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The Effect of Guided Inquiry Model Using Concept Mapping Method Assisted by XMIND on Students' Critical Thinking Skills

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ABSTRACT

This study aims to examine the effect of guided inquiry model using concept mapping method assisted by Xmind on critical thinking skills of students in SMA Negeri 5 Barru. The research method used is Pre-Experiment with One-Group Pretest-Posttest Design research design, sampling technique using Purposive Sampling. The instrument used is Critical Thinking Skills Essay Test with 9 questions that have been adjusted to the indicators of Critical Thinking Skills involving 35 students as research subjects. The results of the study show that the Application of Guided Inquiry Model using Concept Mapping Method assisted by Xmind significantly improves critical thinking skills of students in SMA Negeri 5 Barru. From the analysis it can be seen that students are more involved in learning, able to connect physics concepts with real situations or in everyday life and develop better problem-solving skills in each meeting and are confident in expressing opinions that students know related to the problems given.

Keywords: *Concept Mapping, Critical Thinking Skills, Guided Inquiry, Learners, Xmind*

INTRODUCTION

The era of the industrial revolution 4.0, marked by the rapid progress of digital technology, presents challenges for the 21st century education system. In 21st century learning, there are four skills that a person must have, including creative thinking, critical thinking, problem solving, and communication and collaboration.(Nurfadilah & Handayani, 2022). Education that prepares students to be able to face technological advances is student-centered learning where the teacher acts as a guide, facilitating the learning process of students who actively observe, collect theories and facts to build students' understanding and skills such as physics learning.(Parwati et al., 2020)Physics is a natural science that consists of facts, principles or concepts in learning which requires certain methods to attract students to be active in learning.(Nurlina & Nurfadilah, 2024).

Based on the results of observations conducted at SMA Negeri 5 Barru by researchers on Monday, December 9, 2024. Where researchers saw directlyimplementation of learning by teachersInterviewed regarding physics learning, that the critical thinking skills of students at SMA Negeri 5 Barru are still categorized as very low, this was stated directly by the physics teacher, especially at SMA Negeri 5 Barru which is currently implementing the Independent Curriculum, where this curriculum emphasizes students to have critical thinking skills. The

physics teacher also said that there are some students who have creative skills when taking notes. However, the learning process in class is more focused on improving students' ability to remember information and concepts and working on practice questions without any factual and detailed explanations of theories or concepts so that students are unable to discover new things and be able to apply physics concepts in real life. Where this is needed in physics learning that directly proves concepts and theories, therefore to find out directly, students need notes that connect one concept to another from accurate sources through student searches in this technological era so that students have new knowledge in researching the learning.

During the last physics lesson, the learning that was carried out was considered to only discuss physics questions that were explained through practice questions. This was considered less than optimal, because it was seen directly through the students' notes which were incomplete or said to only contain questions and answers to the existing practice questions without any detailed concepts or theories explaining the material that the students were studying.Lack of understanding of the material causes students to be less active in asking questions, expressing opinions, and answering teacher questions. Given these various obstacles, innovative learning is needed to engage students. Hence, the idea of implementing a digital-based learning model and method was born.

According to Handayani (2009), "Learning must be innovative, making students active, and this also applies to physics learning. Learning is centered on students, where the teacher only acts as a facilitator and motivator in the learning process." The selection of models, methods, approaches, learning strategies, teaching media, and so on are innovations in learning. Innovation in learning can improve student learning outcomes. One learning model that can be used is the guided inquiry learning model.

The guided inquiry learning model ensures active involvement of students in learning. According to Dewi (2013) in(Darnella et al., 2020), the guided inquiry learning model emphasizes the process of discovering a concept, so that a scientific attitude emerges in students. The provisions of the guided inquiry model for students are that students can construct their own understanding, obtainIndependent learning and research skills, high levels of motivation and engagement, and the development of social, language, and literacy skills. According to Long & Carlo (2011: 1), students' weaknesses lie in their ability to take notes and

connect concepts. Therefore, the implementation of the Guided Inquiry Model tends to focus only on student involvement during learning, which can result in limitations in recording information and potentially forgetting the material they have learned.(Nurdiana et al., nd).A new approach to help students achieve meaningful learning in the classroom. Concept mapping provides concrete visual support for organizing information before it is learned. Teachers who have implemented concept mapping note that it provides a logical basis for determining which core ideas need to be included or removed from lesson plans. Clear mapping can prevent students from developing misunderstandings.

