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ANALYSIS OF ETHNOSCIENCE IN SCIENCE AND TECHNOLOGY IN TERMS OF EXPLORATORY LEARNING IN GRADE IV SARENG 02 MADIUN ELEMENTARY SCHOOL

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Abstract

The purpose of this study was to describe the implementation of ethnoscience in IPAS in terms of the concept of exploratory learning. The type of research is descriptive qualitative. The source of data is IPAS learning activities on the material of plant sources of future life. Data collection through: observation, interviews, and documentation studies. The results of the study are IPAS learning with an exploratory approach has stages: preparation, including the implementation of diagnostic assessments, formulating open questions; discovery stage, through learning with an inductive approach; exploration stage of new concept application, through data validation with reference book matching techniques and summative assessment. The assessment results showed an increase in the average results of diagnostic assessment with summative assessment from 56.76 to 90.40 or an increase of 33.64. The conclusion of the research is that IPAS learning through exploration learning has been able to improve students' knowledge.

Keywords: *Learning, exploration, ethnoscience*

Introduction

Learning cannot be separated from the notion of learning. Suardi (2018) explains that learning is an interaction activity between students, teachers, and the environment. On the other hand, learning is associated with relatively permanent changes. Elbadiansyah and Masyni (2021: 2) explain that learning is a process of behavior change in individuals that is relatively permanent due to the interaction between individuals and their environment. Moh Surya (Ubabuddin, 2019) explains the characteristics of behavior change, namely: conscious and deliberate changes (intentional); continuous changes (continuous); functional changes; positive changes; active changes; permanent changes; purposeful and directed changes.

Changes that occur due to learning can be optimized by learning that utilizes learning resources that exist in the students' environment. The definitions that need to be understood together in this article are learning and learning resources. Darsono (Annisa Nidaur Rohmah, 2017) explains that learning is a series of activities carried out by educators or teachers that aim to change the behavior of students towards a positive or better than before.

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This is different from the definition of the learning process. Trianto. (2014: 10) explains that the learning process is the utilization of facilities and strategies so that students can learn, or in other words, how supporting learning facilities can be effectively utilized to change the behavior of students. Meanwhile, the definition of the learning process explained by Tilaar (Mohamad Surya, 2014) explains that the learning process is a way of how students have, access, get the subject matter to be learned. The above understanding emphasizes that in the context of this work there are three things that are the focus of research, namely: the learning process, the learning process, and learning itself.

The learning process is oriented towards learning tools. One of the learning tools is the environment around learners. For example: historical monuments, biotic and abiotic environments, and social-cultural communities, are learning resources that can support students to be able to learn. Sujarwo, et all, (2018: 59) state that the environment as a learning resource is everything that is around or around students, one of which is human culture, which can be utilized to support learning and learning activities more optimally. This opinion emphasizes that the environment is a potential source and can act as a learning resource to achieve learning goals and objectives. Ardianti and Raida (2022: 208) stated that: "*environment-based learning can present real examples in the environment so that the learning process is real and meaningful for students. Learning in a real environment can make it easier for students to understand a concept, because students can directly see the conditions in the environment"*. This confirms that the environment-based learning process can provide real examples so that the learning process becomes real and meaningful for students. Learning in a real environment can make it easier for students to understand a concept because students can directly see, experience or explore the conditions in the environment.

Exploratory learning is explained by Supardan (2016) as learning that belongs to the constructivism group and is a popular and growing approach in building knowledge. Sriandi (2015) explains that exploratory learning is a way for teachers to implement the learning process by exploring ideas, arguments and different ways of students through a number of open questions and commands so that students are able to build knowledge about concepts and forms of problem solving. Open questions are explained by Yeo (Sutriningsih, 2014) as questions whose answers are not short sentences, but are able to stimulate learners to describe as much information as possible from what they understand. Meanwhile, the definition of knowledge is explained by Soekidjo Notoatmodjo (Jusuf and Raharja, 2019), which is the result of curiosity after sensing interaction with the object to be known. Sensing in this case is the utilization of the five human senses, namely: eyes, nose, ears, skin, and ears.

