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Identification Science and Engineering Performance Elementary School Students Using Based LKPD Engineering Design Process

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Abstract

Science and engineering performance play an important role in science and engineering education. This study aims to identify science and engineering performance by using LKPD based Engineering Design Process (EDP). This type of research is qualitative using the method case study. Data was collected through observation, interviews and documentation. The validity of the data using triangulation techniques. The results of the study showed that the use of EDP-based worksheets can improve science and engineering performance in elementary school students. Students demonstrate a better understanding of science concepts and techniques and are able to apply them in the EDP included in the LKPD. But some students still think that science concept events are things that are rarely encountered in everyday life. So that students do not understand the science concept that occurs in a water filter. However, students are able to demonstrate the ability to identify problems, design solutions, and evaluate the results they get.

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INTRODUCTION

Natural Science is a science that has a relationship with natural phenomena in a systematic way in an experimental observation. In science learning, the emphasis is on experimental processes that can relate students' cognition to the material studied in class. The aim is to foster interest and curiosity about the natural surroundings and be able to apply them in everyday life (Zahro, 2020). Apart from playing a role in the cognitive aspect, natural science also has a function that is used to develop psychomotor and affective aspects (Hasasiyah et al., 2020). Expansion in science learning includes knowledge in the form of facts, concepts and principles, and produces a process or product. So that in teaching and learning activities this can be applied, but in practice many learning materials are only centered on the teacher and make the learning process run in one direction. Without involving students directly (Wunangun, 2022). Then the existing teaching materials are not enough to facilitate students in digging up information during the learning process and are not enough to help educators to convey basic things to students as the start of the learning process (Sari et al., 2019). Also in science learning activities many students are not systematic in solving the problems given (Muhlisin et al., 2023).

This happens because in science learning students are only provided with natural science concepts without involving student performance (Penggabean et al., 2020). So that science and engineering performance students are still relatively low. Based on Mora's research al., (2020) science and engineering performance based on assimilation of content and development of skills to stimulate critical thinking and improve students' practice in science. Therefore, it is important to identify science and engineering performance students to design innovative science lessons with projects based on collaborative work between students. Science performance teaching science performance, this needs to be given to students to maximize science learning. By providing a comprehensive learning experience starting from processes, products, conditions and technological applications (Migoa and Abocejo, 2021). Whereas Engineering performance is the technical ability to make products that have functions based on predetermined criteria (Buttet al., 2018).

Engineering performance more emphasis on technical performance that provides experience to students in improving the quality of the product being developed. Deep science con-

cept engineering performance will help students learn and solve the problems they face (Shofia, 2019). To provide a good learning experience for students in engineering performance needed a learning model that has a deep concept engineering performance engineering design process (EDP). Engineering design process is a series of steps carried out to introduce the design process to students in order to produce a product (Putra et al., 2023). The stages of EDP learning will be packaged in the form of teaching materials, namely student worksheets (LKPD). LKPD will facilitate student activities in learning, because LKPD contains steps or instructions for completing assignments in accordance with the basic competencies that must be achieved (Nurhidayati et al., 2021). Therefore, the EDP-based LKPD is designed to identify results of science and engineering performance students. Based on the description above, the writer wants to do research to identify identity science performance Elementary students use EDP-based worksheets and identify identities engineering performance Elementary students use EDP-based worksheets.

METHOD

This type of research is a descriptive qualitative research approach to case study related phenomena based on facts that prove the existence of problems that need to be examined. The research was conducted at SDN Rowo Indah 01 Jember in the even semester of the 2022/2023 school year. The population of the study were fifth grade students. Sampling used a technique of probability sampling, namely by the ratio of the number of students 4 girls and 4 boys, by way of sampling simple random sampling (Ames et al., 2019). Stages or steps in this research namely planning, conducting school observations to collect data related to learning activities. Design, determine the sample used in research through techniques purposive sampling. Preparation, develop research instruments. Collect, carrying out learning in research classes using EDP-based worksheets. As well as conducting experiments and conducting interviews related to student responses after conducting experiments. Analyze, conducting data analysis and presenting research results. Share, draw conclusions from the data obtained (Yin, 2018).

Data collection techniques and instruments were carried out through observation, interviews and documentation. Observations were made during the process of learning activities by carrying out assignments and practicums by

students through EDP-based worksheets. The interview is open to the respondent's answers after the respondent has finished working on the EDP-based LKPD. Documentation, namely collecting all information in the form of recordings, videos and photos. Data analysis techniques in qualitative research consist of three steps, namely data reduction which is done by attaching the results of interviews and copying the results of interview recordings in writing in the form of interview transcripts. Presentation of data, data that has been reduced is analyzed related to science and engineering performance students. Drawing conclusions, conducting an analysis to review comparisons of the statements elicited by students while participating in EDP learning in accordance with science and engineering performance. The validity test of the data used in this study is technical triangulation. Aims to maintain data consistency and data validity to be used as a guide in concluding the phenomenon under study.

