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Ethnoscience-Based Mind Mapping Video Using Indigenous Knowledge to Practice Student's Science Literacy Ability

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ABSTRACT

Research aims to determine differences in scientific literacy skills and student responses after applying ethnoscience-based mind-mapping videos using indigenous knowledge. Type of research is pre-experimental with one group pretest-posttest design. The sample used was 22 students taken by purposive sampling technique. The data analysis technique used paired sample t-tests and descriptive statistics. Based on the study's results, it was found that (1) there were differences in students' scientific literacy skills before and after the application of ethnoscience-based mind mapping videos using indigenous knowledge, and (2) the average student response with very good criteria. The results of the application of ethnoscience-based mind mapping videos using indigenous knowledge have an impact on (1) science learning innovations in junior high schools and universities in teaching science material in the context of culture and local wisdom and developing scientific literacy skills of students and prospective science teacher students; and (2) strengthening the profile of Pancasila students using the promotion of diversity through ethnoscience. This research implies that how students practice their science literacy skills on indigenous knowledge can use video mind mapping in addition to e-modules, pop-up books/the like and help preserve local wisdom for the next generation.

INTRODUCTION

Currently, the world is facing a transition from the Industrial Revolution era (R.I.) 4.0 to Society (5.0). The development of eras 4.0 to 5.0 focuses on Sustainable Development Goals/SDGs (Nastiti, 2020). The era of R.I. 4.0, Society 5.0, and the SDGs signify the importance of competence. There are four competencies required, including 1) Leadership; 2) Language Skills; 3) Literacy; and 4) Writing Skills (Schwab, 2017). Leadership prepares humans to control and regulate their thinking, called metacognition (Flavell et al., 2002; Lai, 2011). Language skills are needed to understand how other people work and communicate (Zanaton, 2017).

Literacy demands HOTs to assess and analyze accurate information (Griffin & Care, 2015; Jatmiko et al., 2018) and strong characters to adapt to the digital era, such as responsibility (Vosinakis, 2020). Writing Skills are used to express ideas for creative solutions to problems, called Creative Problem Solving (Barutcu, 2017). Universitas Trunojoyo Madura has a significant role in seeking the quality of the learning process and outcomes of the four competencies, including the scientific literacy of Madura students through effective and efficient learning. Today's essential issue in Indonesian education is promoting scientific literacy (OECD, 2015; Nugraheni et al., 2017).

The preliminary study by Qomaria et al., (2019) showed that thinking skills, including scientific literacy, were still low for both students and college students. Awareness of the importance of Madurese cultural values is also lacking. This resulted in the values of nationality and national character originating from the values of Madurese local wisdom fading. The lack of educational facilities and infrastructure, such as digital technology, also results in the low quality of education for the Madurese community. There is a gap between inputs, outputs, and demands for human resources for employment in Madura. It is necessary to improve education quality and learn in Madura as early as possible so that Madurese human resources are skilled and competent.

The advice is to develop innovative learning to integrate local content from the local area, such as Madura, learning models, and approaches into teaching materials. Integrating local content as media and learning resources into science learning characterizes the scientific approach. Integrating local content into science learning encourages students to learn independently and actively; the value of local wisdom and character can also be preserved (Bozpolat, 2016; Mumthas & Suneera, 2015; Parmin & Fibriana, 2020).

To support this potential, teaching materials such as mind mapping videos are needed, which can be studied with and without teacher guidance. Mind mapping combined with video scribe becomes a mind mapping video on science material to help students construct their understanding of the material, scientific literacy, and interest. This is in line with research by Fasasi (2017), Adelia (2021), Robertson (2015), and Archer-Bradshaw (2017), which states that the use of mind-mapping videos in learning can increase interest, concept understanding, and student learning outcomes, and learning becomes creative and innovative.