Exploratory learning has stages in learning. Octariani and Rambe (2020) explain that the stages of exploratory learning, namely: the preparation stage, the teacher asks questions so that students explore initial knowledge to diagnose and correct misconceptions of concept mastery before new concepts are learned; exploration of new concepts found, students to express or describe in their own language for the ideas obtained; exploration of new concept applications, students are asked to present the results of building concepts applied in a problem with correct arguments. Soedjad (Effendy, et all, 2023) explains that concepts are abstract ideas that can be used for categorization and classification expressed in terms. Meanwhile, Tanwifi (Effendy, et all, 2023) explains that concepts are abstract ideas to describe the relationship between several facts.

The low concept building in IPAS learning occurs in class IV SD Negeri Sareng 02 Madiun. The results of observations obtained data that IPAS learning outcomes can be said to be low because the value obtained is the minimum value is 40 and the highest is 65 with an average of 56. Of the 20 students who got a score greater than or equal to 60 as many as 3 or 15%. If analyzed from the learning side, the teacher applies the expository method, which relies heavily on the ability to memorize concepts without knowing and understanding the meaning in the subject matter. Sanjaya (Triariani, 2017) explains that the expository learning strategy is an application with an emphasis on the process of delivering material verbally (can be done with discussions and lectures) so that it is able to think critically in mastering the material. This method may be able to poes learners at an advanced school level. But considering that students are elementary school, where the stage of building knowledge is in concrete operations, it requires objects that can be observed or explored.

Learning for students to be able to build knowledge with the ability to describe the material requires objects to become environmental learning resources. Environmental learning resource objects need to be inventoried so that they become a learning tool and are in accordance with the learning style of students. Learning resource objects, nowadays, are often referred to as ethnoscience. Wahyu (2017) explains that ethnoscience is a field of ethno-study, namely about the social-culture that exists in indigenous peoples in understanding the natural conditions that surround them. So, ethnoscience is part of the knowledge of ethnography. Puspasari, et all, (2019) explained that learning with ethnoscience methods is done by integrating learning materials into the environment. This integration, for students in elementary school, needs to see objects by paying attention to their skills.

Research that is relevant to the researcher's research, namely: Putri, et all, (2022, 107-108) focuses on Ethnoscience in science learning and its benefits on student learning outcomes. The results showed that Ethnoscience learning is very effective for all levels of education including elementary school, especially to achieve good learning outcomes. Ethnoscience learning has high effectiveness when applied to science or science-related subjects. Ethnoscience learning is able to improve student learning outcomes when compared to conventional learning. The results of Senjawati's research (2020, p. 47) underline that Ethnoscience-based learning in science materials can increase interest or high enthusiasm for learning. This has an impact on the assessment results which have increased significantly. Another study was conducted by Sartika, et al. (2022) which focused on the effectiveness of ethno-STEM-based science learning in practicing analytical thinking skills. The results of the study state that ethno-STEM-based science learning is effective in training students' analytical thinking skills, which is supported by the teacher's ability to manage the class, students' activities in learning, improving learning outcomes in the form of students' analytical thinking skills, and the positive response of students to learning.

Research conducted by previous studies focused on the application of egtnoscience in learning Natural Sciences (IPA) and learning outcomes. Meanwhile, the research that researchers carry out focuses on how learning facilities, namely social culture in the community in the environment of students, are able to become learning resources for the implementation of exploratory learning

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in natural and social science lessons (IPAS). Based on the description above, researchers can formulate the problem formulation as follows: how is the implementation of ethnoscience in IPAS in terms of exploration learning in class IV at SD Negeri Sareng 02 Madiun? Meanwhile, the purpose of this study is to describe the implementation of ethnoscience in IPAS in terms of the concept of exploratory learning.

