An analysis of critical thinking skill and interpersonal intelligence in the development of ethnoscience-based teaching material salt production

S Sarwi¹, G Nisa², and B Subali¹

¹Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, Indonesia
²Graduate School, Universitas Negeri Semarang, Indonesia

Corresponding author: sarwi_dosen@mail.unnes.ac.id

Abstract. The environment can act as a source of learning for elementary school students. Environmental-based science learning is really important in building the basic concepts of science. Teaching material development for learning resources is rarely carried out by teachers. The objective of this research was to analyze the use of salt ethnoscience-based teaching material on students' critical thinking skills and interpersonal intelligence. The research method used was a mixed method with a concurrent embedded research design. This research was conducted in two public elementary schools in Demak Regency, Central Java, Indonesia. The sample in this research amounted to 96 sixth-grade students. Data collection techniques used were tests and questionnaires. The research results showed that the use of salt ethnoscience-based teaching material had an effect on critical thinking skills with an N gain of 0.64 at moderate interpretation. The critical thinking skill showed a positive correlation with students' interpersonal intelligence with r = 0.657 (moderate). It can be concluded that the implementation of ethnoscience-based teaching material is effective for improving critical thinking skills and interpersonal intelligence.

1. Introduction

Learning to be the spearhead in educational practice is expected to prioritize the implementation process. Learning science in elementary schools is not optimal because learning only focuses on theory and does not involve the environment as a learning resource. The implementation of the learning process has not involved science process skills in science learning in elementary schools [1]. Environment-based learning activities make students active in the learning process [2].

To improve the learning process, the government facilitates printed teaching materials in the form of student books and teacher books in the 2013 curriculum. The current learning process tends to follow what is written in student’s books, and teachers have not developed learning based on the surrounding environment. The teaching materials used are not yet based on ethnoscience. At the same time, ethnoscience-based learning improves students' attitudes towards science [3]. Optimizing the quality of the learning process and improving students' scientific attitudes towards science [4].

The teaching materials in grade IV contain the uniqueness of Indonesian regions, which are rich in culture. Meanwhile, the student books only contain regional peculiarities in general in Indonesia. In fact, each region has a different local culture that can be used as a learning resource. This does not provide opportunities for students to recognize and analyze their environment so that they are less in developing
critical thinking skills. Analyzing and evaluating activities can develop critical thinking skills [5]. Critical thinking skills are one of the 21st-century skills that students must master.

Critical thinking skills should be developed through science learning in elementary schools. One of the goals of learning science in elementary schools is to study natural phenomena and preserve nature. Social relationships with the surrounding environment with the ability to observe, understand and motivate [6]. The need for learning outside the classroom in order to practice critical thinking skills about natural occurrences around in everyday life.

The ability to think critically is also accompanied by multiple intelligences contained in each student [7]. This suggests that developing interpersonal intelligence and increasing children's ability to solve problems effectively and develop empathy. Students' multiple intelligence is not only found from the value achieved but seen from the student's ability to solve a problem [8]. Interpersonal intelligence in students must be developed through interaction with the environment.

Based on the results of observations and interviews with grade IV teachers in the Wedung, Demak Central Java, Indonesia. That the learning that is carried out only uses teaching materials for student books that have been provided by the government, learning activities are adjusted to the contents of the student's book. Learning does not involve the environment as a learning resource. So that students are less familiar with their environment. Students' understanding of the mastery of the material lacks due to inadequate teaching materials used. The teaching materials used are not yet based on ethnoscience, even though the local area has good potential. Wedung Demak is located on the seacoast of Java. This geographical condition has the potential to produce national salt and can be used as a source of science learning. Integrated teaching materials are needed with elements of local culture and contextual implementation to see regional characteristics [9].

Learning science provides a learning experience that requires meaning for life skills in solving problems in the environment. Problem-based learning encourages students to be active in the learning process [10]. As well as the design of science learning based on local wisdom can increase positive character [11].

2. Method
This study used a mixed-method with a concurrent embedded design. In this study, to naturally determine the implementation of the learning process activities of ethnoscience-based teaching materials. The population in this study were fourth-grade elementary school students in Wedung, Demak Regency Central Java Indonesia in the 2018/2019 academic year. The sampling method uses the purposive sampling technique. The subjects of this study were 53 students of Babalan Primary School in grade IV and 43 students of Kedungmutih Primary School.

