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Implementation of ethnosains in science learning in madrasah ibtidaiyah

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Abstract: The purpose of this study was to analyze and describe science learning based on ethnoscience at MI Darul Ulum Paiton. Ethnoscience learning is the integration of local cultural values into the learning process, especially science subjects.This research uses a descriptive qualitative approach. The research subjects were students of MI Darul Ulum Class IV. The research results show that ethnoscience-based science learning at MI Darul Ulum is carried out in three stages, namely planning, implementation, and evaluation. Planning is carried out routinely at the beginning of the semester by the class teacher. Implementation of learning emphasizes contextual learning. Evaluation is carried out authentically to measure student performance. In addition to measuring the affective, cognitive, and psychomotor domains, morals are the main consideration in the evaluation process.

Keywords: Ethnoscience, Science Learning, Madrasah

PRELIMINARY

Ethnoscience learning is the integration of local culture into the learning process. The goal is to create a learning environment and design learning experiences for students. The learning process combines the culture that develops in society by bringing out local wisdom values. The teacher does not only play the role of conveying material, but also internalizes values that can foster a sense of empathy for the environment.

Citing John Dewey's theory of integrated learning, where students will shape their knowledge based on interactions with their environment and life experiences (Saputro, M. N. A., & Pakpahan, 2021). These experiences and the student's environmental context are linked to the subject matter learned at school. Learning must give a meaningful impression to students which will ultimately have a positive impact on their competencies (Warsah, I., & Uyun, 2019; Negeri, 2016)

Science is expected to be holistic learning so that it can motivate students to understand the material and relate it to the context of everyday life. Learning that is in

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accordance with student characteristics is one of them by considering aspects of diversity in culture and place of residence (Zubaidah, 2016). Student learning experiences are influenced by socio-cultural conditions in society and the environment around students. This factor must be integrated in learning science.

Ethnoscience comes from the word ethnos (Greek) which means nation and scientia (Latin) knowledge. Parmin, P., et al (2017), said that ethnoscience is knowledge possessed by a nation or ethnic group or certain social groups as a *system of knowledge and cognition typical of a given culture*. Learning with an ethnoscience approach is based on the recognition of culture as a fundamental (fundamental and important) part of education as an expression and communication of an idea and the development of knowledge (Pertiwi, U. D., & Firdausi, 2019).

The ethnoscience-based science learning process emphasizes local wisdom and problems that exist in society, so that students are able to solve problems encountered in everyday life (Nuralita, 2020). This opinion is in line with the research results of Andayani et al., (2021); Nuralita & Reffiane, (2020); Dinissjah et al., (2019) which states that ethnoscience is easier to develop in learning by integrating the culture and habits of the people around students. Cultural knowledge such as folklore, fairy tales, traditional games, traditional rituals, local production, and the use of nature is a form of ethnoscience learning.

The results of interviews with Mrs. Sulastri, a class IV teacher at MI Darul Ulum, stated that ethnoscience learning was taught to students in various forms of activities such as games of tug of war, slingshots, canned telephones, tape making, planting medicinal plants, and others. The same thing was also conveyed by Mr. Ahmad, a grade V teacher who said that the environment in which students live is familiar with ethnoscience activities in their daily lives. Some examples include traditional games that are still played by many children, such as tops, rickshaws as a means of transportation, traditional musical instruments such as tambourines or flutes.

Based on some of the research results above, it is felt that ethnoscience needs to be integrated into science learning, especially at the elementary school/Madrasah Ibtidaiyah level. This refers to Piaget's developmental theory, that elementary school students are in the concrete operational stage of development. That is, at this stage students will learn from something that is real that they usually encounter around where they live.

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Elementary school material is presented in thematic books that combine several subjects. The application of an integrated learning model that integrates several subjects in a unit that is bound by a theme is the right step for studying ethnoscience.

Ethnoscience-based learning is in accordance with the 2013 curriculum, where students will learn a lot and carry out the process of observing, trying, asking, gathering information, and communicating. In addition to this suitability, ethnoscience also aims to make students love their nation's culture more, which in turn can increase their knowledge and understanding of the culture of their region. Implementation of ethnoscience in learning will be useful for students in absorbing abstract lessons. The material presented will be presented contextually and provide learning experiences according to the real world.

In line with this explanation, this study aims to analyze the application of ethnoscience learning so that students have critical thinking skills and are able to solve problems. Therefore, researchers are interested in conducting research related to the implementation of ethnoscience in science learning at MI Darul Ulum.