It is making mind mapping videos in science learning so that it is more contextual and needs to be linked to an ethnoscience approach. Ethnoscience is an approach that transforms scientific knowledge with indigenous knowledge related to all fields (Yasir et al., 2020; Adelia, 2021; Adhi et al., 2018). Ethnoscience in science materials can create an environment to make it easier to understand science learning materials by linking science materials and community culture (Damayanti et al., 2017), scientific communication (Yasir et al., 2021) and providing real examples to students (Sudarmin, 2014; Parmin & Fibriana, 2019).

Ethnoscience-based real examples using indigenous knowledge in mind mapping videos in this research are to be developed by providing tangible examples that exist in the surrounding community that is integrated or connected with scientific evidence on additive and addictive substances as a novelty in this study. Integrating learning materials with ethnoscience-based real examples can produce meaningful learning and construct students' scientific knowledge (Hadi & Ahied, 2017; Yasir & Wulandari, 2020).

Based on the background and problems described above, an ethnoscience-based mind-mapping video study was conducted using indigenous knowledge to practice students' science literacy ability. This study aims to determine differences in scientific literacy skills and student responses after applying ethnoscience-based mind-mapping videos using indigenous knowledge.

RESEARCH METHOD

General Background

This research includes experimental research with the type of Pre-Experimental. According to Emzir (2013), Pre-Experimental research follows the experiment's steps but does not include a control group. The approach used in this research is quantitative. The time of research was carried out in the even semester, March of the 2021/2022 academic year. The research was conducted at Regional Technical Implementation Unit (RTIU) Junior High School (JHS) An Nidhomiyah, Pamekasan Regency. The research design used one group pretest-posttest (O1 X O2). O1 is the pretest value of students' scientific literacy skills before applying ethnoscience-based video mind mapping using indigenous knowledge. At the same time, O2 is the posttest value of students' scientific literacy skills before being applied to ethnoscience-based mind-mapping videos using indigenous knowledge. X is the treatment given, namely video-based mind mapping. Ethnoscience uses indigenous knowledge in science learning. The independent variable in this research is video mind mapping based on ethnoscience using indigenous knowledge, while the dependent variable is students' scientific literacy ability.

Sample / Participants / Group

The population in this study were all students of grade VII RTIU JHS An Nidhomiyah Pamekasan for the academic year 2021/2022. From the population, the research sample was selected using non-probability sampling because it did not provide equal opportunities for each member of the population to be the sample. The sampling technique is purposive based on specific considerations, goals, and rules (Sukmadinata, 2015). The purpose of using purposive sampling is to determine the differences in scientific literacy skills and student responses after applying ethnoscience-based mind-mapping videos using indigenous knowledge. The sample used in this study was class VII-B RTIU JHS An Nidhomiyah Pamekasan with a total of 22 people, as well as an experimental class by giving ethnoscience-based video mind mapping treatment using indigenous knowledge.

Instrument and Procedures

The data collection instruments used in this study were student scientific literacy test sheets and student response questionnaires. The scientific literacy test consists of 6 essay questions. The scientific literacy aspect is competence with indicators of identifying scientific issues, explaining scientific phenomena, and using scientific evidence. The student, scientific literacy test was adopted from Yasir & Wulandari (2020) and has been validated by four validators from the Science Education Lecturer at Trunojoyo Madura University, National Central University, Surabaya State University, and science teachers at State JHS 2 Sreseh using Aiken's obtained a score of 0.79 (very valid) and has been tested for reliability using Borich from 4 validators obtained 93% (very reliable).

Questionnaire of student responses to the application of ethnoscience-based mind mapping videos using indigenous knowledge in science learning using a Likert scale with answer choices of Strongly Agree (SA), Agree (A), Kinda Disagree (KD), and Disagree (D). Indicators of student response questionnaires include student interest in the application of ethnoscience-based mind mapping videos using indigenous knowledge in science learning, the effectiveness of ethnoscience-based mind mapping videos using indigenous knowledge in science learning in training science literacy skills, and activeness in science learning. The research procedure performed is illustrated in the **Figure 1.**

