

## IMPLEMENTATION OF THE ETHNO-STEM APPROACH ( SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS ) IN SCIENCE LEARNING TO IMPROVE CRITICAL THINKING SKILLS AND INTEREST OF STUDENTS

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### Abstract

*Education must be able to arouse students' curiosity , so that they can minimize knowledge misconceptions in science learning. There is a need to adapt appropriate learning models in teaching as part of the teacher's responsiveness in learning in accordance with current developments. The provisions that must be provided by students must be in accordance with the skills required by the education market share. Research objectives This is For enhancement Skills think critical and interested participant educate in science learning with use approach Ethno -STEM. Type of research used in study This that is study field research with approach quantitative . The sampling technique uses technique probability sampling . Deep data collection methods study This includes methods , questionnaires , and observations . Data analysis applied to research This is inferential data analysis . Inferential data analysis using the N-Gain test for measure enhancement Skills think critical participant educate .*

*The research results are in the form of integration principle enthology and STEM concepts with seven characteristics main , among others is involve context wisdom local , learning based problem , involvement participant education , critical thinking , collaboration and teams , use technology , as well emphasis on the scientific process . Implementation approach Ethno -STEM is effective in increase Skills think critical and interested Study participant educate especially in class experiment . Teacher response to approach can classified as response good , the teacher response was 51.6% % which influenced response Good participant educate as much as 58.1%. By overall , approach Ethno -STEM can become method effective learning in learning science subjects ..*

*Keywords : Approach Ethno -STEM, Skills Think Critical , Student Interest*

### Introduction

Revolution Industry 4.0, characterized by smart robots with intelligence artificial ( AI ), demanding change curriculum education For produce participant competitive students globaly . Learning just traditional focuses on memorization

and practice Skills certain become No adequate (Risdianto & Cs, 2019) . In the 21st century , technology and information change public become more knowledgeable , possible access easy to global information , but also brings impact negative like explosion difficult information filtered (Trisnawati & Sari, 2019) .

Skills known 21st century as 4C (communication, collaboration, critical thinking, creativity ) is very important . However , teachers in Indonesia, such as shown by the results of PISA 2015, still Not yet capable push participant educate For think critical (Mu'minah et al., 2019) . STEM ( Science, Technology, Engineering, Mathematics ) learning can be done increase mastery exact with way more applicable , incl through approach Integrating ethno -STEM culture local to in learning .

The inability of students at MTs Darul Hikam, Undaan, Kudus to understand science material is often caused by learning that is not interesting or not relevant to everyday life. Apart from that, the lack of interesting and effective learning models to introduce science concepts can cause teachers difficulties in teaching. Learning that does not actively involve students and lacks a connection between learning material and everyday life can make understanding science concepts difficult.

Lack of curiosity and enthusiasm in class VIII students at MTs Darul Hikam, Undaan, Kudus which results in students not focusing on the material presented by the teacher, curiosity and enthusiasm for students in learning science will make students active in learning, critical thinking, and students' high interest in learning. Facts show that students in general are not happy with science learning. Students think that science learning is very difficult and annoying and there is too much to memorize, so learning methods are needed that can reduce this impression (Tulljanah & Amini, 2021) .

Approach Ethno -STEM is expected Can repair understanding participant educate with hook draft scientific with activity relevant everyday life , such as making shrimp crisp Samier cassava in Kudus, Central Java. Making process

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shrimp crisp This become example concrete How science , technology , engineering and mathematics can applied in life real . Additionally , approach this can also be done increase Skills think critical and interested Study participant educate with connect knowledge scientific with culture local learners . Making cassava samier crackers is a relevant lesson in Basic Competency (KD) 3.3 which contains explaining business concepts, simple machines, and their application in everyday life including muscle work in the human skeletal structure (Kompetensi Dasar dan Materi IPA kelas 8 – MTsN1 Bandar Lampung, 2020). Apart from that, this learning is also found in Basic Competency (KD) 4.3, namely presenting the results of problem solving related to the benefits of using simple aircraft in everyday life (Musfiah, 2022) .

Study This aim For analyze characteristics Ethno -STEM in science learning , its implementation For increase Skills think critical and interested participant educate , as well teacher and participant responses educate to approach This . The type of research used in this research is field research. With use method quantitative type experiment , research This involving 88 participants educate class VIII MTs Darul Hikam Kudus with sample of 58 participants shared learning become class experiment and control . Data collection was carried out through questionnaires , documentation , and observations , with inferential data analysis . Inferential data analysis using the N-Gain test for measure enhancement Skills think critical participant educate .

