



Effects of Teaching Materials on Learning Salt Factory Topics Based on Ethnoscience to Improve Mastery of Students Concepts and Life Skills

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Abstract: Understanding concepts and life skills is important for students to develop. This study aims to analyze effects of teaching materials on learning salt factory topics based on ethnoscience to improve mastery of concepts and life skills. This research is a quasi-experimental study using a non-equivalent design. Data collection techniques in this study used tests to measure concepts and questionnaires to measure life skills. The research instruments were multiple choice tests and a Likert scale questionnaire. The instrument meets the validity and reliability. The sample in this study was 77 elementary school students. Data analysis technique used paired t-tests, and one-way ANOVA. The application of ethnoscience-based thematic learning tools in experimental 1 and experiment 2 showed higher concept understanding posttest results compared to control groups with conventional learning. This was proved by the sig value. < 0.05 and the average posttest score in experiment class 1 was 80.32 and experiment 2 was 83.37 higher than the control class of 75.25. Learning physics salt factory materials sourced from local wisdom can increase mastery of concepts and increase understanding of life skills. This teaching is effective enough in improving the mastery of concepts and developing students' life skills.

Keywords: Ethnoscience; Life skill; Mastery Concept; Student

Introduction

In the 21st century, education is important to ensure students have learning skills, innovation, skills in using information technology and media, and can work and survive using life skills (Cao, 2018). System success education in a country can be seen from the ability of its graduates to use the results of education for life. A good education system must be capable of providing provisions for graduates to give life skills to students (Cronin et al., 2020). Education plays an important role in providing capital to students with various life skills, not solely focusing on the learning process on knowledge only

(Mohammadzadeh et al., 2020). This is very much needed because life skills education is an alternative as an effort to prepare students to have attitudes and life skills as provisions for later life through an activity active, creative and fun learning (Thang et al., 2019). As in research (Hasan et al., 2021) there is still no in-depth understanding of life skills education. The skills that need to be trained for students according to Thornhill-Miller et al (2023) consist of responsibility, discipline, mastering & finding information orally communicated, cooperative manners, problem solving, adaptable/flexible, and tolerance average.

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The 2013 curriculum is strengthening life skills-based learning experiences (Hidayat et al., 2018). This is based on the fact that every student is expected to have a number of competencies that have been determined through competency standards. However, in reality, all of that still needs escort in its implementation in schools. The 2013 curriculum aims to encourage students to make observations, ask questions, reason, and present what they have obtained or. The objects that become the 2013 curriculum learning emphasize natural, social, artistic, and cultural phenomena (Sudarmin et al., 2023). For educators, they are demanded to be more creative and innovative, when needed it is still far from the expectations of the application of the 2013 Curriculum as well as the interest of educators to make teaching materials independently. One instant thought from educators using textbooks published by private publishers without checking that is fully supported by inappropriate textbooks in some elementary schools such as the phenomena presented in teaching materials do not connect with culture in everyday life. Then the components of the learning process and learning resources still need improvement in content and illustrations (Winarto et al., 2022). Schools play an important role in introducing local culture to children. Learning must be relevant to students (Blau et al., 2020). One of them is applying ethnoscience learning.

Monotonous teaching can make students can't develop a concept (Zainuddin & Perera, 2019). Conceptual understanding is important factor in the activity learning (Cicekci et al., 2019). Understanding the concept has a relationship closely related to students' interest in learning (Höft & Bernholt, 2019) and problem solving (Herrmann Abell & DeBoer, 2018). Student at school requires an understanding of the concept right in every lesson. (Emden et al., 2018) states that understanding concept is the basic goal science learning. When students already understand the concept then will easily solve the problem and accepted concept passing through the student's mental space then translated into an understanding which will give rise to an idea (Höft et al., 2018). Low understanding of the concept cause students give different answers to the same question (Patall et al., 2018). Ethnoscience learning can improve concept understanding.