METHOD

This research uses a descriptive qualitative approach. Descriptive research is the most basic research to describe or describe observed phenomena, both natural and artificial phenomena, in an objective descriptive manner. Its contents describe activities, characteristics, changes and relationships, similarities and differences with other phenomena (Rubiyanto, 2013). The subject of this research is MI Darul Ulum. MI Darul Ulum is a formal institution under the auspices of the Darul Ulum Foundation which is located in Paiton Village, Paiton District, Probolinggo Regency. The research flow can be described as follows:

Figure 1. Ethnoscience Implementation Research Flow

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In accordance with the research flow above, the object of this research is ethnoscience in science learning. The sample selection technique uses snowball *sampling*, *namely* the technique of determining a sample that is initially small in number, then enlarges. Interview, observation, and documentation methods are data collection techniques used by researchers. Data validation using triangulation of sources and techniques. While the data analysis technique is by collecting, reducing, presentation, and conclusion of data.

RESULTS

Ethnoscience Learning Planning

Ethnoscience-based science learning at MI Darul Ulum is only applied to certain materials. This material is material that can be integrated with ethnoscience, for example related to the use of nature, surrounding culture, regional food, or regional arts. In implementing ethnoscience-based learning, MI Darul Ulum refers to the 2013 curriculum. The characteristics of the 2013 curriculum are that there is a balance between developing spiritual and social aspects, knowledge aspects, and skills aspects. In addition to implementing the 2013 curriculum for students in grades 1, 3, 5 and 6, MI Darul Ulum also applies an education unit level curriculum, namely for grades 2 and 4.

Based on the results of observations, it can be seen that the teacher has presented learning material that is contextual and attracts students' interest. Students are motivated to learn science because the ethnoscience approach is presented naturally by presenting examples of activities that lead to the potential of the surrounding environment. Teachers prioritize learning that raises local wisdom values that are applied contextually. The activities that are usually carried out are by observing the activities of the surrounding community or visiting places where tape, ice is made or with thematic learning.

The results of the interview with the grade 3 teacher, Ms. Masruroh are as follows "Planning in implementing ethnoscience is usually done by the teacher at the beginning of the semester and also at the beginning of the month. We had discussions about the material, what media to use, then what form the activities would take. Because ethnoscience is related to the environment...so sometimes we also forget that there is material that matches ethnoscience values, sometimes it is not formulated at the beginning, but we still bring it up in learning."

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The same thing was also conveyed by Mr. Dahlan, that for ethnoscience in science material we present and provide examples of activities that are often carried out by students. Planning is done at the beginning of the semester.

Implementation of Ethnoscience Learning

The implementation of ethnoscience-based science learning at MI Darul Ulum is contextual. This can be seen based on observations during the learning process. The material studied by students is associated with culture and local wisdom in society.The implementation of learning activities is adapted to the local situation and always links ethnoscience to relevant topics. This means that the application of ethnoscience-based science learning is only applied to certain materials that can be associated with an ethno-science approach.

The results of interviews with Mrs. Masruroh, it is known that the implementation of ethnoscience learning is usually by inviting students to the surrounding environment or to a batik business, practice making tape, playing traditional games, tug of war, and other games. In line with the results of these interviews, observations made by researchers found that ethnoscience-based learning at MI Darul Ulum involved students actively and contextually. Students are asked to observe activities or do it directly in order to gain different experiences.

The ethno scientific approach at MI Darul Ulum is implemented through several activities, such as making tape, observing the surrounding environment, and making batik.

a) Tape Making

Tape is a traditional food that is familiar to the community, especially in the Paiton District area. This food is sold in traditional markets. Tape making is done traditionally by involving a scientific process in the form of fermentation. The basic ingredients for making tape are cassava and tape yeast. Class IV MI Darul Ulum students are taught to be able to make tapes starting from the process of preparing the materials until the tapes are ready to be enjoyed.

The process of making tape begins with smearing tape yeast into cassava that has been peeled and washed clean. The cassava is then placed in a basket covered with clean banana leaves and then tightly closed. The curing process is carried out for 2-3 days at room temperature. During this curing period, the tape is not allowed to be

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opened so that the quality is maintained and to avoid sour tape. Fermentation is a process of energy production in cells without oxygen (*anaerobic*). Through this activity, students learn science as well as understand local wisdom in the community in the form of traditional food. The fermentation process in making tape is a scientific process that is learned by students.

b) Batik

Batik is one of the cultural assets for the Indonesian people and ancestral heritage. Batik motifs are formed with liquid wax using a tool called a canting for fine motifs, or a brush for large motifs, so that the liquid wax seeps into the fabric fibers. The cloth that has been painted with wax is then dyed with the desired color, usually starting with the light colors. Dyeing is then done for other motifs with darker or darker colors. After several coloring processes, the batik cloth is dipped in a chemical to dissolve the wax.

The process of making batik has scientific process skills, namely physical changes, when the wax melts because it is heated. Then when you scratch the canting onto the cloth, there is a change in the state of the object from liquid to solid. The liquid wax will freeze after being rubbed on the cloth due to the influence of temperature. Furthermore, in the color dyeing stage, a convection heat transfer process occurs, water and dye are heated to boiling on the stove.