Research result show that use Ethno -STEM in science learning , in particular through making shrimp crisp Samier cassava , yes become method effective For hook knowledge scientific with culture local , improve involvement participant educate , as well strengthen understanding natural science concepts more in-depth and relevant (Fawaida et al., 2023) . The use of Ethno-STEM learning in making cassava samier crackers can be a very useful approach in the context of science education. Based on these problems, research is important regarding "Implementation of the Ethno-STEM ( Science, Technology, Engineering, and Mathematics ) Approach in Science Learning to Improve Students' Critical Thinking Skills and Interests."

## Results And Discussion

This research was conducted at MTs Darul Hikam Kudus in the 2023/2024 academic year, from 18 January to 3 February 2024, with a focus on students in grades VIII B and VIII C. The aim of the research was to evaluate the implementation of the Ethno-STEM approach in science learning in order to improve critical thinking skills and students' interest in learning. The curriculum used is the 2013 curriculum which is integrated with the Ethno-STEM approach, which combines local wisdom and ethnoscience, especially in the context of making cassava samier crackers.

This research measures analysis, problem solving, association, discovery, integration and evaluation skills through pre-test and post-test using Student Worksheets (LKPD). In addition, the study assessed students' learning interest based on participation, engagement, and attitudes towards the Ethno-STEM approach. The presentation of the results of data analysis is as follows:

### a. Characteristics Approach Ethno -STEM in Science Learning

Characteristics approach Ethno -STEM that will applied in science learning can be measured through questionnaire or questionnaire .

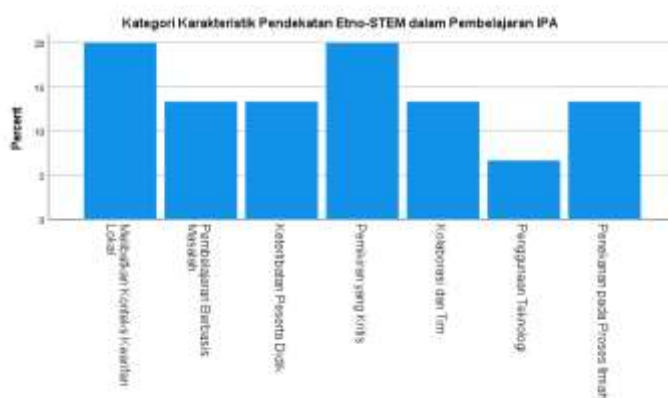


Figure 1.1. Characteristic Data Results Approach Ethno -STEM in Science Learning

Source : IBM SPSS Processed Data

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Based on Figure 1.1 characteristics approach Ethno -STEM can concluded that mark involve context wisdom local 20%, learning based 13% problem , engagement participant educate 13%, engagement participant education 13%, critical thinking 20%, collaboration and teams 13% , use technology 7%, scientific process emphasis 13%.

b. Implementation Approach Ethno -STEM in Science Learning

Implementation approach Ethno -STEM in learning This pre-test was carried out moreover formerly For obtain initial data . Pre-test data results Skills think critical can seen in figure 1.2.

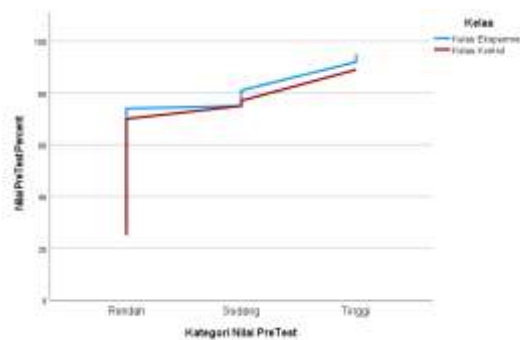
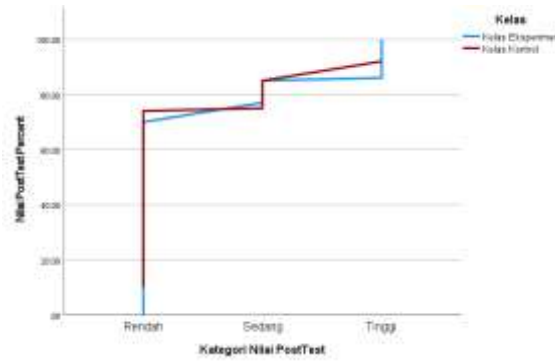


Figure 4.2. Pre-Test Data Results

Source : IBM SPSS Processed Data

Pretest data results in Figure 1.2. can concluded that class average grade experiment more tall from class control . As class experiment obtain mark category high 92% and class control got 90%. After pre-test done furthermore carry out post-test For obtain mark enhancement Skills think critical and interested participant educate . Figure 1.3. serve post-test data results.