Physics subjects for the application of life skill learning because science is studying the universe and the phenomena that occur in it so that it is oriented towards academic competence and applies what is has been learned in life (Drake et al., 2018). Ethnoscience learning approach learning aims to connect science in the classroom and everyday life and prevent the erosion of cultural values local area of Indonesia as a result of the swift currents globalization has had an impact friction between cultural values and local wisdom

(Puspasari, 2019). Learning ethnoscience is important and can be a bridge in towards good science learning as study of learning in schools (Parmin et al., 2019). The low achievement motivation and student learning outcomes can be overcome with the integration of ethnoscience (Khoiriyah et al., 2021) (Putri & Usmedli, 2020). Students are more active, creative, critical, and analytical. In addition, students who take part in ethnoscience learning will be more many have meaningful understanding and experience al this is due to learning from the culture that develops in society (Iriani & Kurniasih, 2019). Students will be more interested in new experiences by learning how to deal with life (Apriyani et al., 2019). Skills are obtained by increasing knowledge and skills on an ongoing basis, while motivation must be built on self-awareness to perform best in every performance (Sarwi et al., 2018). Based on these studies learning will be more successful and interesting if educators can provide life skills education for students who will certainly benefit in their future lives.

The results of previous research concluded that the ethnoscience approach trains students to think creatively (Khoiri et al., 2018), is more active and respects the potential of their own region (Khoiri & Haryanto, 2018), increases students' positive attitudes towards science and ability to solve problems (Sumarni et al., 2019), increase student learning activities, (Rahmawati et al., 2019), critical thinking skills (Falah et al., 2018), entrepreneurial character (Sudarmin et al., 2019), scientific literacy (Handayani et al., 2018), and scientific literacy (Alim & Subali, 2019), as well as scientific communication (Winarto et al., 2022). This study has the novelty of analyzing the impact of learning physics on energy themes based on ethnoscience to improve mastery of concepts and life skills. This study aims to analyze the impact of learning physics based on ethnoscience to improve understanding of concepts and life skills.

Method

The method used in this study is a quasi-experiment with the design model of the group pretest-posttest design, an experiment carried out in one group without comparison groups by giving pretest and posttest. Quasi-experimental placement of research subjects into the experimental and control groups was carried out non-randomly (Creswell & Creswell, 2018). This experiment did not place the subject either in the experimental group or the control group at random. The design used is shown in Tabel 1.

Tabel 1 Research design

Initial Ability	Treatment	Final Ability
Q1	X	Q2
Q1	= initial ability of the research subjects	
X	= treatment used thematic-integrated teaching materials	
Q2	= final ability of the research subjects	

The research sample was determined by purposive sampling by considering the characteristics of all regencies. Purposive sampling is a sampling technique with certain considerations in (Creswell & Creswell, 2018). The subjects in this research were 22 grade IV from Primary School A, 27 grade IV Primary School B, and 28 grade IV Primary School C. The sampling technique used purposive random sampling, so that there were 77 students determined as research subjects. The technique of collecting data used questionnaires life skills and tests mastery concept. The analyzed the data using complete standards score test, paired t-test, and one ways ANOVA

Result and Discussion

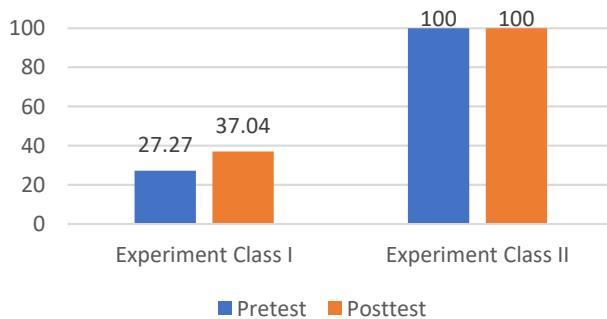
The data in this study consisted of independent variables namely development thematic material based on ethnoscience and the dependent variable, namely mastery of concept and life skill.