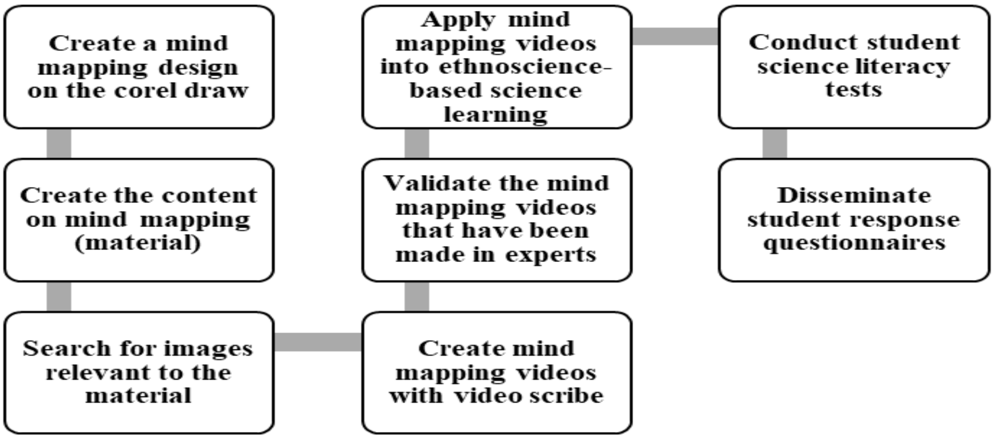

Figure 1. Research procedures.

Data Analysis

The data obtained in this study are (1) differences in students' scientific literacy skills after the application of ethnoscience-based mind mapping videos using indigenous knowledge in science learning, (2) students' scientific literacy abilities from test results, and (2) student responses to the application of mind mapping videos. Based on ethnoscience using indigenous knowledge in science learning from questionnaires. The formula calculates the student's scientific literacy ability score:

$$NP = \frac{R}{SM} \times 100\%$$

(Pahrudin et al., 2019)

Information:

NP : search analysis
R : score obtained by students
SM : the maximum score of the test in question
100 : fixed number

The scientific literacy score obtained was then classified according to the criteria, including 80 NP 100 (very high), 60 NP < 80 (high), 40 NP < 60 (medium), 20 NP < 40 (low), and 0 NP < 20 (very low) (Modification from Sinaga et al., 2017). Based on these calculations, the category of scientific literacy level can be seen in **Table 1.**

Table 1. The category of scientific literacy level.

Score	The category of scientific literacy level	Description
0-7	Under level 1	Students show little evidence to provide explanations, evaluate and design scientific questions and interpret data. Students can identify patterns directly in data sources in some familiar contexts and can describe superficial causal relationships. Students can identify independent variables in scientific investigations. Students can transform and describe simple data and apply it in familiar situations.

Score	The category of scientific literacy level	Description
8-14	Level 1	Students can use simple sources in several contexts and explain superficial causal relationships. Students can partially change and describe simple data and apply it directly in familiar situations. Students can comment on the merits of competing explanations, interpretations of data, and proposed experimental designs in a variety of contexts, personal, global, and local, with which they are very familiar.
15-39	Level 2	Students can make several conclusions based on different sources in new contexts and can relate to superficial causal relationships. Students can distinguish between scientific and straightforward questions, distinguish between scientific and non-scientific questions, and distinguish between dependent and independent variables in experimental designs that have been designed. Students can modify and describe errors and make valid comments based on the beliefs of scientific hypotheses. Students can develop partial arguments for questions and comments in competing explanations, interpretations of data, and proposed experimental designs in various contexts, whether personal, global, or familiar.
40-60	Level 3	Students demonstrate evidence of related scientific thinking and reasoning in typically applied situations in very familiar situations. Students can also develop partial arguments for critical questions and explanations, models, interpretation of data, and proposed experimental designs in various contexts, whether personal, global, or local.
61-71	Level 4	Students demonstrate evidence of related scientific reasoning and reasoning in unfamiliar situations. Students can also develop simple arguments for critical questions and explanations, models, interpretation of data, and proposed experimental designs in various contexts, whether personal, global, or local.
72-85	Level 5	Students demonstrate evidence of advanced scientific thinking and reasoning which requires abstract models and ideas to be applied in complex and unusual situations. Students can also develop arguments to critique and evaluate proposed explanations, models, data interpretations, and experimental designs in various contexts, whether personal, global, or local.
86-100	Level 6	Students consistently demonstrate advanced scientific thinking and reasoning, which requires abstract models and ideas to be applied in complex and unusual situations. Students can also develop and critique arguments and evaluate proposed explanations, models, data interpretations, and experimental designs in various contexts, whether personal, global, or local.

