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The Effect of Problem Prompting Learning Model Assisted by Mentimeter Media on Critical Thinking Ability Students

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Abstract: The purpose of this study is to ascertain the impact of the Probing Prompting learning model supported by Mentimeter media on the critical thinking abilities of class X MIPA SMA Negeri 2 Soppeng students. The study was carried out at SMA Negeri 2 Soppeng. This study was conducted in April. A control group design with a pre-test, post-test, and quasi-experimental design is used in this study. The population of this study consisted of all students in class X MIPA SMA Negeri 2 Soppeng; the sample was taken from classes X MIPA 1 and 3, each of which had 25 students; class X MIPA 1 served as the experimental class, and class X MIPA 3 served as the control class. The research tool utilized in this study was a description test with 10 numbers. Based on data analysis, it was possible to determine how well students were able to use critical thinking when reading about environmental contamination. The results of the hypothesis test (t-test) demonstrate that for the post-test of both classes, tcount>ttable equals 11.66>1.67. When the results of the hypothesis test for the Pre-test value in both classes reveal tcount ttable, which is -2.13 1.67, then H0 is accepted and H1 is rejected. This is in compliance with the criteria in the hypothesis test.

Keywords: Critical thinking; Mentimeter; Problem prompting

Introduction

As we enter the twenty-first century, everyone in the entire world may access a variety of information. Since science and technology are progressing so quickly, everyone may now communicate and access information without being constrained by time or space (Rapanta et al., 2020). Every country, particularly Indonesia, faces challenges and worldwide competitiveness as a result of the swift advancement of science and technology. It is anticipated that the presence of quality human resources will enable them to compete with the larger community, particularly in the workplace.

Every person must possess both competent hard and soft skills in the twenty-first century in order to enter the workforce and be prepared to compete with other nations (Rakowska & de Juana-Espinosa, 2021; Seetha, 2014). According to Trilling & Fadel (2009)every person in the 21st century needs to have the following competencies. Setiawati (2014) the phrase "21st century abilities," as it is more frequently used in different places of the world.

Higher level thinking abilities, more in-depth learning results, and communication skills are considered 21st century competencies (Luna Scott, 2015). According to Saavedra & Opfer (2012)there are four types of 21st century skills: *living as a citizen*: citizenship, life and career, and personal and social responsibility, including cultural awareness and competence; *thinking styles:* creativity and innovation, critical thinking, problem solving, decision making, and learning how to learn (metacognition); *working styles*: communication and cooperation in groups; and *tools for work*: general knowledge and literacy information communication technology (ICT).

However, the emphasis is on sophisticated or higher order thinking (creativity, metacognition), communication, cooperation, and more challenging teaching and learning than memorization (Ansari et al., 2019; Chang et al., 2021; Zain et al., 2022). The concepts or notions of 21st century abilities listed above are

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presented in several ways. The four Cs—critical thinking and problem-solving, communication, collaboration, and creativity and innovation—are the 21st century talents that students need to acquire (Haryani et al., 2021; Kennedy & Sundberg, 2020).

One of the talents in critical thinking and problem solving is the ability to interpret and resolve issues (Rahman, 2019). Thus, teachers must foster the character traits of critical thinking and problem-solving skills in relation to these fundamental learning characteristics. This ability is also a component of higher thinking. HOTS stands for Higher Order Thinking Skill. Higher Order Thinking Skill or HOTS questions are assessment tools used to assess higher order thinking abilities, or it is possible to say that HOTS questions assess metacognitive aspects as well as factual, conceptual, and procedural ones (Abdullah et al., 2021; Adinata et al., 2019).

In the fourth industrial revolution, biology education should be able to prepare students for a world that is both static and dynamic and reasonably complicated. So that pupils have the ability to think and speak, schools must switch from a teacher-centered learning strategy to a student-centered learning method (student-centered learning). Only an education that enables pupils to achieve their potential will enable them to meet these difficulties and expectations. Therefore, the 4 learning features of the Industrial Revolution 4.0 era—Communication, Collaboration, Critical Thinking and Problem Solving, Creativity and Innovation—must be referenced in biology learning activities in schools.

