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The Impact of Google Forms-Assisted Discovery Learning Model on High School Students' Capacity for Creative Thought in Physics Classes

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ABSTRACT

The purpose of this study was to evaluate the impact of using the Google Forms-assisted discovery learning approach on high school students' capacity for original thought during physics classes. (differing from other research) This study used a non-equivalent control group design and a quantitative approach using a quasi-experimental design. Students from classes X MIPA 1 and X MIPA 2 served as the experimental and control groups, respectively, for this study, which was carried out at SMAN 16 Bandar Lampung. Essay questions were used as a test instrument to gather data. The independent sample t-test, with a significance level of 0.05, was the statistical test that was employed. The findings of the hypothesis test showed that the sig value was less than 0.05 (i.e., 0.018 < 0.05), supporting the H1 hypothesis and showing a significant difference in the creative thinking skills of the control class and the class that used the Google Form-assisted discovery learning paradigm. Thus, it can be said that utilizing the Google Form-assisted discovery learning methodology improves students' capacity for original thought in physics classes.

Keywords: Google form, creative thinking abilities, and discovery learning

INTRODUCTION

These days, the main emphasis in the field of education is on 21st-century skills. In the age of globalization, 21st-century skills are a collection of abilities seen to be necessary for people to have in order to meet the demands and problems of a society that is becoming more complicated [1] [2]. In addition to literacy, numeracy, and technological proficiency, these 21st-century skills also encompass social, collaborative, critical, and creative thinking abilities [3]. The capacity for creative thought is a crucial 21st-century skill. This capacity, which calls for rapid and accurate innovation, is crucial for tackling the world's increasingly complex difficulties [2]. The ability to come up with fresh, original ideas, to make connections between seemingly unrelated ideas, to take chances, and to think creatively are all components of creative thinking [4] [5].

Because 21st-century skills are intimately linked to innovation and creativity, which are critical for satisfying labor expectations, creative thinking abilities are crucial. According to [1], [3], the ability to think creatively is essential in both the business and daily life, particularly when solving complicated situations and coming to wise conclusions. The development of creative

thinking abilities is crucial in the classroom since it can help students comprehend the material more deeply and solve problems more successfully, according to a number of studies [6]–[11]. Furthermore, pupils who possess creative thinking abilities are more likely to be willing to take chances during the learning process, which boosts their self-esteem and flexibility.

The development of pupils' creative thinking skills is crucial in the field of education. This is done to get children ready for challenges in the future. To help pupils increase their capacity for creative thought, a method and learning model are required. The discovery learning paradigm is one that can assist pupils in cultivating their capacity for creative thought [12]. By observing, studying, and speculating about the subject under study, this learning technique enables students to hone their creative thinking abilities. This learning technique [13] encourages students to think creatively, improves their cognitive skills, and makes them more involved in the learning process. As a result, the discovery learning model is regarded as one of the best strategies for encouraging pupils to improve their capacity for creative thought.

Because the discovery learning approach enables students to actively participate in the learning process and build their critical and creative thinking skills[15]–[19], its application is directly tied to 21st-century skills[14], particularly creative thinking abilities. Under the guidance of the teacher, students are allowed to autonomously explore and analyze topics and issues in the discovery learning paradigm. During this process, students must connect and apply the principles they have learned to novel circumstances or unfamiliar contexts by using their creative thinking abilities. They are also required to take chances and come up with something new, as well as investigate different options and innovative ways to handle issues.

As a result, the discovery learning paradigm may be a useful tool for teaching pupils 21st-century abilities, particularly those related to creative thinking. Furthermore, because it offers a more dynamic, engaging, and demanding learning environment, this model can improve students' motivation and interest in learning as well as their problem-solving and metacognitive capabilities [17], [20]. Through guided problem-solving exercises and independent investigation, students use the discovery learning approach to explore and discover concepts and knowledge [21], [22].

In the digital age, education is changing quickly, and teachers must stay up to date with these changes. Improving the quality of education to be more inventive, creative, and interactive is one of the largest issues facing the field. Innovation and creativity are becoming crucial components of the labor market, both now and in the future. As a result, educators must create learning models that foster students' capacity for original thought.