**Figure 1.3. Post-Test Data Results**

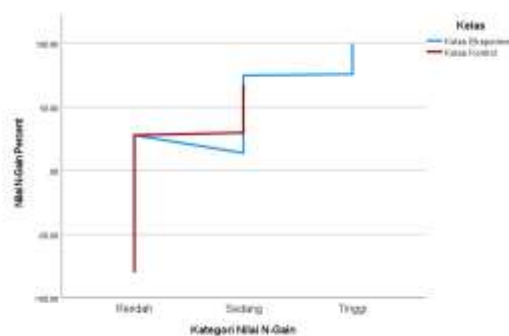
*Data source Processed by IBM SPSS*

Based on post-test data results class experiment more superior than class mark highest namely 100%. Improvement results think critical and interested participant educate can is known through the N-Gain test. N-Gain test results obtained can seen in table 1.1 and figure 1.4.

**Table 1.1. N-Gain Data Results**

	N-Gain Value
<b>Class Experiment</b>	0.411
<b>Class Control</b>	0.343
<b>Difference</b>	0.068

*Source : Excel Processed Data*



**Figure 1.4. N-Gain Data Results**

*Source : IBM SPSS Processed Data*

Table 1.1. show class N-Gain value experiment more big than mark class control with difference value 0.068. Meanwhile in figure 1.3. show comparison class N-Gain value experiments and classes control that can be seen chart

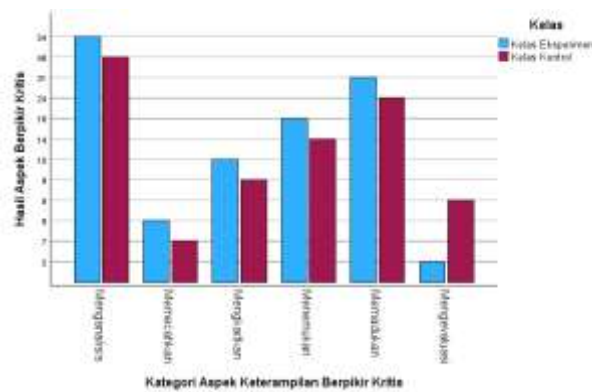
comparison category medium N-Gain value class experiment more big than class control namely 70% and 60% with category N-Gain value 69%.

**Table 1.2. N-Gain Value Category**

		N-Gain Value Category			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	16	27.6	27.6	27.6
	Currently	38	65.5	65.5	93.1
	Tall	4	6.9	6.9	100.0
	Total	58	100.0	100.0	

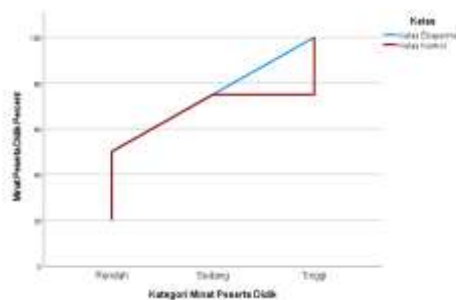
Source : Processed IBM SPSS Data

Aspect Skills think critical and interested as well as participant participant educate to science learning using approach Ethno -STEM can presented in figure 1.5; 1.6; and 1.7.



**Figure 1.5. Aspect Data Results Skills Think Critical**

Source : IBM SPSS Processed Data

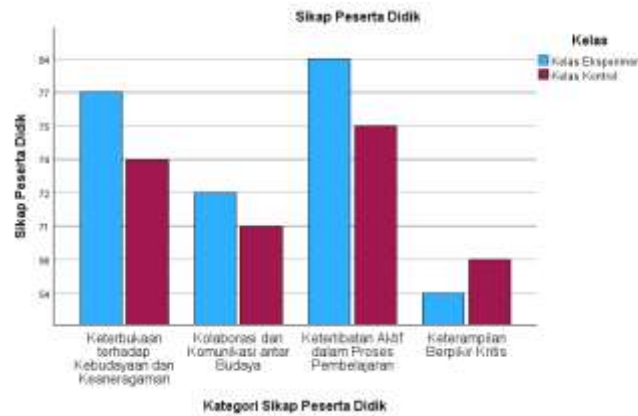


**Figure 1.6. Student Interest Data Results**

Source : IBM SPSS Processed Data

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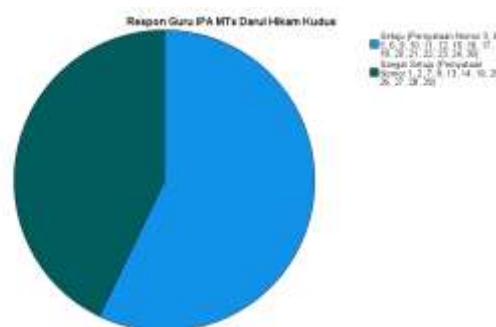
**Figure 1.7. Assessment Data Results Attitude Learners**