Data collection techniques used in this study: 1) tests to determine students' critical thinking skills. 2) a questionnaire to determine students' interpersonal skills. The analysis used includes the n gain test and person correlation. Qualitative data were collected during and after the implementation process. The analysis technique used in qualitative data includes data reduction, data presentation, and conclusion drawing. Reduction of data on the selection process, simplification from written records in the field. Presentation of data by compiling a collection of information that may draw conclusions. Draw conclusions by considering the results of quantitative and qualitative analysis.

3. Results and Discussion
Teaching materials are developed based on the local wisdom of the Demak area with its coastal geographical conditions. Development of teaching materials based on the ethnoscience of salt production. The design of teaching materials is as follows:
Learning using ethnoscience-based teaching materials is carried out to see critical thinking skills and interpersonal intelligence. Data processing in this study was supported by **Software Statistical Product and Service Solution (SPSS)** 16. The data processed were the results of tests of critical thinking skills. The results of the study obtained students' critical thinking skills from a reasoned multiple-choice test given to grade IV students after learning using ethnoscience-based teaching materials.

Table 1. N-Gain result of the average pretest and posttest scores for two elementary schools in Demak

|            | Babalan (N=53) | Kedungmutih (N=43) |
|------------|----------------|---------------------|
| Pretest    | 61.32          | 57.90               |
| Posttest   | 86.03          | 84.53               |
| N-gain     | 0.64           | 0.62                |

Based on table 1, it is known that the average pretest score of Babalan elementary school students is 61.32, while the average pretest score of Kedungmutih elementary school students is 57.90. Furthermore, based on the average posttest score of Babalan students was 86.03, while the posttest average score of Kedungmutih students had an average posttest score of 84.53. N-gain 0.64 (scale 0-1) with medium interpretation for Babalan and Kedungmutih. This shows that students' critical thinking skills generally improve after learning using ethnoscience-based teaching materials. The results of the N-gain factor analysis concluded that the increase in the score between the pretest and posttest was critical thinking skills.

The learning process that involves the environment as a learning resource can trigger students' critical thinking skills. The ability to think critically is influenced by a good learning environment [12]. Ethnoscience-based teaching materials are one of the learning resources based on local wisdom that can provide opportunities for students to analyze. Ethnoscience-based teaching materials facilitate meaningful learning experiences through "Let's Read," "Come Observe," "Let's Try," "Come on Reflect," which builds learners to build their own understanding with various pictures and questions containing High Order Thinking Skills (HOTS). Learning outcomes from the aspects of analysis, synthesis and evaluation are related to one's critical thinking skills in constructing conceptual understanding in the
learning process [13], [14], [15]. Agree that learning that uses problems in the student’s environment has a positive effect on critical thinking skills [16], [17], [18].

The ability to think critically arises because of interpersonal intelligence. Interpersonal intelligence is the ability to interact with other people and be able to understand a situation [19]. Interpersonal intelligence data collection uses a questionnaire with indicators of social sensitivity (2.4), social insight (2.7), and social skills (2.3) on a scale of 1-3.

![Interpersonal Intelligence Questionnaire Results](image)

**Figure 2.** Interpersonal Intelligence Questionnaire Results

Based on Figure 2, it can be seen that there are no students who have low interpersonal intelligence, 37 students have high interpersonal intelligence and 59 students have high interpersonal intelligence. The level of interpersonal intelligence is determined by the environment [20]. Students with good interpersonal intelligence can solve problems in groups [21].

**Table 2.** Pearson Correlation Test Results of Critical Thinking Ability with Interpersonal Intelligence

|          | Critical thinking | Interpersonal |
|----------|-------------------|---------------|
| Critical thinking | Pearson Correlation | 1 | .657** |
| Sig. (2-tailed) | | | .000 |
| N | 96 | 96 |
| Interpersonal | Pearson Correlation | .657** | 1 |
| Sig. (2-tailed) | | | .000 |
| N | 96 | 96 |

**Correlation is significant at the 0.01 level (2-tailed).**

In this study, the person correlation test was conducted to analyse the relationship between critical thinking skills and interpersonal intelligence. Based on the person correlation test, it was obtained sig (2-tailed) of 0.00 < 0.05 with Pearson’s correlation of 0.657 in the moderate category. So that the ability to think critically is positively related to interpersonal intelligence with moderate correlation. Interacting and learning skills can affect students’ interpersonal intelligence [22],[23]. Evaluating the level of
emotional intelligence is important for building efficient communication skills, and the interpersonal relationship formed between teachers and students was the strongest predictor for teachers’ joy (positive relation) and anxiety (negative relation) [24],[25]. Therefore, there is a need for cooperation between parents, teachers and the community in honing students' interpersonal intelligence.