RESULT AND DISCUSSION

The data obtained in this study is based on the observation results chart science performance student. The following is the observation data science performance elementary school students.

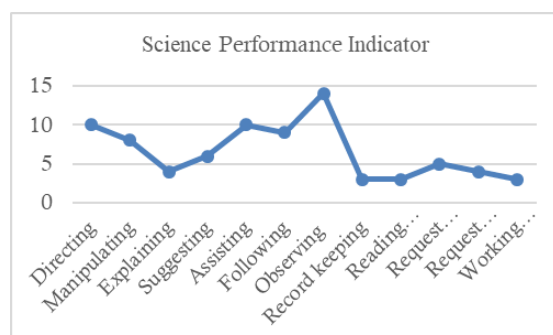


Figure 1. Observation Result Science performance elementary school students

Based on Figure 1 shows that science performance in elementary school students as much as 79 points. Indicator Science performance used according to Jovanovic and King (1998). In the directing indicator as many as 10 points, students are able to direct group members according to the implementation of activities. Students tend to be able to give directions to their themes during water filter practicum. In accordance with the theory which states that directing is giving direction to group members regarding the steps of carrying out activities. So that in water filtering practicum activities students can direct other students by

providing input. The preparation indicator gets point 8, this activity shows that during the activity of making water filter equipment students are more inclined to prepare the tools or materials used, compared to arranging or putting the materials into the water filter tool. Preparing is handling or dealing with materials/equipment needed during practicum. Then the indicator explaining gets point 4 because of the lack of students in explaining science concepts to other students. Explaining is a scientific concept that is explained to others. In this case students are able to explain what they get or feel from doing practicum activities to their friends or to the teacher to obtain additional information or a more complete explanation (Jovinonic and King, 1998).

The indicator suggests getting 6 points, students do more of what they see such as suggesting other students to arrange the cotton until it is neatly arranged in the bottle. Suggesting is offering suggestions regarding the activities being carried out. Practicum activities allow students to quickly adapt to other students to form good teamwork. The indicator helps to get 10 points because students are more likely to like to help or take a hand in doing what is assigned to them. So that the indicators help have an influence on student involvement in the practice of water filtering equipment. The following indicators get 9 points because students are more active in following simple screening tools than design students in LKPD. Making it easier for students to arrange the tools and materials used. Following indicators are direct suggestions from other students (Jovanovic and King, 1998).

The observing indicator gets a score of 14 points because most students are very happy to observe the changes that occur in the water filter equipment. When dirty water is poured into a water filter, it will go through various processes contained in the ingredients in the bottle, so that it can turn dirty (turbid) water into clean water. However, in this context the concept of science in students' thinking has not yet emerged, students think that the results of what they do are miracles. Observing is a passive act of observing the activities carried out. The indicator of taking notes earns points 3. Taking notes is writing down the results needed such as information or instructions. In practicum activities students show a little note-taking attitude, such as answering LKPD and making designs for water filtering devices. The indicator of reading instructions gets point 3, based on the literature reading instructions is an act of seeing or giving directions to other students. In this case students show little attitude to-

wards reading instructions, because students tend to observe more. The indicator of asking for the opinions of other students earns point 5. Asking for the opinions of other students is an attitude of asking for opinions or explanations from other students. This is done to foster an attitude of mutual cooperation among fellow students. The indicator asked for the teacher's opinion, the points obtained were 4, students more when carrying out practicum activities did little interaction with the teacher, in the sense that they did not involve the teacher too much in every action. Then the indicator of working together interactively obtained point 3. Working together interactively will form an attitude of cooperation between students cooperatively, thus forming small discussions among group members to solve problems encountered. In practice students do not show enough to work interactively with other students. Due to the lack of communication between fellow group members (Jovanovic and King, 1998). Deep EDPscience performance is able to influence elementary students' ability to understand science better by understanding the basic concepts of science, and being able to analyze a problem in science. Using EDP-based LKPD is able to develop students' ability to solve a problem by providing a solution, which in problem solving is the result of students' thinking skills. In accordance with the theory that EDP learning is able to make students have the ability in the process of identifying problems, determining problem solutions, designing prototypes, making prototype models of problem solving tools in a good category (Ulum et al., 2021). In line with this, through EDPscience performance students can be identified students more often show the behavior of observing, directing, suggesting, helping and preparing.