*Concept Mapping*is an effective method to get new ideas and get information easily from the mind. By utilizing*Concept Mapping,*The brain's natural workings can be engaged from the start. This means that recalling information later becomes easier (Buzan, 2010: 5)*Concept mapping*not only illustrates important concepts, but also establishes connections between existing concepts.In education, Concept Mapping can be used as a learning strategy, an instructional strategy in learning, a strategy for curriculum planning and a tool for evaluating student understanding, learning how to learn, revealing misconceptions and as an evaluation tool.(Nurani, 2013).

According to Krikuk & Rudnick, 1999(as mentioned by Martatis, 2023),Critical thinking is a thinking process that involves testing, connecting, and evaluating all aspects of a problem situation, including the ability to gather information, remember, read, understand, and identify relevant elements. There are six fundamental elements that are the focus of critical thinking: focus, rationality, conclusions, context, clarity, and overall evaluation (as quoted from Ennis, 1996). Critical thinking is also described as "cognitive skills and strategies that can improve desired thinking outcomes, namely goal-oriented, based on strong reasons, and effective problem-solving and conclusion-forming" (as mentioned by Halpern, 2013). Critical thinking skills need to be applied in the context of physics learning, both in simplifying and understanding conceptual knowledge that requires a higher level of thinking to connect these facts so that the concept is truly presented clearly (as mentioned by Arends, 2012).

The innovation of the guided inquiry learning model using the Concept Mapping method assisted by Xmind is a combination that greatly supports the process of critical thinking skills of students in schools. Moreover, the current state of education accompanied by

technological developments in the field of education, it is undeniable that the world of education must adapt to the application of existing technological developments. The process of creating Concept Mapping with the help of applications feels easier and more enjoyable. One example of an application that is often used in creating Concept Mapping is Xmind. Xmind is a simple and user-friendly application or website. The variety of features that Xmind has, for example the ability to insert images, colors, audio, video and links, makes the process of creating Concept Mapping with this application interesting. In addition, files that have been created with Xmind can be easily converted to various file formats, such as Microsoft Word, PDF and others.(Firmansyah et al., 2020). Therefore, research on the influence of the Guided Inquiry learning model using the Concept Mapping method assisted by Xmind is very important to be carried out.

MATERIALS AND METHODS

The type of research used in this study is a Pre-Experiment with a One-Group Pretest-Posttest Design. The design used in this study is a One-Group Pretest-Posttest Design as shown in Table 1 as follows:

O_1 X O_2

(Sugiyono, 2011)

The study was conducted at SMA Negeri 5 Barru, located in Tanete Riaja District, Barru Regency, South Sulawesi. The study was conducted in the even semester of the 2024/2025 academic year. The population comprised all 231 grade X students of SMA Negeri 5 Barru, consisting of seven classes. The sample was selected using a purposive sampling technique with X2 as the class studied and a total of 35 students.

The independent variable in this study is a guided inquiry model using the concept mapping method assisted by Xmind. Meanwhile, the dependent variable in this study is students' critical thinking skills. This research procedure is divided into three stages: the initial stage, the implementation stage, and the final stage.

This study used a Critical Thinking Skills test instrument consisting of nine questions or nine numbers. The instrument was structured based on the indicators and sub-indicators of Critical Thinking Skills, adapting it to the physics material to be taught to students and the operational verbs used in the

test instrument. The outline of the Critical Thinking Skills test instrument, adjusted to the indicators and sub-indicators, can be seen in Table 2 below:

No.	Indicator	Sub-indicators	Item No.
1.	Provide a simple explanation	a. Focusing questions	1
		b. Analyzing arguments	2
		c. Asking and answering questions	3
2.	Building basic skills	d. Observing	4
3.	Conclude	e. Making deductions	5
		f. Making decision values	8
		g. Composing induction	9
4.	Make further explanation	h. Identifying assumptions	6
5.	Setting strategy and tactics	i. Determining action	7
		Amount	9

Source: processed data (2024)

The test instrument, in the form of descriptive questions, was administered during the pretest and posttest to measure students' critical thinking skills on the Renewable Energy topic. Prior to use, the research instrument underwent several tests, including validity, reliability, and difficulty index. Data collection techniques in the initial stage included observation, interviews, and documentation. The final data collection phase included a pretest and posttest.