(Pahrudin et al., 2019)

Data of students' responses calculated using the formula:

$$P = \frac{F}{N} \times 100\%$$

(Yulandina et al., 2018)

Information:
P: percentage
F: the number of respondent scores
N: max score

The percentage of student response questionnaires obtained was then classified according to the criteria, including 85 P (very good), 70 P < 85 (good), 50 P < 70 (poor), and P < 50 (very poor) (Yulandina et al., 2018).

RESULTS AND DISCUSSION

Data on Differences in Students' Scientific Literacy Ability After Application of Ethnoscience-Based Mind Mapping Videos Using Indigenous Knowledge

Mind mapping containing additives and addictive materials is made using a video scribe to become a mind mapping video. Additives and addictive substances are obtained from indigenous knowledge in Madura in food, beverages, and plants. The mind mapping video display that has been made is shown in **Figure 1.**

Figure 1. Ethnoscience-based mind mapping video using indigenous knowledge.

Students' scientific literacy skills after applying ethnoscience-based mind mapping videos using indigenous knowledge were analyzed using descriptive analysis. The results of the descriptive analysis can be seen in **Table 2.**

Table 2. Descriptive analysis of pretest and posttest of scientific literacy ability.

Calculation of Descriptive Statistics	Pretest	Posttest
N	22	22
Mean	51,00	77,95
Std. Deviation	14,478	8,505
Variance	209,619	72,331
Minimum	29	62
Maximum	87	95

Hypothesis testing was carried out using the SPSS version 16 program with the Paired Sample Test method. Paired Sample Test is used to see the difference between two paired samples and data that are usually distributed. The results of hypothesis testing can be seen in **Table 3**.

Table 3. Results of paired sample t-test of scientific literacy ability.

Paired Sample Test				
Paired Differences				
Mean	Std. Deviation	T	df	Sig. (2-tailed)
-29,955	10,643	-11,878	21	0,000

Table 3 shows a significance value of 0.000 <0.05, which means that H0 is rejected. Hypothesis testing is also based on the criteria -the table that then H0 is rejected. The test is carried out in two ways: $\left\{\left(\frac{x}{2}\right) = \left(\frac{0,05}{2}\right) = 0,025\right\}$ so that the criteria obtained are 0.025. The results of the t-test calculation in Table 3. are obtained -11,878 $\leq$ 2,079$\leq$ 11,878. Based on the table and count results, it shows that the results follow the criteria for testing the hypothesis, which states that H0 is rejected, so it can be said that scientific literacy skills experience differences after applying ethnoscience-based mind mapping videos using indigenous knowledge.

The difference in scientific literacy ability occurs because science learning that applies ethnoscience-based video mind mapping using indigenous knowledge relates additive and addictive science material to natural phenomena from Madura culture and local wisdom. This can make students appreciate nature by utilizing the knowledge and experience previously acquired in everyday life and current technological developments. Knowledge, understanding, and experience gained from everyday life help solve problems related to additive and addictive substances through the essence of scientific literacy (Yuliati, 2017; Sumarni et al., 2016). The environment influences students because there is interaction with the community, so students can easily remember and apply their knowledge (Mahat & Wesley, 2022).

The ethnoscience approach in mind mapping videos in science learning also links culture with science material, making it easier for students to understand learning (Damayanti et al., 2017; Yulandina et al., 2018). In this case, the teacher also plays an active role in growing students' scientific literacy skills by providing articles related to the surrounding culture so that students more easily understand the material. In line with the research of Jufrida et al. (2019), Nofiana & Julianto (2018) suggest that learning will be easy to understand if it is associated with everyday life. Everyday life has many lessons that can be associated with learning.