Source : IBM SPSS Processed Data

Data results from aspect think critical , class experiment more superior category aspects of cognitive level C4 than class control , except for the cognitive level category evaluate (C5) more A little than class control . Whereas interest data results participant educate to approach Ethno -STEM in science learning can concluded that 50% of participants educate class experiment low and 50% interest participant educate high , class control got 70% interest medium and category interest tall Still not enough . Furthermore attitude participant educate on learning Ethno -STEM, class experiment more Good than class control , except for skills think critical class control more superior than class experiment .

**a. Teacher and Student Response to Approach Ethno -STEM in Science Learning**

Teacher response to implementation approach Ethno -STEM in science learning can seen in figure 1.8.



**Figure 1.8. Results of Response Data from Science Teachers at MTs Darul Hikam Kudus**

Source : IBM SPSS Processed Data

Based on figure 1.8. teacher's response to implementation approach Ethno -STEM in science learning states positive on learning . Category teacher's response to approach Ethno -STEM in science learning is response Good . The teacher's response can be obtained results 51.6% category response good and very good 38.7%. Percentage category the teacher's response is measured through IBM SPSS

Response participant educate to approach Ethno -STEM in science learning can varies on different factor . Response results participant educate can presented in figure 1.9. and 1.10.

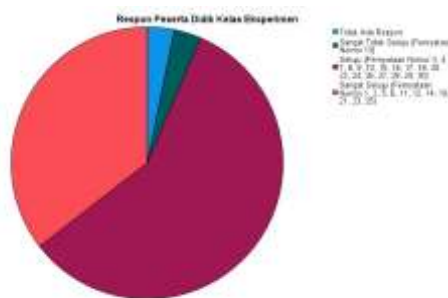


Figure 1.9. Response Data Results Class Students Experiment at MTs Darul Hikam Kudus

Source : IBM SPSS Processed Data

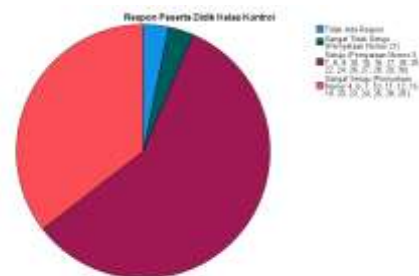


Figure 1.10. Response Data Results Class Students Control of MTs Darul Hikam Kudus

Source : IBM SPSS Processed Data

Response data results participant educate show that response to approach Ethno -STEM in science learning has an influence positive . Percentage category response participant educate class experiments and classes control was 35.5% very good response , 58.1% response good , 3.2% of responses are very bad Good .

Characteristics are characteristics that describe something, including properties, aspects or elements of a concept. Characteristics help in identifying and understanding something in depth. In the context of 21st century education, preparing students to use media and technology for communication, research, innovation, creativity and problem solving is very important (Siregar & Nara, 2015) . Effective media and technology enable teachers to organize learning activities better (Nurmala et al., 2021) . The use of STEM in learning can be train students in solving everyday problems (Fawaida et al., 2021) . The Ethno-STEM approach integrates ethnoscience principles with STEM science concepts, which have characteristics, namely:

1. Involves the context of local wisdom

The Ethno-STEM approach in science learning, which involves local wisdom in making cassava samier crackers, focuses on understanding taste, shape and traditional tools, resulting in 20% understanding in the experimental and control classes. Problem-based learning

2. Problem-based learning

Problem-based learning in research shows the STEM aspect in science learning which focuses on problem solving which gets 13% results from the experimental class and control class.

3. Student involvement

Student involvement in science learning using the Ethno-STEM approach, which refers to ethnoscience and STEM, involves active participation and collaboration in solving problems, resulting in 13% understanding in the experimental class and control class.

4. Critical thinking

Critical thinking in research focuses on critical thinking on science learning using an Ethno-STEM approach which can encourage critical and analytical thinking skills.