Additionally, technology can be a useful instrument for raising the standard of education. Google Form is one piece of technology that can be used. Teachers can use Google Forms, an online tool, to build surveys, quizzes, and forms to get information from students. Google Forms can be used in the classroom to assist teachers get student feedback and track their progress.

Technology-assisted discovery learning strategies have been demonstrated to improve students' capacity for creative thought. However, particularly in Indonesia, there is currently a dearth of study on the application of the Google Forms-assisted discovery learning approach. Thus, by investigating the impact of the Google Forms-assisted discovery learning paradigm on students' capacity for creative thought, this study seeks to close that gap.

It is anticipated that this research will significantly advance both the advancement of technology in education and the creation of

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learning models that can foster students' capacity for creative thought.

METHOD OF RESEARCH

This kind of study employs the quasi-experimental approach and includes two classes: a control group that utilizes the problem-based learning model and an experimental group that uses the discovery learning model with Google Forms' help. A nonequivalent control group design is used in this study.

The study was carried out at SMAN 16 Bandar Lampung. The study's population comprises all 76 students enrolled in the X MIPA class for the 2020–2021 academic year, with 25–26 students in each of the three courses. Two classes—class X MIPA 1 and class X MIPA 2—were used as samples. Random sampling is the method used for sampling. The researcher employed a number of data collection methods to gather information for the study, such as a six-item test of creative thinking skills that is available on Google Forms and an observation sheet for the application of the learning model. The questions are piloted to assess the degree of validity, reliability, difficulty, and discrimination before the research test instrument is deployed. After passing the necessary tests—the homogeneity and normality tests—data analysis employs an independent t-test.

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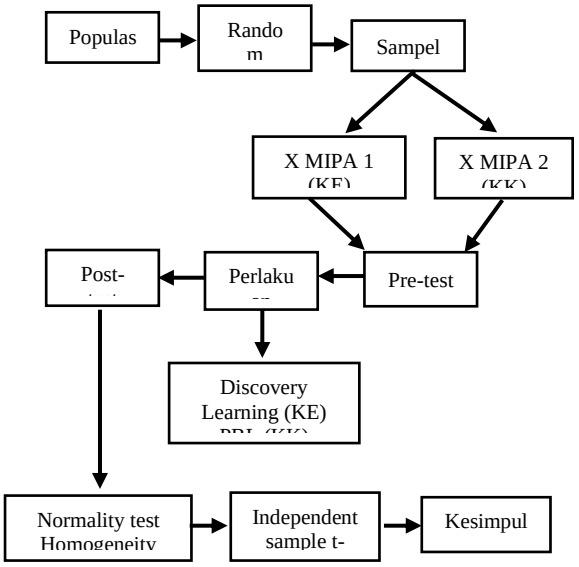

Figure 1: Research Flow

RESULTS AND DISCUSSION

Vectors are the primary focus of this study. This study was carried out at SMAN 16 Bandar Lampung between September 13 and October 6 of the 2021–2022 school year with the goal of evaluating how the Google Forms-assisted discovery learning model affected the physics tenth-grade students' capacity for creative thought. Essay assessments intended to gauge students' capacity for creative thought were used by the researcher to gather data. 50 students participated in this study, 25 of whom were in the experimental group (class X MIPA 1) and 25 of whom were in the control group (class X MIPA 2). The experimental group was taught using the Google Forms-assisted discovery learning paradigm, whereas the control group was taught using the problem-based learning approach. (PBL). Instruments that had undergone quality testing were used to test the data.The data results, including posttest, normality, homogeneity, and t-test analysis results, were acquired by the researcher. Table 1 displays the scores of the students' creative

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thinking skills in the experimental and control groups.

Table 1. Students in the Experimental and Control Classes' Scores on Creative Thinking Ability

Nilai	Kelas Eksperimen	Kelas Kontrol
Tertinggi	85,00	80,00
Terendah	60,00	50,00
Rata-rata	71,68	65,28

Table 1 shows that there is no discernible difference between the experimental class and the control class in terms of creative thinking skill scores. The percentage of students who are able to think creatively is therefore crucial to our study. Table 2 shows the average creative thinking capacity of the students as well as the calculation of each indicator based on the predefined criteria.