On the indicator chart engineering performance based on the results of observations show the behavior of the student learning process as much as 88 points.

Indicators Engineering performance used by Wieselmanet al, (2019). It has fifteen indicators namely, the indicator of thinking based on the results of observations has 10 points. This is because most students do the same thing several times when putting water filter materials into plastic bottles. Students tend to be engrossed in designing the materials they use to filter dirty water. Thinking is the act of thinking of solutions/ideas related to problems that occur.

Then based on the results of observations the directing indicators obtain point 12. The behavior of students who demonstrate the ability to

direct other students according to activity procedures.

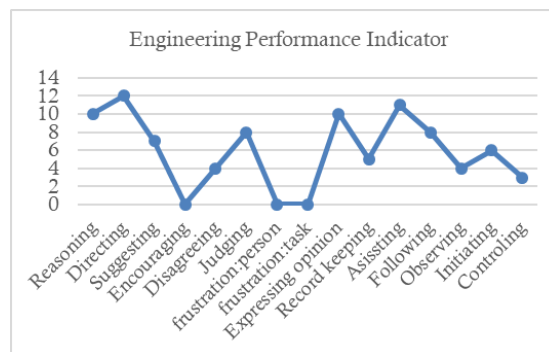


Figure 2. Observation Results Engineering performance elementary school students

The indicator suggests based on observation to get point 7, because students have the ability to offer suggestions regarding the activities being carried out. So that good communication is formed between fellow members of the group / other students. The encouraging indicator is based on the observation that there are no students who show the behavior of this indicator. The indicator of disagreeing based on the results of observations earns 4 points. The indicator of assessing is the ability to evaluate other students or other group members, based on the results of observations earns points 8. The indicator expresses the frustration of friends based on the results of observations that there are no students who show this process. The indicator expresses task frustration based on the observation that there are no students who show this behavior in this indicator. The indicator of expressing an opinion is the ability to make an argument in conveying ideas in a problem, based on the results of observations obtaining 10 points. The indicator of taking notes is the behavior of writing down the results in terms of answering LKPD or writing down the results of discussions or instructions from the teacher, based on the results of observations obtaining points 5. The indicator helps is the ability to help other students to solve a problem, based on observation results get point 11. The following indicator is the act of following directions from other students, based on the observation results get point 8, the observing indicator is the behavior of observing a problem actively and passively, based on the results of observations get point 4. Starting indicator based on observation results obtained point 6, starting is the first step or action to solve a problem. The control indicator is based on the observation points obtained, namely 3, controlling is an act of regulating to direct ac-

ording to plan, in this case students do not show much of this behavior (Wieselmann et al, 2019). EDP involvement in engineering performance can find out students' processing abilities in designing or designing by analyzing problems, absorbing sources of information into solutions and evaluating solutions (Ulum et al., 2021). Through EDP students can know their role as engineers, so they can identify engineering performance and what students do when doing practice, the results shown are in engineering performance students tend to show more directing, helping and opinion behaviors.

Based on the results of the interviews students were able to understand science concepts well. But some of the students still don't understand the science concept that occurs in a water filter. Students are able to explain in detail how to study a water filter practice, the process of making a water filter tool, the uses of a water filter tool, and what students can implement after successfully making a water filter tool in everyday life. So that students can design a water filter according to the understanding that students have. The results obtained by students in group one are able to produce clean water, and students in group two have water that has been filtered using a water filter still looks cloudy. This is influenced by the composition of the ingredients in the plastic bottles. Thus affecting the quality of filtered dirty water. A simple water filtration system is an effort to treat water for household and industrial uses. The filter media functions as a filter tool such as gravel, coconut fiber, palm fiber, stones, and sponges (Wicaksono et al, 2019).

CONCLUSION

Indicator Science performance which has the most points, namely on the observing indicator, students tend to show more observing attitudes. Then the indicators that students showed little were indicators of reading instructions, asking for the teacher's opinion and working together interactively. While on the indicators engineering performance the main point is the guiding indicator. In this case students tend to show more behavior or process of directing technique performance. Then pushing, expressing frustration with friends and assignments, there are no students who show this behavior.

Suggestions for teachers in the science learning process should often invite students to practice skills in science and engineering performance, in order to be able to solve a scientific problem and engineering in everyday life with solutions

that are in accordance with the concept of IPA. However, the teacher's role continues to guide and guide students during learning activities in order to form good discussions between students. Suggestions for researchers that can be taken into consideration in further research and can add to the good experience in the field.

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