The process of draining the cloth that has been dyed and letting it sit so that the color can penetrate to the maximum in the fabric fibers results in capillarity, the dye seeping into the fabric. The process of boiling the cloth in boiling water at 100 degrees Celsius to melt the wax/night wax that sticks to the cloth to reveal the pattern that has been designed is a change in form from solid to liquid, that is, the wax changes from solid to liquid due to a change in temperature. The last is the process of washing the batik cloth with clean water to remove any remaining wax/malem that is still attached. Then, the drying/drying process allows the loss of water content in the fabric due to the evaporation process.

c) Traditional game

Traditional games found in Indonesia are games originating from traditions and culture in each region (Okwita, A., & Sari, 2019). In its implementation, traditional games utilize the environment as a means to play. In addition, they are played not

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only individually but also in groups consisting of many people. Traditional games are not only a vehicle for children to play, but also a means of character development because there are values contained in them.

Several games are closely related to the concept of learning physics, one of which is tops and banana stem boats which are related to the concepts of rotation and pressure. The game of tug of war also contains some physics material including material on work and energy, momentum and impulse, kinematics, dynamics, equilibrium of rigid bodies, etc.

MI Darul Ulum students are no stranger to traditional games such as tops, tug of war, kites. In order for the existence of local excellence and local wisdom in the form of traditional games to remain strong, students as the next generation need to instill a sense of care and love for culture and local wisdom by bringing back students' knowledge of traditional games and integrating cultural knowledge in the learning process, especially learning physics .

d) Observing the Surrounding Environment

The environment around the student's residence can be used as a learning resource. One object that can be observed is a plant. Students can directly observe the plants around their homes and also around the school. One of the activities carried out was observing the forms of leaves and roots. This activity intends to improve students' skills and understanding of science material. From this observation process, students can also distinguish between ornamental plants and medicinal plants or herbs. In addition, the school environment becomes a learning center by providing green open spaces.

Ethnoscience Learning Evaluation

The learning objectives that have been jointly formulated by the class teacher are then evaluated periodically in a structured time. The routine evaluation is carried out with the intention of solving all the problems encountered during the learning process. All complaints, needs, and deficiencies will be resolved to improve the quality of learning. The activity of exchanging thoughts and ideas is carried out by MI Darul Ulum teachers so that they become professional teachers based on applicable standards. The standards

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that must be possessed by educators include pedagogic competence, individual competence, social competence, and personality competence.

Evaluation activities at MI Darul Ulum are carried out periodically, as the result of an interview with Mr. Ahmad "we carry out routine evaluations, usually every month, of course all are evaluated. How do students follow the learning process, the readiness of students in doing assignments, or also the teacher himself". Observations made by researchers regarding this evaluation activity are that the teacher periodically evaluates students, either in person or at a scheduled time. Authentic assessment is an emphasis in the ethnoscience-based science learning process.

DISCUSSION

Ethnoscience Learning Planning

Ethnoscience-based science learning planning at MI Darul Ulum is to formulate activities to be carried out, both preparing materials, teaching materials, media, and the environment around students. Activities are routinely held to prepare and synchronize the material with the environment. As is the case with the theme of Traditional Games. In connection with this theme, the teacher prepares several choices of traditional games which can then be used in learning.

MI Darul Ulum is under the auspices of the Darul Ulum Foundation, which in its implementation of education includes Islamic boarding schools. Based on the Decree of the Minister of Religion Number 184 of 2019, the Spirit of Madrasah-Based Management (MBM) has given broad autonomy to madrasas in managing education. Shawmi (2016) explains that the madrasah curriculum should be developed taking into account national education goals, madrasah objectives, developments in science and technology and the demands of the times. Especially in the face of the industrial revolution 4.0. Madrasah must prepare student competencies and carry out 21st century learning by having 4C capabilities (*critical thinking, creativity, communication, and collaboration*) (Anshori, 2017; Pertiwi & Rusyda Firdausi, 2019; Zubaidah, 2016)

The pesantren-based madrasah curriculum is of course characterized by Islamic values, strengthening religious moderation, strengthening character education, literacy, and the formation of noble character which are superior values for MI Darul Ulum. In order for the curriculum in madrasas to run effectively, careful planning is needed in its

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preparation. Learning planning activities of selecting, establishing, developing methods to achieve the desired learning outcomes (Anggraeni, P., & Akbar, 2018; Saputro, M. N. A., & Pakpahan, 2021; Jannah & Aisyah, 2021). This planning process involves several classroom teachers. This stage is carried out at the beginning of the semester and at the beginning of each month to plan what activities students will do during learning. This activity aims to analyze several things related to the learning process, for example the preparation of materials, teaching materials, and the media to be used.