Research Methods

This type of research is descriptive qualitative. The research time began in September to December of the 2023/2024 academic year. The research subjects were fourth grade teachers and students at elementary school (SD) Negeri Sareng 02 Madiun. The research focuses on the implementation of exploratory learning. The analysis of exploratory learning uses the stages of exploration from Octariani and Halimah (2017), namely: the preparation stage, exploration of concept discovery, and exploration of new concept applications. The main data source is IPAS learning activities in class IV. Data collection techniques were carried out by interview, observation, and documents.

The degree of trust is the activity of describing the results of research on the actual object description. Moleong (2019: 48) states that techniques to test the degree of trust can be through: extension of participation, persistence of observation, triangulation, peer checking, adequacy of reference, negative case analysis, member checking. The techniques used to test the degree of trust in this study are observation persistence, peer checking, and triangulation. Data analysis uses interactive analysis from Miles and Huberman's theory.

Research Results and Discussion

Results

The results of the analysis of teaching module documents obtained data that at the stage of preparation for exploratory learning, described teacher activities, namely: designing diagnostic assessments, linking plant material, sources of life on earth with environmental learning resources, namely plants around the school; inventorying plants that have chlorophyll with those that do not have; designing formative tests; designing research scenarios, whether or not there is a change in leaf color in plants that have chlorophyll; designing observations of food sources in fungi by looking at the position of growth; and designing formulating conclusions to build knowledge; and designing summative tests.

The results of observations and analysis of diagnostic assessments obtained data, namely: the teacher conducts a diagnostic assessment to determine the ability of students to recognize the environment at school and be able to name the plants. The test results stated that: 20 out of 25 or 80% of learners, are able to mention at least 10 names of plants in the school environment well and know their location. While 5 out of 25 or 20% of learners are able to mention less than 10 names of plants and their positions; and learners have known the types of plants between fungi and non-fungi.

The results of the diagnostic assessment, based on the results of interviews with teachers, are used to develop trigger questions and group students based on the level of understanding of fungal and non-fungal plants (plants that have green leaves or chlorophyll). This was revealed during an interview with the teacher, who stated that:

> *"... right... I use diagnostic tests to find out the initial knowledge of students' abilities... I make it the basis for making questions before starting the learning process... right... also to group students based on those who know fungal plants and those who don't..."*

The results of observations on the implementation of learning, obtained some supporting data for this study, namely: the teacher gives open questions to students. The questions are: (1) how many plants grow around the school?, (2) what is the name of the part that is in the plant?, (3) what is the color of the leaves of the plant?, (4). on one plant, try what happens if one leaf is wrapped in plastic and the other is not wrapped?, there are mushrooms around this school? Try to notice what distinguishes the way it grows from the original plant; b) the teacher gives directions to students to record, summarize, and present at the end of learning; and c) the teacher divides students into five groups with five students in each group.

The results of the analysis of teaching module documents obtained data that: teachers need to provide trigger questions to provoke students to find answers, analyze, formulate findings of observations, and compile reports on the implementation of learning to be evaluated or explained during classroom learning; students are trained to think critically and creatively in building their knowledge; find environmental learning resources as a responsibility for environmental sustainability and support the objectives of plant material as a source of life on earth.

The results of interviews with teachers obtained data that can be arranged in the table as follows:

Table 1. Summary of interview results on the implementation of IPAS learning

Fokus Pertanyaan	Jawaban Guru
Identifying learning problems and Assessing or determining student status	This learning is made in groups and utilizes the environment as a learning resource aims to see the learning style of students, see the social skills of students with the media is the environment as a learning resource, and the most important thing is to see how to compile reports, with indicators: if the preparation of the report is disorganized then how to build knowledge occurs problems, and vice versa.
How to build the IPAS concept	Building the concept of IPAS material on plants as a source of life on earth, using an inductive process. Premise 1: learners are asked to compare plants with fungi from the way of life by looking physically. Premise 2: chlorophyll plants are made experiments to see the process of photosynthesis, one leaf is covered with plastic and the adjacent leaf is not. Asked to observe the color change. Premise 3: Conduct an experiment to answer why fungi can live without having chlorophyll leaves.