How do increase mastery of concept student before and after learning?

Improved understanding of student concepts after the implementation of ethnoscience-based teaching materials is measured through tests, paired t-tests, and one ways ANOVA.

1. Mastery Concept of Student

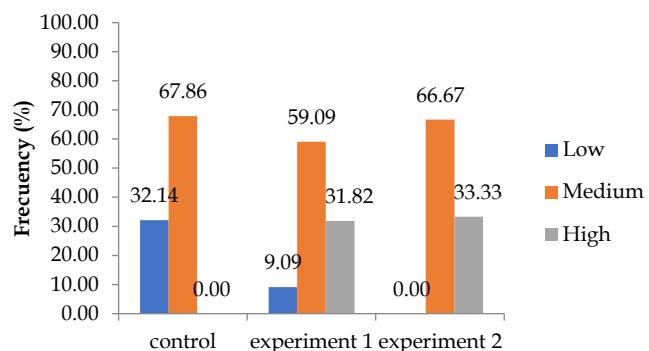
The results of the student's learning completion test are presented in Figure 1.

**Figure 1.** Mastery Concept Score

Based on Figure 1 it can be known that the highest completion increase was found in experiment class 1 and experiment 2 with an increase percentage of more than 67%.

2. N-Gain Test

N-gain analysis is used to determine the improvement of understanding of student concepts so that it can be known the effectiveness of the application of ethnoscience-based thematic learning tools to the understanding of student concepts. Shorten test results with N-Gain are presented in Figure 2.

**Figure 2.** N-Gain Category for each Class

Based on Figure 2, it can be seen that the average student in the control class has n-gain values in the low and medium categories, while in the experimental class 1 and experimental class 2. Students are in the medium and high categories. The average n-gain in students' understanding of the concept of experimental class 1 and experimental class 2 is in the medium category with a value of 0.58.

The application of ethnoscience-based thematic teaching materials in experimental grade 1 and experiment 2 suggests it can effectively improve understanding of student concepts. This can be seen from the average understanding of the concept of students who experienced a significant increase, the increase was in the moderate category, and the average results of posttest study of experimental class 1 were 80.32 higher than the pretest of 52.55 as well as the average posttest study results of experiment grade 2 were 59.37 higher than the pretest of 83.37.

3. Compare of test scores (one ways ANOVA)

ANOVA's one-way compare test is used to determine the average comparison of posttest understanding of student concepts between control groups, experiment 1, and experiment 2. The results of one ways ANOVA test showed a calculated F value of 8.507 and significance of $0.000 < 0.05$, so it can be concluded that there is a significant difference in posttest average between the compared groups. Because there are significant average differences, LSD testing is continued to determine the group with the highest average posttest concept understanding. LSD test results are presented in Table 1.

Table 1. Result of LSD Test

Groups	Sig. (2-tailed)	Result
Control vs Experiment 1	0.018	Significant
Control vs Experiment 2	0.000	Significant
Experiment 1 vs Experiment 2	0.154	Not Significant

Based on the results in Table 1, the application of ethnoscience-based thematic learning tools in experimental 1 and experiment 2 showed higher concept understanding posttest results compared to control groups with conventional learning. This was proved by the sig value. < 0.05 and the average posttest score in experiment class 1 was 80.32 and experiment 2 was 83.37 higher than the control class of 75.25.

How do increase life skill student after learning?

Students' life skills can be presented from nine indicators of formation, among others, responsibility, discipline, mastering and finding information, verbal communication, cooperation, manners, problem solving, adaptability/ flexibility, and tolerance (Thornhill-Miller et al., 2023). Analysis of students' life skills can be presented in Table 3.