4. Conclusion
The conclusion in this study is that there is an increase in critical thinking skills obtained from the pretest and posttest measurements. The N-gain test is used to measure critical thinking skills in the learning process using salt ethnoscience-based teaching materials. The results of the calculation showed that the average pretest score of Babalan students was 61.32, while the average pretest score for students of Kedungmutih was 57.90. Furthermore, based on the average posttest score of Babalan students was 86.03, while the post-test average score of Kedungmutih students had an average posttest score of 84.53 with the N-gain = 0.64 of Babalan and N-gain = 0.62 Kedungmutih included in the moderate category. It was found that a positive correlation between critical thinking skills and students' interpersonal intelligence = 0.657 (moderate). The results of this study concluded that the application of ethnoscience-based teaching materials in science learning was to develop critical thinking skills and interpersonal intelligence.

References

[1] Nwagbo C and Chukelu U C 2011 J. Sci. Assoc. Niger. 1 58
[2] Sedana I N A, Renda N T and Widiana I W 2016 e-J. Program Pascasarj. Univ Pendidik. Ganesha 1 4.
[3] Fasasi R A 2017 Int. J. Sci. Educ.: Conf Ser 0950 1464
[4] Melyasari N S, Sutoyo S and Widodo 2018 Conf. Seminar Nasional Kimia-National Seminar on Chemistry (SNK)(Atlantis Press)
[5] Lastriningsih L 2017 J. Prima Edukasi 1 68
[6] Nasution R K and Siregar N I 2017 Analitika 1 18
[7] Sutarman, Sunendar D and Mulyati Y 2019 Int. J. Instr. 4 12
[8] Wijayanti F and Widiyatmoko A 2015 Unnes Sci. Educ. J. 4 1
[9] Najib K 2018 J. Penelit. Pembelajaran Fis. 2 99
[10] Yew E H and Goh K 2016 Health Prof. Educ. 2 2
[11] Sarwi S, Alim, Fathonah S and Subali B 2020 J. Phys.: Conf. Ser. 1567 022045
[12] Dawit T, Verburgh AT and Elen J 2014 Can. Cent. Sci. Educ. 4 1
[13] Živković L 2016 Procedia – Soc. Behav. Sci. 232 102
[14] Yaniawati R P 2013 J. Educ. Learn. 7 109
[15] Kashefi H, Ismail Z and Yusof Y M 2012 Procedia - Soc. Behav. Sci. 56 117
[16] Asyari M, Al-Muhdhar M H I, Susilo H and Ibrohim 2016 Int. J. Lesson Learn. Stud. 5 36
[17] Ismail N S, Harun J, Zakaria M A Z M and Salleh M 2018 Elsevier 28 177
[18] Sarwi S, Rusliowati A and Khanafiyah S 2012 J. Pendidik. Fis. Indones. 8 41
[19] Baş G 2016 Educ. Sci. Theory Pract. 16 6
[20] Thomas R H 2010 Celebrating Every Learner Activities and Strategies for Creating A Multiple Intelligence Classroom (San Fransisco : Josey-Bass)
[21] Maryati I and Priatna N 2017 Musharafa 6 33
[22] Wahyuni A, Sulaiman and Muahmud H R 2016 J. Pesona Dasar 3 33
[23] Miguel I, Valentim J P and Carugati F 2013 Eur. J. Psychol. Educ. 28 1163
[24] Petrovici A and Dobrescu T 2014 World Conf. Educ. Sci. WCES : Conf. Ser. 116 1405
[25] Hagenauer G, Hascher T and Volet S E 2015 Eur. J. Psychol. Educ. 30 385