RESULTS AND DISCUSSION

Observation Results of the Implementation of the Guided Inquiry Model Using the Concept Mapping Method Assisted by Xmind

The results of observations conducted to assess the implementation of the guided inquiry model using the Xmind-assisted concept mapping method. Observation data were analyzed to identify findings related to the effectiveness of each stage of the guided inquiry model in the context of using Xmind, including obstacles and challenges faced during the learning process. The results of these observations will be described in detail and interpreted to provide a comprehensive picture of

the implementation of the guided inquiry model using Xmind-assisted concept mapping, which is presented in Table 3 below:

Table 3 Results of Observations on the Validity of the Guided Inquiry Model Using the Method *Concept Mapping*a ssisted by Xmind during the meeting

Stages	Percentage of Observation Results Per Meeting					Percentage
	Per-1	Per-2	Per-3	Per-4	Per-5	
Orientation	18	24	26	27	35	0.20
Formulating the Problem	5	9	11	15	27	0.11
Formulating Hypotheses	3	7	10	20	35	0.12
Collecting Data	18	24	26	29	31	0.20
Testing Hypotheses	18	24	26	29	31	0.20
Formulating Conclusions	15	18	21	23	31	0.17
Average	77	106	120	143	190	

Source: processed data (2024)

Based on table 3, the observation results at each meeting with 6 stages of guided inquiry at the first meeting averaged 77 while at the 5th meeting it increased in all stages. This is because at the first meeting students still do not know how to formulate problems, formulate hypotheses, collect data, test hypotheses and formulate problems. The cause is that previous physics learning is more about directing students in working on physics problems and many students are still working on deadlines for other subject assignments so that students do not focus on one subject, for example this physics lesson and there are no notes related to previously studied physics materials so that when orientation in asking previous questions many of the students forget the material being asked.

Thus, at the fifth meeting, an average of 190 was obtained. This was because students had been given motivation in the form of advice. The results of observations on the implementation of the guided inquiry model using the Concept Mapping method assisted by Xmind can be seen in full in the Appendix to the Learning Daily Journal.

The results of observations on the validity of the guided inquiry model using the Concept Mapping method assisted by Xmind during learning are also presented in the form of a bar chart in Figure 1 below:

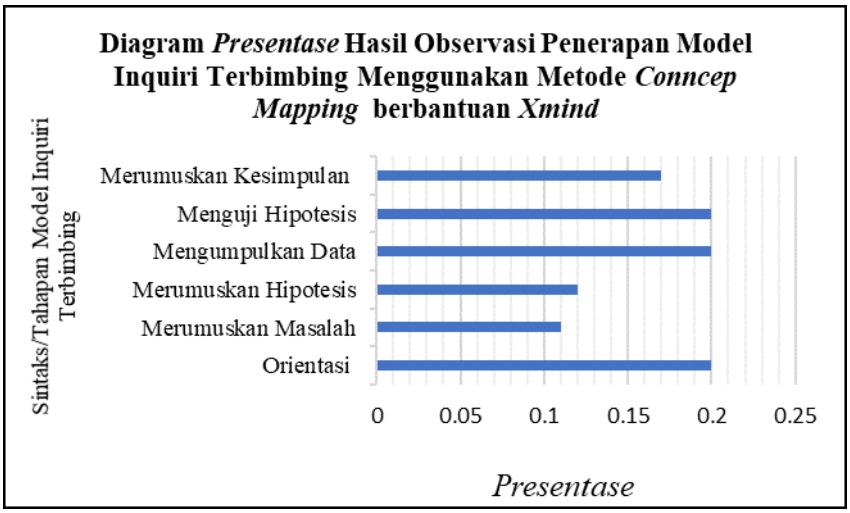


Figure 1 Percentage Diagram of Observation Results of Model Application Guided Inquiry Using the Concept Method *Mapping*Xmind-assisted