Table 2. Percentage of Students in Experimental and Control Classes with Creative Thinking Skills by Indicator

Indikator	Persentase		Kategori
	KE	KK	
Fluency	80,43	74,34	Kreatif
Flexibility	70,40	77,30	Kreatif
Orisinility	60,51	55,44	Cukup Kreatif
Elaboration	65,77	65,21	Kreatif
Rata-rata	69,28	68,07	Kreatif

more lucidly displayed in Figure 2's subsequent graph.

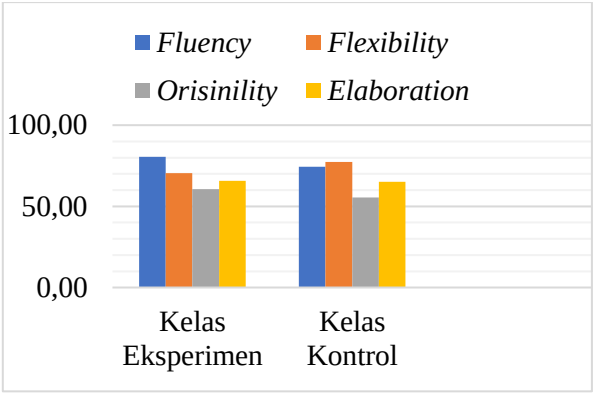

Figure 2. Graph of Creative Thinking Ability Percentage by Indicator

With an overall average of 69.28% falling into the creative category, Table 2 and Figure 2's data on creative thinking abilities by indicator demonstrate that students' creative thinking abilities tend to be most superior in the fluency ability indicator (80.43% with a creative category) and the lowest percentage in the originality indicator (60.51% with a fairly creative category). The experimental class demonstrated higher fluidity of thought, which means they were able to come up with a lot of ideas. Problem-solving grew easier as more ideas were generated, which was influenced by the teacher's chosen teaching model. In contrast, the control group's students' creative thinking skills had the lowest percentage on the originality indicator (55.44%), which is in the fairly creative category, and the highest percentage on the flexibility indicator (77.30%), which is in the creative category. The creative category is represented by the overall average percentage of 68.07% across all metrics. This outcome is more likely to produce a variety of ideas, which facilitates problem-solving. There seems to be a distinction between these two classes, namely between the experimental and control groups, where the former employs the problem-based learning model and the latter the discovery learning model.

The study's findings indicate that the experimental group significantly improved on

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the fluency indicator. Compared to students participating in traditional learning, those using Google Forms to support their discovery learning were able to produce more ideas and concepts in the same amount of time [12]. According to research findings, the experimental group's capacity to produce a wide range of ideas from various viewpoints significantly improved on the flexibility indicator. Additionally, students are better able to think creatively and show that they can look for other answers [6, 23]. According to research findings, students participating in Google Form-assisted discovery learning are able to produce more unique and unusual ideas on the originality indicator than students participating in traditional learning. Pupils can think creatively and come up with more original ideas [4], [24]. According to research findings, the experimental group significantly improved their capacity to elaborate on concepts and offer more thorough justifications on the elaboration indicator [24].

According to the aforementioned description, the discovery learning paradigm increases students' engagement in the learning process and fosters their capacity for creative thought. Due to its student-centered approach and the teacher's relatively restricted role, discovery learning can also help students improve their cognitive abilities, study on their own, become more motivated and enthusiastic about learning, and gain more confidence in their comprehension of the subject matter.

The hypothesis of this study is addressed using the findings of the students' capacity for creative thought. An independent sample t-test is used as the hypothesis test in this investigation. Prerequisite tests are carried out before to the hypothesis test. Tests for homogeneity and normalcy are prerequisites. The Kolmogorov-Smirnov test is used in this normalcy test, which is carried out with SPSS version 26. Below are the findings from the normalcy test.