Data from the analysis of formative assessment documents, obtained data: 1) students have recognized the school environment and plants that exist and their location in the school environment; 2) students have been able to answer the differences between fungi and non-fungi; 3) students have been able to recognize leaves and leaf colors; 4) students have been able to understand how fungi can

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live, because they do not have chlorophyll; 5) students have been able to understand the use of leaves for the process of photo synthesis; 6) students have been able to understand the relationship between the physical form of plants and the number of green leaves they have; and 7) the function of plants that have green leaves for humans during the day, namely the producer of Oxygen (O_2). Questions for numbers 1 to 3, all (100%) learners were able to answer well. However, for questions number 4 to 7, all (100%) learners were able to answer the questions well with the teacher needing to provide confirmation of scientific arguments.

Data from the observation of the implementation of the learning process, obtained the following data: 1) students are able to answer how fungi live based on the growing environment, namely from plants that have been weathered. This answer was obtained after finding several fungi that live in several plants that have been weathered; 2) based on experiments by covering several leaves with black plastic, green leaves turn dark green (change color). So, students are able to answer that the photosynthesis process needs sunlight and occurs only during the day; 3) based on physical observations, plants that have green leaves, their trunks have a strong shape and if they spread, the process will spread quickly; and 4) students based on accidental experiments, after conducting several experiments, doing resting activities under a large tree and many green leaves stated that it was cool. The teacher responded to the statement by emphasizing the statement that even though there was no big wind but under the tree it felt cool because plants during photo synthesis release oxygen.

The data from the observation of the implementation of the presentation obtained the following data: 1) students are able to describe the results of observations and experiments carried out. The results of the presentation show that students are fluent in explaining and followed by scientific arguments; 2) during the presentation, other students are allowed to ask questions. The interaction of students with students shows that the concept understanding of students who present is an indicator of increasing the understanding of the concept of IPAS; 3) the teacher asks questions about the results obtained during observation and experimentation. Teacher interaction with students who present is intended to diagnose the level of achievement of the IPAS concept; 4) The teacher confirms the achievement of the understanding of the IPAS concept. If the students in the presentation are in accordance with the concept of IPAS, the teacher will ask the students to open the book and say "is it appropriate?". If the presentation material is not complete, the teacher also asks students to open the book and say "Where is missing?"; 5) helping students build the concept of IPAS in accordance with the specified learning outcomes. Matching the material in the book with the results of observations and experiments serves to build the concept of IPAS according to the inductive stage and helps students evaluate the concept of IPAS.

Data on the results of diagnostic test assessments and summative assessments are compiled in the following table:

Table 2. IPAS Diagnostic Assessment and Summative Assessment Results

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Diagnostic Grade	25	45.00	72.00	58.7600	8.39285
Sumatif Grade	25	80.00	100.00	90.4000	7.89515
Valid N (listwise)	25				

Source: School documents, class IV teacher assessment.

The summative assessment results show an increase in the average from before learning or during the diagnostic assessment, from 56.76 to 90.40 or an increase of 33.64 and the standard deviation has decreased from 8.39 to 7.90.

Discussion

Learning with an exploratory approach, teachers carry out the planning stages starting with using diagnostic assessments. The purpose of this assessment is to diagnose the problem of prior knowledge that students need to have. This is in accordance with Majid and Abdul's (2021) explanation that the diagnostic assessment is to determine the ability of prior knowledge and learning problems. The implementation of diagnostic assessment is carried out systematically and purposefully with the following steps: 1) identify the existence of learning problems, carried out by paying attention to changes in behavior. In this lesson, teachers have inventoried environmental learning resources as ethnoscience for learning IPAS plant material and future sources of life. Through environmental learning resources, teachers have arranged planning through group learning, so that deviant behavior or in decreasing learning outcomes, can be inventoried; 2) review or determine the status of students, in this learning the teacher has determined the learning outcomes written in the teaching module, determined the level of achievement of specific goals for students, determined the pattern of achievement of students, namely knowing how far the difference is with the set goals, and estimating the causes of learning problems.