The curriculum should pay attention to and care about the social system that develops and applies in a society. In addition, in implementing ethnoscience-based mathematical learning it is necessary to pay attention to the selection of learning resources. Learning resources are anything that can be used as a source in the learning process (Mulyani & Armiati, 2021; Fitriyani, 2019). Learning resources in learning activities are needed as a guide for educators and students. Several learning resources that are effectively used include the surrounding environment, literature, audio-visual, and the internet.

Implementation of Ethnoscience Learning

IPA can be interpreted as knowledge obtained through data collection by experiment, observation, and deduction to produce a reliable explanation of phenomena. In science learning, students are expected to have abilities, including: a) the ability to know what is observed, b) the ability to predict what has not been observed, and c) the development of a scientific attitude (Hadi, et al., 2020; Puspasari et al., 2019). The science learning process contains activities for asking questions, answering and understanding answers, and perfecting answers.

Learning through the ethnoscience approach will go well when students are able to be actively involved in the learning process. Ethnoscience as a study of indigenous knowledge systems from community culture and phenomena related to the universe found in local communities. Ethnoscience-based learning aims to introduce students to facts that have developed in a society, then associated with science materials. According to Andayani et al., (2021); Yuliana et al., (2021) stated that learning is an activity that can be carried out psychologically and physiologically. Activities that are psychological, namely activities that are mental processes (Sari Kardi & Eko Nopiyanto, 2020; Rahmawaty et al., 2021). Some activities that involve psychological elements include

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thinking, understanding, concluding, listening, studying, comparing, differentiating, expressing and analyzing.

According to Damayanti et al., (2017), ethnoscience is a branch of cultural studies that seeks to understand how natives understand their nature. Indigenous people usually have ideologies and philosophies of life that influence them to survive. Ethnoscience as a study of indigenous knowledge systems from community culture and phenomena related to the universe found in local communities. Ethnoscience-based learning aims to introduce students to facts that have developed in a society, then associated with scientific material and knowledge.

Ethnoscience learning is a strategy for creating a learning environment and designing learning experiences that integrate culture as part of the learning process in elementary schools. This learning is by incorporating the culture that develops in society. The active involvement of students in learning will bring up values that are instilled through life experiences and a sense of empathy for the environment. In this case the teacher does not only convey theoretically but also internalizes the values taken from learning activities.

The ethnoscience-based science learning process at MI Darul Ulum is carried out contextually, where students will be invited to visit directly in the field. In addition, students also held activities such as making tapes. Observation of the surrounding environment is also carried out in order to add insight and be able to introduce local culture to students. Furthermore, students are expected to have a love for the richness of their regional culture.

Ethnoscience Learning Evaluation

As previously explained, IPA is a subject that emphasizes process skills. Satria & Egok, (2020) explain process skills as an approach that emphasizes facts and concepts used in science learning based on scientific activity steps. The science learning process at Darul Ulum is not much different from several other schools. Students in this case are asked to observe, classify, measure, and make inferences. The connection with the ethnoscience approach is that students are asked to make observations related to the material being studied with the environment around where they live.

The process approach in science learning is considered important, because through this approach students will process and interact with other students to achieve learning

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goals. The process and learning objectives as well as evaluation procedures are closely related and cannot be separated from one another. Ethnoscience-based learning evaluation activities at MI Darul Ulum are carried out routinely by teachers. Like the ethnoscience learning plan which is carried out at the beginning of the semester and every month, this activity also contains an evaluation. In this case, the purpose of conducting an evaluation is to measure the quality of learning, solve problems.

The success of learning is not only measured by academic value, but also supported by morals, attitudes and behaviors of students that are in accordance with Islamic character (Muzianah, 2017). Moreover, this school is based on a boarding school that always refers to Islamic education in all its aspects. As introspection is done, the teacher reports the student's learning results in the form of a report. Learning outcomes are reported at mid-semester and at the end of the semester/year. The report is presented in addition to the form of numbers and is also explained with a description. The ethnoscience-based IPA learning assessment process uses authentic assessment to measure learning outcomes IPA, namely knowledge or cognitive assessment, attitude or affective assessment, and psychomotor or skills assessment. All three can be obtained from the learning process and exams.

CONCLUSION

Based on the research results, it can be concluded that ethnoscience-based science learning at MI Darul Ulum is carried out in three stages, including planning, implementation, and evaluation. Ethnoscience learning planning is carried out by holding regular meetings with teachers at the beginning of the semester and every month. Implementation of learning emphasizes the process and contextual skills approach. Students make observations, try out, and visit places that are full of local culture and wisdom. The evaluation process is carried out authentically, where the teacher conducts a direct assessment of the student's performance results. In addition, moral assessment is an added value for students at MI Darul Ulum.

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