5. Collaboration

Collaboration and teams in Ethno-STEM learning in research focuses on STEM to support collaboration and teamwork which was obtained by 13% of the experimental and control classes.

6. use of technology

This research refers to STEM which will apply technology as a tool to support learning and help students understand science concepts with more effective methods with results obtained by 7% of the experimental class and control class.

7. Emphasis on scientific process

The emphasis on the scientific process in STEM learning includes observation, measurement, experimentation, and data analysis to help students understand science concepts, resulting in 13% understanding in the experimental and control classes.

The implementation of the Ethno-STEM approach in science learning has been carried out through various media, such as modules, evaluation instruments, and Student Worksheets (LKPD) (Prabawati et al., 2023) . This approach aims to make students more innovative, creative and have the analytical thinking skills needed in the 21st century (Sudarmin et al., 2020) . Through the pre-test and post-test , the increase in students' critical thinking skills and interest in learning is measured. The results show that the experimental class that used the Ethno-STEM approach experienced significant improvement compared to the control class. Even though the control class did not show a significant increase in scores, the results of the hypothesis test showed that there were significant differences in critical thinking skills and interest in learning between the experimental class and the control class (Asna et al., 2024) . This is caused by several factors during the learning process, such as students not paying attention to the teacher when explaining the learning steps, some students playing alone and not obeying the rules and even sleeping during learning, deviations in students' answers to questions from the teacher. Therefore, students do not understand the learning material taught by the teacher.

The experimental class showed better critical thinking results than the control class in the cognitive level aspect category C4 except for the evaluation

aspect category C5 which was lower than the control class. This is caused by deviations in students' answers to questions given by the teacher. Meanwhile, the results of research on students' interest in the Ethno-STEM approach in science learning show that the experimental class has 50% low interest and 50% high interest, the control class has 70% low interest and only a few high interests. Apart from that, the attitude of the experimental class students was better than the control class. This is caused by some students playing alone when learning begins, students taking too many permissions to go to the bathroom, and not paying attention to the teacher who explains the material that has been presented.

The research results show that the Ethno-STEM approach is effective in improving students' critical thinking skills and interest, although there are several obstacles such as students' lack of attention. The use of local wisdom-based learning in the learning process has also been proven to increase critical thinking skills and the interest of MTs Darul Hikam Kudus students in science learning.

Teacher responses to the implementation of the Ethno-STEM approach in science learning are generally positive (Asmaningrum et al., 2022) . Research shows that teachers respond very well to several indicators, including understanding the concept of Ethno-STEM in science learning, how to integrate local wisdom, identifying local wisdom as a learning resource, designing learning that integrates Ethno-STEM, and using reflection to develop critical thinking skills ( Syaifulla & Diliarosta, 2021) .

By categorical , the teacher's response to approach Ethno -STEM in science learning is classified as response Good as much as 51.6%. As teacher's ability in the learning process influence response participant educate to approach Ethno -STEM. Skilled teacher abilities in manage class , method relevant learning , as well give motivation to participant educate will more capable respond in a way effective to approach learning including Ethno -STEM. Apart from that , the teacher's ability to use local potential as a learning resource can increase students' understanding because the knowledge construction process occurs (Fawaida & Abidin, 2023) .

Response participant educate to approach Ethno -STEM in science learning varies depends on the success of the teacher in implement it and relevance learning (Sartika et al., 2022) . The data shows that implementation approach Ethno -STEM in science learning has an impact positive for participants educate . Implementation of the Ethno-STEM approach in science learning can improve critical thinking skills and interest and positive influence of MTs Darul Hikam Kudus students with a good response of 58.1%. The successful implementation of the Ethno-STEM approach in science learning is a good implementation by the teacher's ability to design interesting and relevant learning experiences (Budhi & Fawaida, 2021) . In addition, understanding the needs and characteristics of students is a teacher's tactic for optimizing the positive impact of the Etno-STEM approach (Widyaningrum, 2018) . The Ethno-STEM approach can be an effective method for creating meaningful and in-depth learning experiences in Natural Science (Science) subjects.

## **Conclusion**

discussion analysis , it can be concluded:

1. Ethno-STEM approach in science learning: Integrating ethnosience with STEM through seven characteristics, including local wisdom and technology, that improve science understanding and social skills.
2. Effectiveness of implementation: The Ethno-STEM approach is effective in improving students' critical thinking skills and interest, with the experimental class showing better results than the control class.
3. Positive impact: The Ethno-STEM approach received a positive response from teachers (51.6%) and students (58.1%), increasing critical thinking skills, interest and meaningful learning experiences in science.

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