Table 3: Findings from the Students' Posttest Creative Thinking Ability Normality Test

Karakteristik Uji *Kolmogorov-Smirnov*	**Nilai**		**Hasil**	**Kesimpul-an**
	KE	**KK**		
Sig	0,200	0,200	*Sig>α*	Berdistri-busi Normal
α	0,050	0,050		

Table 3 shows that the data in both the experimental and control classes are normally distributed, as indicated by the normality test value sig>α. The homogeneity test, the second necessary test, will next be carried out to ascertain whether or not the two obtained samples are identical. The homogeneity test results are shown below.

Table 4: Findings from the Homogeneity Test of Posttest Results on Students' Capacity for Creative Thought

Uji Homogen	**Hasil Uji Homogen**	**Hasil**	**Kesimpulan**
Sig	0,426	*Sig>α*	Data Homogen
A	0,050		

It is evident from the above table that the results of the homogeneity test using Levene's statistic based on the mean show that the sig value > α. This indicates that the results of the homogeneity test can be regarded as homogeneous and that the students in the class have varying degrees of capacity for creative thought.

The parametric test (Uji independent sample t-test) was conducted subsequent to the completion of the prerequisite tests. The outcomes of the hypothesis test are as follows.

Table 5: t-test results for the experimental class's posttest data

	Uji Dua Arah	**Sig.**	**α**	**Hasil**	**ket**
t_{hitung}	-1,0973	0,018	0,05		

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t_{tabel}	-1,6605		Sig < α 0,018< 0,05	H1 diterima

As can be observed from the above table, H1 is accepted, indicating that students' capacity for creative thought is influenced by the discovery learning approach with Google Forms' help.

Before introducing the content to the experimental and control classes at the first meeting, the researcher gave them a pretest. Next, the discovery learning model and a student-centered method are used to implement learning. Additionally, the media used consists of graphical graphics, LDS (student discussion sheets), and textbooks. Vectors are the material's primary focus. After verifying the students' attendance, the learning objectives are presented, the vector material is demonstrated, and questions pertaining to the subject in real-world situations are given as stimuli. The steps of the discovery learning paradigm are followed when implementing the learning activities in the core portion.

In the meantime, the researcher uses a scientific approach and the problem-based learning model to teach the control class. The lesson begins with the researcher motivating and assessing the students' perceptions of the vector material, followed by questions about it to gauge how well the students understood it at first. Students are then given a number of vector-related problems to solve in order to apply what they have learned in the core activities utilizing the steps of the problem-based learning paradigm.

The experimental class and the control class were given a post-test by the researcher at the end of the three meetings. Using Google Forms, the researcher sent the students six questions.

Additionally, the findings of this study support earlier hypotheses and investigations about how the discovery learning approach affects students' capacity for creative thought. By encouraging students to explore, develop ideas, and solve problems, discovery learning can improve their capacity for creative thought, claims [1]. In this instance, Google Forms has also worked well as a tool to support the process of discovery learning.

By employing legitimate and dependable research tools, taking a representative sample, and giving the control and experimental groups identical and clear instructions, the researchers have tried to reduce the number of variables that could affect the study's findings. However, this study has a number of drawbacks, including a small sample size and a brief learning period.

All things considered, this study significantly advances the creation of educational models that can foster students' capacity for original thought in the classroom. It is believed that the study's findings would help educators and educational institutions create more creative and successful teaching strategies that will help students become more adept at creative thinking.

Furthermore, the findings of this study have important applications. Teachers can use the Google Form-assisted discovery learning paradigm as an alternative to traditional classroom instruction if they find that it helps pupils develop their capacity for creative thought. Additionally, in order to support the process of discovery learning, educators might use Google Forms into their lessons.

Additionally, the study's findings can be used as a foundation for future investigations into the creation of technology-assisted discovery learning models. To improve learning effectiveness, future research can try implementing the discovery learning paradigm with alternative technologies or integrating Google Form with other technologies like virtual reality (VR) or augmented reality (AR).

CONCLUSION

With the help of Google Forms, the discovery learning approach has been

successfully and promptly implemented. The creative thinking indicator is used at every level of the learning process to help students develop their problem-solving skills. In comparison to the control group, students who engaged in discovery learning also performed better on tests. A hypothesis test result of 0.018, which is less than 0.05, demonstrated the impact of the discovery learning model and indicated that H1 is accepted.

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