Indigenous knowledge as a context in the ethnoscience approach by taking food, drinks, and plants from local culture and Maduranese local wisdom also supports the differences in students' scientific literacy abilities for each indicator. The indicators of scientific literacy aspects of competence used are (1) explaining scientific phenomena, (2) evaluating and designing investigations, and (3) interpreting scientific data and evidence. Indigenous knowledge as a scientific phenomenon in Madura is tried to be explained scientifically by students (indicator 1). From the scientific phenomena presented later by students, they were solved by conducting investigations through experiments supported by scientific literature studies on proving indigenous knowledge into scientific knowledge (indicator 2). The research data are then interpreted, standardized, and conceptualized through cross-bordering ethnoscience transformation (indicator 3). These results are in line with Yasir & Wulandari (2020), Jufrida et al. (2019), and Hwang et al. (2018) that the use of culture and local wisdom as local content in science learning is very helpful in training scientific literacy.

Using indigenous knowledge as local culture and local wisdom in science learning becomes an experience and adds meaning to learning to strengthen scientific literacy skills for students. This is in line with Gestalt cognitivism learning theory which states that students will quickly understand the lesson by linking daily habits. Experience can introduce the relationship between elements and events (Dewi et al., 2017). When the experience has been formed, the meaning of the relationship between the elements and the learning material will be more effective, and learning will be easy to achieve a goal (Bailey, 2019). The behavior of each individual will be distinct from the surrounding environment, so learning should be linked to everyday situations and conditions so that students easily understand the material being studied. These situations and conditions can attract students to be more enthusiastic about participating in learning.

Student Response Data After Application of Ethnoscience-Based Mind Mapping Videos Using Indigenous Knowledge

This study measured student responses after applying ethnoscience-based mind-mapping videos using indigenous knowledge obtained from response questionnaires. The results of the student response analysis are presented in **Figure 2**.

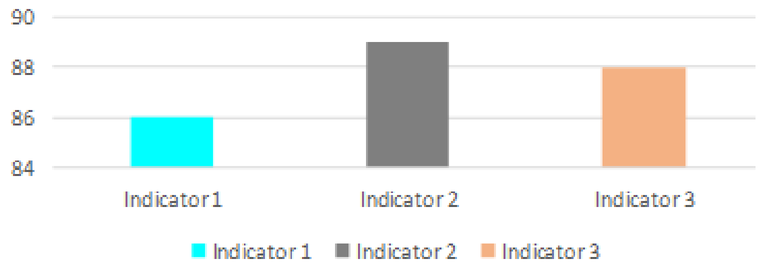

Figure 2. Student response results.

Information:

Indicator 1	: student interest in science learning
Indicator 2	: the effectiveness of the application of ethnoscience-based mind mapping videos using indigenous knowledge in science learning in training scientific literacy skills
Indicator 3	: student activity in science learning

Indicators of student interest in science learning obtained 86% with perfect criteria. This shows that students are interested in learning science that has been done. The application of ethnoscience-based mind mapping videos using indigenous knowledge makes students trained to associate local culture and local wisdom with science learning so that students are more enthusiastic in participating in the learning process. This is in line with the research of Damayanti et al. (2017) stated that students felt interested in ethnoscience-based learning.

The indicator of the effectiveness of applying ethnoscience-based mind mapping videos using indigenous knowledge is obtained by the percentage of 89% with suitable criteria. This means that ethnoscience-based mind-mapping videos using indigenous knowledge in science learning effectively train students' scientific literacy skills. Students are trained to solve the phenomena of food, drink, and plants from local culture and local wisdom that occur using scientific evidence. In line with the research of Ariningtyas et al. (2017) stated that ethnoscience-based learning was effectively used in improving students' scientific literacy skills.