Based on Figure 1, it can be described that the orientation stage, testing the hypothesis and collecting data have the same high percentage of 0.20, this indicates that class X 2 students of SMA Negeri 5 Barru are good at listening to the teacher, good at testing the hypothesis, and good at collecting data. At the stage of formulating the problem, the percentage is only 0.11, not much different from the percentage of the stage of formulating the hypothesis, which is 0.12. This is due to the lack of confidence in students in giving opinions.

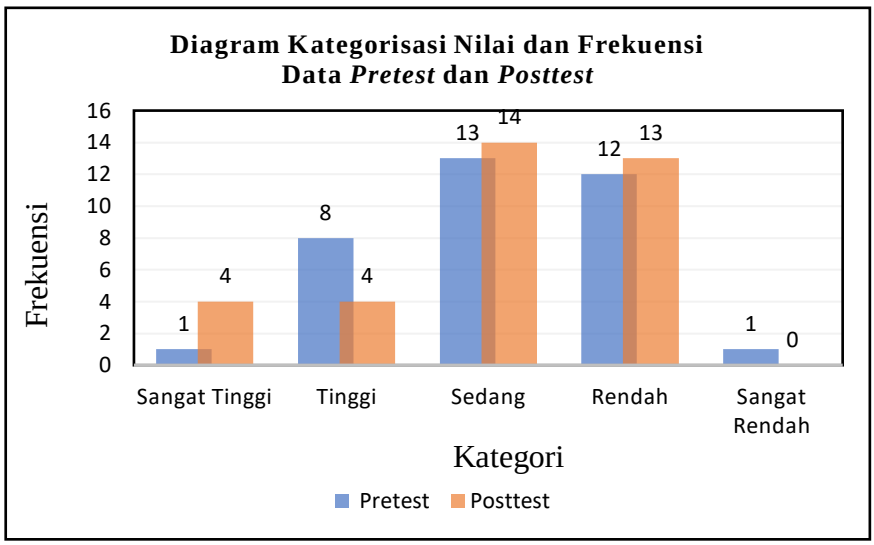
a. Descriptive Analysis Results of Pretest-Posttest

The results of this study were analyzed using descriptive analysis and N-Gain test analysis. Table 4 below shows the results of the descriptive analysis of the pretest-posttest of critical thinking skills.

Table 4. Results of Descriptive Analysis of Pretest-Posttest Critical Thinking Skills

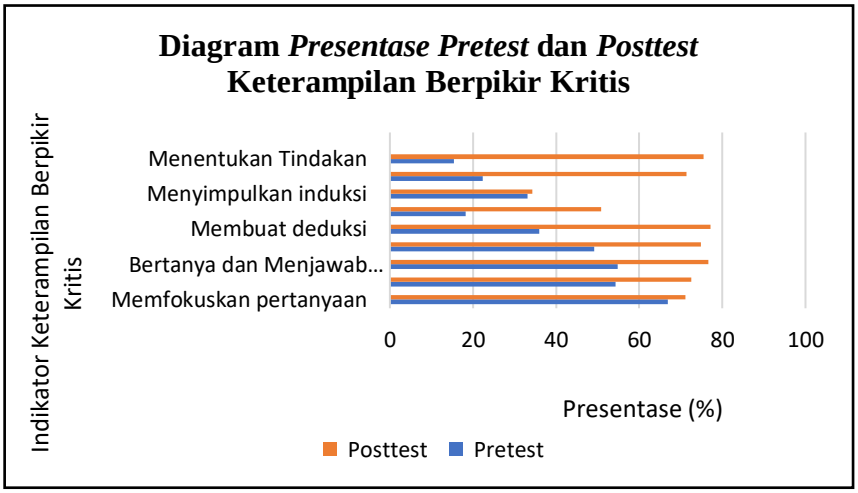
Category	Pretest Results	Posttest Results
Number of Samples	35	35
Average value	27.6	55.7
Standard Deviation	13.56	12.94
Variance	183.87	167.44
Highest Value	50	84
Lowest Value	5	35
Ideal Values	92	92