The probing prompting learning model is one of the learning models used in creating the teaching and learning process. According to Ke & Schwarz (2021), the probing prompting learning model involves teaching students through the use of a series of questions that are guiding and exploratory so that a thinking process takes place that connects each student's prior knowledge and experience with the new information being learned. In this learning, communication skills are developed with the goal of helping students share their skills with one another, develop critical thinking skills, express their opinions, give one another the chance to channel their skills, aid one another in learning, and evaluate one another's skills as well as their own and other friends' roles.

Probing prompting is a term used to describe learning strategies that emphasize interaction between teachers and students through the presenting of questions and challenges. This teaching method places a focus on students' participation in their learning (student center learning) According to the word's etymology, probing is an investigation and examination, whereas urging is an encouragement or a direction. Learning through the presentation of a sequence of questions that direct and develop students' ideas is known as the probing prompting learning strategy (Pratiwi et al., 2019).

In the probing prompting learning technique, the presence of a series of questions prompts students to actively and thoughtfully consider a belief or a form of knowledge that is accepted from the point of view of the arguments that support it and the subsequent conclusions that become its tendency in examining different opinions to assess and decide in order to develop critical thinking skills.

Using mentimeter technology, use probing prompting to learn. According Andrini (2021), mentimeter media is a type of learning tool that enhances the educational process and enables direct communication between teachers and students. Additionally, this application enables the uploading of images, graphics, quotes, the creation of reports on student responses when inquiries are made in the form of replies, the provision of answer information, and much more. The advantage of the mentimeter is that it can increase student engagement while they are learning by facilitating data gathering, allowing for the expression of opinions, and allowing for the creation of interactive questions (Khasanah et al., 2021; Mayhew, 2019; Pichardo et al., 2021). The results of research by Megasari et al. (2018) showed that students' critical thinking skills increased. Previous research by Pratiwi et al. (2019) demonstrated that mentimeter media-assisted learning using probing prompting techniques had a positive effect on student learning outcomes and critical thinking skills.

Based on the various descriptions provided above, it is necessary to conduct research on how the probing prompting learning model, supported by Mentimeter media, affects students' critical thinking abilities. Environmental pollution material was chosen because it is closely related to actual events and phenomena, which will help students develop their critical thinking abilities. Students are expected to observe and comprehend the phenomena that take place in their immediate surroundings when studying environmental contamination. It is intended that by developing pupils' thinking abilities, they will become more environmentally conscious. The author will analyze "The Effect of Probing Prompting Learning Model Assisted by Mentimeter Media on Critical Thinking Skills of Class X MIPA Students of SMA Negeri 2 Soppeng" against the backdrop of the aforementioned description.

Method

This study's research methodology was quasi-experimental research. The non-equivalent design that was used is split into two classes: the experimental class and the control class. Purposive sampling was used to

sample the two classrooms in this study, keeping in mind that the pupils had not been given any information about environmental pollution. In this study, a pre-test on critical thinking abilities was administered to both groups with the same questions to ascertain the students' starting points and whether or not there was a difference between the experimental group and the control group. The experimental group then received therapy using probing prompting learning techniques supported by mentimeter media, while the control group received treatment using traditional learning approaches. Both groups took a post-test with the identical set of questions as the pre-test following the therapy. In both groups, the experimental and control classes' pre-test and post-test results were compared are showed in Table 1.