Table 3. Average scores (%) of student life skill's

Indicator	Experiment 1	Experiment 2
Responsibility	95.45	98.15
Discipline	94.32	96.30
Mastering & finding information	93.18	98.15
Oral communicated	86.36	98.15
Cooperate	90.91	98.15
Manners	94.32	100.00
Problem solving	89.77	98.15
Adaptable/flexible	94.32	100.00
Tolerance	96.59	100.00
Average	92.80	98.56

The results showed the average life skill score of students in experiment grade 1 was 92.8% and experiment 2 was 98.56% higher than the control class of 85.81% (Table 3). It is also supported by the life skill score of each indicator in experiment class 1 and experiment 2 which is higher than the control class with an average score difference of 9.87%. It can be concluded that the application of thematic teaching materials based on ethnoscience is better in improving students' life skills compared to conventional learning.

Physics learning is sourced from salt factory by salt farmer Javanese coastal implementation using an inquiry approach. Students are given the need for energy problems with energy reserves. Students compile the formulation of the problem how to produce salt. In the exploration stage, students observe videos of the process of making salt sourced from sea water. Students

compile a hypothesis can produce salt. Students carry out an investigation to answer the hypothesis. Students conclude the results of the investigation.

The application of ethnoscience-based thematic teaching materials in group experimental 1 and group experiment 2 shows results can effectively improve students' mastery of concepts and life skills. This can be seen from the completion of student learning outcomes reached 100%, student concept mastery learning outcomes experienced a significant improvement, and the average mastery of the posttest concept of experimental class 1 was 80.32 and the experimental class 2 was 83 higher than the control of 75.55. Similarly, the life skills of students of group experiment 1 and experiment 2 are higher than the control class on each indicator. The results are in line with the results of this study are in line with research (Hasnunidah et al., 2020 ; Chen & Kurniawan, 2022) which concluded that entoscience integrated physics learning has an impact on conceptual mastery. Traditionally an area is very effective for help students understand the concept of food, for example, is related to additives food (Dewi & Mashami, 2019).

Inquiry activities that examine the ethnoscience of the surrounding community provide for students to design activities independently and make room for improvement understanding of chemical concepts (Diawati et al., 2018). Through investigative activities, students are more active in doing more in-depth task exploration so that the concepts obtained are maximized (Sudarmin et al., 2019). Another impact of ethnoscience learning according research Suardana et al, 2018), with the application of ethnoscience-based science modules can improve students' critical thinking learning outcomes with moderate improvement category. Ethnoscience-based teaching materials can effectively improve the results of learning concept mastery with moderate improvement categories (Ahmadi et al., 2019). Sumarni (2018) a significant improvement in learning outcomes after the implementation of integrated science modules based on ethnoscience, this is because the tasks and materials in the module related to ethnoscience make students actively seek information and translate the original science of society on the theme of energy in life into the form of science. The average activity of students during learning is in the good category of $> 70\%$ of students are active during learning. The response of students and teachers is positive to the development textbooks (Atmojo & Kurniawati, 2018).

The use of integrated thematic teaching materials Always Save Energy based on ethnoscience Java regency can effectively improve the mastery of the concept because it is added with the deepening of the material and evaluation questions at the end of each learning. In addition, it is added with ethnoscience-based materials

adapted to the local wisdom of culture in Java Regency, thus adding mastery of student concepts to the material being studied. By the time the student reads "Deepening the Material" he will get a lot of new information that can increase the knowledge of the student. Then by conducting experiments in each learning and interaction with the surrounding environment, for example in the outside yard of the school even in the salt factory near the school makes students experience the development of life skills (life skills). Aspects used in measuring life skills include responsibility, discipline, digging and finding information, verbal communication, cooperation, manners, problem solving, adapting/flexibility, and tolerance. Based on the results of the analysis, it can be known that the life skill score of students in both experimental grade 1 and experimental class 2 is higher than the control class on each indicator with a score increase of 9.81%. When reviewed from each aspect of the measurement, both in the experimental class 1 and the experimental class 2 the highest life skill score is in the aspects of discipline, manners, adaptability, and tolerance.