The indicator of student activity in science learning is 88%, with good criteria. This means that students are enthusiastic and active in following the learning that has been done. Student activity is marked by the timeliness of students entering class, student attendance, student answers when there are questions from the teacher or the worksheet, and likes to ask questions related to the material being studied. This is in line with the research of Nisa' et al. (2015) and Sumarni et al. (2016), stating that ethnoscience-based learning makes students more active in participating in the learning process.

Based on these results indicate that there is a percentage of the highest and lowest indicators. The highest percentage of indicators indicates the effectiveness of applying ethnoscience-based mind mapping videos using indigenous knowledge, while the lowest indicator is student interest in science learning. The highest percentage of results are marked by detailed explanations of scientific phenomena which are detailed using STEAM; the scientific phenomena are also linear with issues of actual scientific knowledge that are identified based on the urgency and impact that arises, as well as proofs of indigenous knowledge into scientific knowledge using scientific evidence sources based on the latest literature review and systematic experiments. Integrating indigenous knowledge from local wisdom as a medium and source of learning into science learning characterizes the scientific approach. Integrating local content in science learning encourages students to learn independently and actively; the value of local wisdom and character can also be preserved (Damopolii et al., 2019; Wulandari et al., 2020). In addition, animated videos in mind mapping significantly add value to the quality of the process and learning outcomes of students in science learning (Shi et al., 2022; Laksmi et al., 2021).

The low indicator of student interest in science learning is because the ethnoscience approach used in science learning is new for students, so it needs adjustment and time to deepen and get used to it. This is in line with the statement by Dangol & Shrestha (2019) that students need to learn in advance to prepare themselves and the need for facilities and infrastructure that support learning and take notes on essential concepts of the material to be taught. That way, students have prior knowledge of the material being taught. Initial knowledge is essential in teaching and learning because it can help students discover new things and understand them. A student's prior knowledge determines new learning possibilities (Kearney & Garfield, 2019). In this way, it is making students aware that entering new information into short-term memory requires encouraging students to activate prior knowledge and focus on specific learning materials, which is called attention (Cleary & Kistansas, 2017).

From the research that has been done, there are suggestions for improving the subsequent science learning in the application of ethnoscience-based mind mapping videos using indigenous knowledge. First, it should be more effective in training scientific literacy skills. It needs to be linked to other science learning models, such as guided inquiry to emphasize the process of proving indigenous knowledge into scientific knowledge, guided discovery to find more ways to integrate local culture and local wisdom in ethnoscience in science learning, local wisdom integrated science to show more standardization, conceptualization, and scientific transformation through enculturation, acculturation, and assimilation. Second, it is hoped that future researchers will manage the effectiveness and efficiency of time in training students' scientific literacy by making clear and measurable designs and timelines. Third, ethnoscience-based mind-mapping videos using indigenous knowledge can be developed more broadly in other science materials. This is in line with previous research that lacks self-awareness (awareness) of the importance of current cultural values even though thinking abilities and skills have developed well because the research conducted has not yet characterized citizen science as a contributor to research data (Yasir et al., 2020) and need to sharpen illustrations and 3D animation using Augmented Reality (AR) and video (Yasir & Wulandari, 2020). This should be followed up by promoting more diversity through tourist tours, museum visits, sites, or content containing local social and cultural (indigenous knowledge) (Tim, 2021; Suyitno, 2020).

CONCLUSION

Based on the research that has been done, it can be concluded that: (1) there are differences in students' scientific literacy skills before and after the application of ethnoscience-based mind mapping videos using indigenous knowledge, and (2) the average student response is very good criteria. The results of the application of ethnoscience-based mind mapping videos using indigenous knowledge have an impact on (1) science learning innovations in junior high schools and universities in teaching science material in the context of culture and local wisdom and developing scientific literacy skills of students and prospective science teacher students; and (2) strengthening the profile of Pancasila students using the promotion of diversity through ethnoscience. The limitation of this study is the lack of diverse indigenous knowledge of additives and addictive substances that are not only obtained from food, beverages, and plants but can be explored from various things. Suggestions that can be given for further research are the need to explore various kinds of indigenous knowledge in Madura related to science teaching materials to add to the characteristics of ethnoscience integration into science learning.

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