Table 1. Quasi Experiment Method with Pre-test Post-test non-equivalent Control Group Design

Class	Pre-test	Treatment	Post-test
Experiment	O_1	X_1	O_2
Control	O_1	-	O_2

Modified from (Sugiyono, 2018)

Description:

X1 = Treatment in the form of *probing prompting* learning technique assisted by mentimeter media

- = Treatment in the form of conventional learning techniques

O_1 = Giving pre-test of thinking skills on environmental pollution material

O_2 = Giving *post-test of* critical thinking skills on pollution material environment

Result and Discussion

The purpose of this study is to ascertain the impact of employing the probing prompting learning model with the help of mentimeter media on the critical thinking abilities of students in the X MIPA class at SMA Negeri 2 Soppeng. The experimental class in this study was designated as X MIPA 1, while the control class was designated as X MIPA 3. Environmental contamination was the subject of the learning process in both sample classes, which were led by the same instructor—the researcher. The results of the Science Literacy ability of Control Class and Experiment Class students can be seen in Table 2.

Table 2. *Pre-test* and *Post-test* data of control class and experimental class

Value	Control Class		Experiment Class	
	Pre-test	Post-test	Pre-test	Post-test
Highest	40	75	55	95
Lowest	15	35	15	70
Average	28.6	52.4	34.4	81

Table 3. N-Gain of Critical Thinking Ability of Control and Experimental Classes

Class	Average Pre-test	Post-test Average	N-Gain	Classification
Control	28.60	52.40	0.32	Low
Experiment	34.40	81.00	0.83	High

Table 4. Normality Test of Pre-test and Post-test

Class	Pre-test		Post-test		Interpretation
	L_{Count}	L_{table}	L_{Count}	L_{table}	
Experiment	0.660	0.173	0.880	0.173	Normal
Control	0.740	0.173	0.850	0.173	Normal

Table 5. Homogeneity Test of Pre-test and Post-test

Class	Pre-test		Post-test		Interpretation
	F_{count}	F_{table}	F_{count}	F_{table}	
Experiment	2.349	1.980	0.357	1.980	Homogeneous
Control	2.349	1.980	0.357	1.98	Homogeneous

Table 6. Hypothesis Test Results

Class	Post-test		Pre-test	
	t_{cout}	t_{table}	t_{cout}	t_{table}
Experiment	11.66	1.67	-2.13	1.67
Control				
Results	tcount > t_{tabel}		tcount < t_{tabel}	
Test Decision	H_1 Accepted		H_0 Rejected	

Table 2 demonstrates the outcomes of the pre- and post-tests in the two sample courses. Whereas the control class's average value before treatment was 34 and after treatment was 51.8 on average. In the same way, the experimental class's average value before treatment was 38.2 and its average value after treatment was 90.6.

Based on Table 3, it is clear that the control class's average Pre-test value is 28.6 and its average Post-test value is 52.4, with an acquired N-Gain of 0.32, placing it in the low N-Gain categorization category. The experimental class, on the other hand, received an average of 34.4 on the Pre-test and 81 on the Post-test with an N-Gain score of 0.83, placing it in the high N-Gain categorization category.

Table 4 shows that the pre-test normality test for class X MIPA 1 (experimental) yielded a value of 0.66 (L_{count}) 0.173 (L_{table}), and the post-test yielded a value of 0.88 (L_{count}) 0.173. (L_{table}). The normality test findings for class X MIPA 3 (control) were Pre-test 0.74 (L_{count}) 0.173 (L_{table}) and Post-test 0.85 (L count) 0.173. (L_{table}). As a result, it is clear from the findings of the two sample classes used in this study that the data is regularly distributed.

Both classes exhibit homogeneously distributed data, according to the aforementioned homogeneity test results in Table 5. Whereas the results of the class X MIPA 1 (experimental) and class X MIPA 3 (control) pre-tests were 2.349 (F_{count}) and 1.98 (F_{table}), and the results of

the post-tests were 0.357 (F_{count}) and 1.98 (F_{table}), respectively (F_{table}).

Based on the information in table 6, the ratio of tcount to ttabel is 11.66 to 1.67. If the results of the hypothesis test for the Pre-test value in both groups reveal t ttabel, which is -2.13 1.67, then Ho is accepted and H1 is rejected. This is in compliance with the criteria of the hypothesis test. This suggests that teaching students in class X MIPA SMA Negeri 2 Soppeng using the Probing Prompting learning paradigm with the help of Mentimeter media can have a positive impact on their critical thinking abilities.

