the ones around us. According to research results the achievement of the fluency indicator in using Instagram as a learning media is 93.75% (Marcella et al., 2021). The experimental class had higher fluency indicators than the control class in both the first and second sub-indicators. This is because the experimental class uses Instagram learning media, where the material presented via Instagram is more interesting and concise so that it can foster students' curiosity. Therefore, students will be more provoked and enthusiastic about asking questions and providing various ideas. The results of research state that curiosity can affect students' creative thinking abilities (Rudyanto, 2016).

The second indicator is originality. Originality is the skill to provide ideas different from others. The skill to think originally (originality) arises when students offer answers or solutions that are different from the others; for example, in this study, namely when students solve existing problems in the student worksheets, design projects according to the provisions, create their communication style in presenting practicum results, and make a project video in the form of a practicum video. This is in accordance with research which revealed that when students plan project designs and conduct research, their creative thinking abilities will develop (Utami et al., 2015; Widiani et al., 2016). The increase in original thinking skills (originality) in this study occurred because students were guided and given the freedom to determine the tools, materials, and practical work methods to be carried out so that they could develop original thinking abilities. According to research the achievement of the originality indicator in using Instagram learning media is 95.83% (Marcella et al., 2021). The experimental class had higher originality indicators than the control class in the first and second sub-indicators. This is because the experimental class uses Instagram learning media, where students upload the results of their best projects as practicum videos made according to their abilities, which are different from other groups. Students will tend to upload the results of their projects to Instagram in the best possible way so they can attract people who see them and give a good impression. In addition, the results of uploads from other people in the form of pictures or videos on Instagram can be used by students as inspiration and foster their creative spirit (Mahendra et al., 2017; Rubiyati et al., 2017). The increase in original thinking skills (originality) in this study occurred because students were guided and given the freedom to determine the tools, materials,

and practical work methods to be carried out so that they could develop original thinking abilities. From these activities, it can create a more enjoyable learning atmosphere, train students to be wise in using social media, and foster students' creative thinking skills (Marcella et al., 2021; Saputra & Sujarwanta, 2021). The third indicator is flexibility. Flexibility is the skill of students to produce various ideas, answers, or questions. The skill to think flexibly (flexibility) of students appears when students provide multiple interpretations of the problems given by the teacher, whether presented through pictures, videos, or problems contained in student worksheets. Showing the results of the practicum and the final results of the project in accordance with the subtitles that each group is working on, can also bring out the skills to think flexibly (flexibility), where students provide different ideas to solve problems. Presentations and question-and-answer activities can help students develop their thinking flexibility (Chandra et al., 2019; Fatma, 2021). According to research results the achievement of the flexibility indicator in using Instagram as a learning media is 89.58% (Marcella et al., 2021). An increase in the ability to think flexibly (flexibility) occurs because students are given the freedom to solve problems but still receive guidance from the teacher (Elkordy, 2016; Ivashova et al., 2019). Optimising the learning process is done when students have discussions with their groups. Students will conduct questions and answers that can increase knowledge and remind them of the subject matter (Dunne et al., 2011; Permanasari, 2016). The experimental class had a higher flexibility indicator achievement than the control class in the first and second sub-indicators. This is because the experimental class uses learning media in the form of Instagram. Factors that influence the ability to think flexibly (flexibility) are experience and high curiosity, which encourage students to have direct experience. The results of research state that curiosity can affect students' creative thinking abilities (Rudyanto, 2016).

The fourth indicator is elaboration. Elaboration is the student's skills to describe things in detail from an idea, object, or situation. The skills to think in detail (elaboration) of students appears when students make project designs where they have to develop work steps to carry out projects in the form of video labs. The skills to think in detail (elaboration) in students also appears when they process data from practicum, where they have to detail and develop the observations they get so they can be used to solve a problem (Brousseau & Warfield, 2014; Rasnawati et al., 2019). The results of research stated that students' detailed thinking skills increased by 5.9% (Fahmi & Wuryandini, 2020). The increase occurred because students were guided to design a project. Through these actions, students can design their own ideas so that they become accustomed to developing ideas according to their creativity. This stage of project creation also requires the skills to think in detail (elaboration), as students must add details to the project to make it more appealing. According to research results the achievement of the elaboration indicator on the use of Instagram learning media is 96.53% (Marcella et al., 2021). The experimental class had higher elaboration indicator achievements than the control class in both the first and second sub-indicators. This is because the experimental class uses Instagram for learning media.

Instagram learning media displays material in the form of images and videos made as attractive and detailed as possible so that students can understand the material. Students' interest in detailing something can be aroused to train their elaboration skills. Thus, students are more concerned with the details when making the final project result so that it looks better and more attractive because later, the project will be uploaded on Instagram and seen by the public. The strength of this research is that it succeeded in proving that the use of video projects on Instagram can improve students' creative thinking skills. This research can also describe the effect of using Instagram in improving students' creative thinking skills on each skill indicator. This research also has areas for improvement, such as that the sample used was only carried out in one school, so the results obtained might make a difference if they were done in other schools. Then, the data collection method only comes from the pretest and posttest results.

4. CONCLUSION

Based on the analysis and discussion, it can be concluded that there is a significant influence or difference between the experimental group and the control group by applying the practicum video project on Instagram in the STEM-PjBL learning model on the skills to think creatively. There is an increase in students' creative thinking skills in experimental and control classes. However, the experimental class had a higher increase in creative thinking skills compared to the control class. This practicum video on Instagram can be an opportunity to improve students' creative thinking skills. This research can be a consideration for teachers in improving students' creative thinking skills by implementing a practicum video project in the STEM-PjBL learning model. This study is expected to serve as a foundation for future research, focusing on using practicum video projects on Instagram and students' creative thinking abilities.

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