On the discipline aspect, students are depicted during timely learning in collecting assignments, and at the time of learning in the salt factory, students are disciplined in observing the process of making salt and working on observation worksheets. Student learning outcomes can be maximized if students are disciplined which can make students more focused during learning (Adesoji et al., 2019). In addition, with the application of ethnoscience learning makes students more polite, this is characterized by children more respect for dissent, responding to criticism, and giving feedback politely during the learning process. At the time of the visit, students were also more polite and polite towards the workers in the salt factory, this is in line with the opinion of (Risdianto et al., 2020), who stated that coming to a new environment makes students more polite. Students' manners can be done in many ways, such as saying greetings when entering the classroom, abusing older people, praying in an orderly manner, not saying rude and high-pitched to others be it peers or older people (Sudarmin et al., 2019).

During a visit to the salt factory students can adapt and be more tolerant of others. They observe, ask questions, and engage in the process of making salt with workers at the salt factory. This will make children more aware of the potential Java regency and more tolerant by not demeaning tau mocking people who work to make salt. Because somehow salt is a staple needed by everyone in making dishes. During the learning process students are motivated and carry out all these aspects, until students experience the development of life skills that make students have personal skills and social skills shown by the student's life skill score with an average of

more than 92%. These results are in line with research conducted by (Yusnitasari et al., 2020), which provides results that with ethnoscience-based learning can develop students' life skills at every learning meeting.

Integrated thematic learning using an ethnoscience approach makes students more interested and enthusiastic about learning because students find learning more enjoyable than just sitting listening to the teacher deliver the material. On Ariningtyas research, et. al. (2017), the implementation of ethnoscience-laden LKS makes students give a positive response with good categories. While in the study Abdurrahman et al (2018) stated that students responded positively to ethnoscience learning and the average response was in a very high category. This indicates that by taking an ethnoscience approach, students discover new, unique things, and they have not yet encountered learning, so they are motivated to learn. The passion and high interest in learning makes the material that has been delivered easily absorbed by students, thus making the mastery of the student's concept increase. In line with Nuralita (2020), that the application of ethnoscience learning is useful to overcome the difficulties of elementary school students in absorbing abstract learners by providing learning experiences that involve students complexly according to the real world (contextual), and another role is as a special alternative in realizing the formation of nationalism character through strengthening the value of local wisdom of the region with the implementation of ethnoscience.

Integrated thematic teaching materials can improve the understanding of the concept and life skills of students significantly. The completion of student concept understanding reached 100%, the score increase reached 25.89%, and the understanding of the concept and life skills of students was higher than the control class. So it can be concluded that the application of integrated thematic teaching materials based on ethnoscience is effective in improving the understanding of students' concepts and life skills. Integrated thematic teaching materials can be an important solution in an effort to improve the mastery of concepts and develop the life skills of grade IV elementary students. This teaching material includes knowledge about the ethnoscience of Java Regency as a salt production area. In addition, this teaching material contains 9 aspects of personal life skills and social life skills in order to develop student life skills, which will later realize students to realize the life skills of the 21st century. The contribution of this research reveals the impact of learning physics based on the ethnoscience of making salt. Students easily understand the concept of physics in making tillage because learning is more contextual connecting physics concepts to the process of making salt. In addition, students' life skills are

developed through salt-making process activities carried out by farmers so that the learning process is contextual, applying cognitive social learning theory.

Conclusion

The conclusion of this study is that students' mastery of concepts and life skills experienced a good increase after applying physics learning based on the ethnoscience of salt making. Future research needs to pay attention to the impact of ethnoscience-based physics learning to develop higher order thinking skills and process skills. The limitations of this study are measuring low-level thinking skills. In addition, it is necessary to measure cultural literacy obtained after applying entoscience-sourced physics learning.

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Author Contributions

Sarwi and Winarto constructing and reviewing the literature. Fathonah reviewed the literature and edited the manuscript by meutia anis, Sri Wardani and fahrur rozi. All authors read and approve the final manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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