Source: Processed data (2025)



Source: Processed data (2025)

Figure 2 Skill Value and Frequency Categorization Diagram Critical Thinking of Students Before (Pretest) and after being given treatment (Posttest)



Source: Processed data (2025)

Figure 3. Pretest - Posttest Data Percentage Diagram Critical Thinking Skills of Grade X 2 Students State Senior High School 5 Barru

Table 4 shows the results of the descriptive analysis of the pretest-posttest of critical thinking skills of 35 students of class X 2 of SMA Negeri 5 Barru. There was a significant increase in the average score, from 27.6 in the pretest to 55.7 in the posttest (from an ideal score of 92). Although the standard deviation decreased slightly (from 13.56 to 12.94), the variance also showed a decrease (183.87 to 167.44), indicating an increase in score consistency after the intervention. The highest and lowest scores also increased significantly, indicating an overall increase in critical thinking skills.

Diagram 1 illustrates the frequency distribution and categorization of critical thinking skills of grade X 2 students before (pretest) and after (posttest) the learning intervention. In the pretest, the majority of students were in the medium (37.14%) and low (34.29%) categories, with only a few students in the very high (2.86%) and very low (2.86%) categories. After the intervention, there was a significant change in the distribution. The proportion of students in the medium category increased to 40%, while the number of students in the very high and high categories also increased, indicating positive development. No students fell into the very low category after the intervention.

A possible bar chart shown in Figure 1 would visually clarify this shift, providing further evidence of the improvement in students' critical thinking skills after the intervention program.

Furthermore, Chart 2 shows the percentage increase in mean scores across nine critical thinking skill indicators after the intervention. All indicators recorded improvements, with the most significant improvements being in "making deductions" (41.14 points) and "determining actions" (60 points). The "making decisions" indicator also showed a significant increase (32.57 points). Although some indicators showed smaller increases, they still showed a positive trend. The "drawing inductive conclusions" indicator experienced a minimal increase (1.15 points), but still showed progress.

Overall, the descriptive data demonstrates the effectiveness of the learning intervention. However, for a more comprehensive conclusion, it is also necessary to analyze the results of the N-Gain test.

Table 5. Results of the Overall N-Gain Test Analysis Using SPSS 24

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Standard Deviation
Ngain_Score	35	-.02	.84	.4353	.18912
Valid N (listwise)	35				

Source: Processed data (2025)

After the N-Gain test was conducted, the N-Gain Score was 0.43, where the value was included in the moderate category, namely in the range of $0.3 \leq G \leq 0.7$. This shows that there was an increase in students' Critical Thinking Skills before and after the guided inquiry model was implemented using the Xmind-assisted concept mapping method in physics learning in class X 2 of SMA Negeri 5 Barru, which was included in the moderate category.

This is relevant to research conducted by(Nurhayati & Langlang Handayani, 2020)which states that the guided inquiry learning model can improve students' critical thinking skills, where this conclusion can be supported by an increase in the N-gain finding of 0.40, which is included in the moderate group.

CONCLUSION

Based on the results of the research and discussion that has been carried out, it can be said that there is an influence of the Guided Inquiry Model using the Method*Concept Mapping*Xmind-assisted learning model on students' Critical Thinking Skills. This is because, the level of Critical Thinking Skills of students in class X 2 of SMA Negeri 5 Barru before being taught with the implementation of the guided inquiry model using the Concept Mapping method assisted by Xmind obtained an average value of 27.6 which is included in the low category. The level of critical thinking skills of students who were taught by implementing the guided inquiry learning model using the Concept Mapping method assisted by Xmind obtained an average score of 55.7 which is included in the moderate category. There is a significant difference in students' critical thinking skills before and after the implementation of the guided inquiry learning model using the Concept Mapping method assisted by Xmind.

THANK-YOU NOTE

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