The calculations' findings support the hypothesis that the usage of mentimeter media in biology classes may have an impact on students' capacity for critical thought. According to research by Nasution & Anas (2022), mentimeters have advantages, including making it simpler for students to understand what teachers are trying to say and being able to enhance critical thinking abilities, attention, and student engagement in learning. Due to the fact that the variable value of using mentimeter learning media (X) is close to zero and the ratio value is positive, it is possible to infer that the value data is regularly distributed. The value of the critical thinking variable in biology classes (Y) is close to zero, according to the results of the excel output display, and based on the ratio value, it can be deduced that the value data is normally distributed, with the acquisition of the average variable value (control), which is 52.4 with a low category, and the acquisition of the average variable value (experimental), which is 81 with a high category. This is consistent with the viewpoint expressed by Wong & Yunus (2020), who believe that using mentimeter media can benefit students. The conclusion that can be drawn is that students' active involvement in the learning process increases with the use of mentimeter media, from previously being less focused on the material being explained, but with the use of mentimeters, students' enthusiasm and their motivation to learn more about biology (Ahmad et al., 2018) subjects increases, especially on environmental pollution material.

The results of the data analysis demonstrate a significant relationship between the probing prompting learning model with mentimeter media support and the probing prompting learning model without mentimeter media support on students' critical thinking skills in environmental pollution subjects, as evidenced by the fact that the coefficient values obtained from the data analysis of the variables (control) and variables (experimental) were less than the probability value. The data analysis coefficient is significant when H0 is rejected and H1 is approved. This demonstrates that applying the Probing Prompting learning approach with Mentimeter media has an impact on students' capacity for critical thought in Class X SMA Negeri 2 Soppeng's environmental pollution class. This is further supported by earlier research conducted by Rachmawati (2018), whose study titled "Application of Probing Prompting to Increase Civics Learning Activities on the Discipline Material of Class II Students" yielded the conclusion that using probing prompting can increase civics learning activities for class II students at SDN Celep. The growth is also characterized by an increase in civics education learning activities, a student-centered mindset, students' ability to participate more fully and feel safe expressing their thoughts, and students' eagerness for learning new content. The level of student learning activity both before and after the cycle is implemented can demonstrate this. It is clear that as students learn, their level of activity rises.

This research suggests that exploring motivating learning can enhance students' critical thinking abilities since they are more engaged and confident in expressing their perspectives. Employing this methodology allows students to find their own material to learn, ensuring that classes are not solely focused on the teacher. Additionally, using mentimeter media makes the learning process more engaging than it would be without it. The probing prompting learning model encourages students to build their own knowledge in accordance with the requirements of the 2013 curriculum, making it a student-centered model. This strategy makes students actively participate in their learning by asking them questions regarding concepts they haven't yet learned or fully grasped. notably in biology education that incorporates science and technology. This is given to content based on actual facts, such as content on environmental pollution. During the two meetings, there were students who were absent, which prevented researchers from recording the results as well as they would have liked. Only pupils who showed up to every learning session were eligible to be studied by researchers.

Conclusion

Students' critical thinking abilities are impacted by the probing prompting learning model with the help of mentimeter media, particularly in SMA Negeri 2 Soppeng, class X MIPA 1 even semester of the 2021/2022 academic year. If $t_{count} > t_{table}$, then H0 is said to be rejected and H1 can be said to be accepted, it is claimed that there is an influence. The hypothesis test, which displays a t_{count} of 11.66 and a t_{table} of 1.67, supports this. Students' capacity for critical thought is growing. This is demonstrated by the pre-test and post-test findings for each class, which show that the experimental class (X MIPA 1) had an N-Gain of 0.83 and a high classification while the control class (X MIPA 3) had an N-Gain of 0.32 and a low classification.

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