Diagnostic assessment also provides a form of initial test. The purpose of the initial test is to see the level of knowledge of IPAS material. The results of the initial test show that the average score is 56.76 with a standard deviation of 8.39. This shows that students already have the ability of IPAS material based on information that can be from social media and from their social-cultural experiences in the community. This condition is utilized by the teacher to formulate sparking questions. The formulation of questions given by the teacher is an open question. The benefits of the formulation of open questions have directed students to: be creative; think critically; raise curiosity and carry out observations; and be able to motivate students to build knowledge inductively.

The description above shows that the IPAS learning stage is in the preparation stage of exploratory learning. This is indicated by inventorying environmental learning resources, conducting diagnostic assessments, formulating triggering questions, formulating learning scenarios, and planning the form of learning in groups.

The implementation of learning by utilizing environmental learning resources, the second stage is the exploration of concept discovery. The initial meeting begins with the teacher asking open questions. Open questions are intended to direct creative, critical, and build knowledge through an inductive approach. This is in accordance with Kwon's statement (Kusmiyati and Rukmini, 2018)

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which explains that open questions are effective for bringing out the creativity of students because these questions direct students to apply strategies to find a variety of answers that may be new.

The discovery of new answers is part of creativity in building concepts or generalizing. Building the concept of IPAS, with plant material as a source of life on earth, learning is through an inductive process. Amri (Ani Aisyah, 2016) explains that the inductive approach is an approach that begins by presenting examples or objects for observation so that students can sort, interpret data at the beginning of learning and proceed to formulate conclusions.

The inductive process in this study, namely: 1) the teacher provides open questions as a trigger for data collection activities to build premises. At this stage the teacher asks students to record questions if there is something unknown during observation and find something known; 2) students actively carry out observations and interact with other students. In this process there are three things to focus on, namely fluency, flexibility, and originality. The fluency process is evidenced by students providing different answers but referring to the indicators of building concepts (generalization process). Such as: the occurrence of color changes in plants whose leaves are covered with plastic with those that are left free (the occurrence of the photosynthesis process), can grow on mushrooms even though they do not have green leaves (symbiosis), taking shelter under a tree with lots of green leaves feels cool (oxygen-producing plants during the day). The flexibility process is evidenced by the teacher's application in applying learning methods or strategies, namely: carrying out object observations, carrying out analysis by distinguishing plants physically from green leafy plants and fungi, analyzing the benefits of observation objects, such as: the benefits of fungi for decaying plants, oxygen-producing plants, and physical growth; 3) the process of building concepts (generalization). This is evidenced by the teacher's ability to direct students to formulate patterns of relationships and validate the results of synthesis according to students by matching techniques with essential material from reference books.

The inductive process described above has realized creativity-oriented and critical learning. At this stage, learning enters the exploration of the application of new concepts. The application of new concepts can be shown by the number of answer responses, the number of methods or strategies used by teachers and students in answering questions, and the ability to draw conclusions (formulate concepts). This is confirmed by Kwon (Kusmiyati and Rukmini, 2018) that learning with an inductive process realizes creativity as indicated by: fluency, indicated by the number of different answer responses; flexibility, indicated by the number of methods or strategies to solve open questions given by the teacher; and originality, indicated by the answers to the results of observation, analysis, and synthesis have been able to draw conclusions for a concept.

Critical thinking has realized the development of knowledge which is shown by the increase in the acquisition of the mean which rose by 33.64 and the standard deviation decreased by 0.49. This shows that the inductive process used in IPAS learning by utilizing Ethnoscience for future life source plant material, has proven that students have been able to apply concepts or generalizations to answer summative assessment questions.

Conclusion

Based on the description above, the researcher can state that the implementation of ethnoscience in IPAS in terms of exploratory learning in class IV at SD Negeri Sareng 02 Madiun is carried out with stages, namely: the preparation stage, including: carrying out diagnostic assessments, formulating open questions; the exploration stage of concept discovery, carried out through inductive concept formation and formative assessment; and the exploration stage of new concept application, through data validation with matching techniques with reference book material used.

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