

## Promoting Student Performance in STEM EDP Model on Climate Change Topics

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**Abstract.** Performance assessment is an authentic assessment that can be done with various kinds of assessments such as written assessments, observation, and assignments that can provide better feedback on performance and skills. Learning using STEM-EDP model is a learning that encourage students engagement and in line with performance assessment. The topic in this lesson is climate change, that is relate with with global issue and suitable for STEM-EDP learning. The purpose of this study was to find out how the performance assesment category of class VII F students at Public Junior Highschool in Samarinda. This research uses a quantitative descriptive approach. The sample of this research was 31 students who were taken by cluster random sampling technique. The instruments used in this study were student worksheets and student performance rubrics. The results of the study obtained a process performance value of 78.3 and 78.6 which describes the process performance in the good category. The product performance values are 81.3 and 83.9 which fall into the very good category. The performance of students need to be promoted by more STEM EDP learning especially in junior high school level.

**Keywords:** EDP; Performance assessment; STEM

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### INTRODUCTION

Science, Technology, Engineering and Mathematics (STEM) learning has an assessment tool that is suitable for assessing performance, namely performance assessment and with performance assessment we can assess each phase in the STEM approach (Septiani & Rustaman, 2016). STEM has a relationship with the nature of the EDP model in which each STEM material can increase student involvement to understand all forms of scientific disciplines that are very appropriate to problems in everyday life (Estapa & Tank, 2017; Honey et al., 2014). In the

performance process carried out by students, it provides opportunities for students to demonstrate their science process skills, think logically, apply initial knowledge to new situations, and identify new solutions to a problem. (Gustina, 2018). In research conducted by Suryana et al. (2018) To determine the performance profile of junior high school students through STEM project-based learning, performance is divided into two stages, namely the design process and the performance process. Performance assessment or what is often referred to by another name as authentic assessment is an assessment of student

activities in actual situations through a process of direct observation and can also be carried out with written assessments, factual assessments, and assignments. (Moch, 2019; Wahyuni et al., 2018).

Science learning materials at the junior high school level that are taught to improve students' skills, especially science and math skills, while increasing students' awareness of environmental issues such as climate change. Learning related to environmental issues such as climate change fits perfectly into the STEM framework by using the EDP model as part of the student learning experience (Widiastuti & Budiyanto, 2022). Learning using EDP is said to be in accordance with the curriculum in Indonesia, namely having knowledge, critical thinking skills and expertise in problem solving and helping students to apply science and mathematics content in a substantial way (Sürmeli et al., 2018; Syukri et al., 2018). According to Sulaeman (2021), in integrating STEM activities through EDP steps that are applied in junior high schools, the exploration of student participation is very meaningful. The research results prove that during STEM activities, student participation is very large, integrating STEM education especially in the engineering component in the science class of the optional science category is very valuable for students to gain skills for their future such as design and collaboration.

Performance assessment is suitable for assessing the achievement of competencies that require students to perform certain tasks such as laboratory practice, presentations, discussions (Hartina et al., 2019). Performance assessment provides opportunities for students to demonstrate their science process skills, think logically, apply prior knowledge to new situations, and identify new solutions to a problem (Gustina, 2018). Performance appraisal

also directs students to demonstrate a process of making a product (Suryana et al., 2015). The purpose of achieving learning outcomes in performance appraisal can include the following aspects: 1) knowledge; 2) application of practice and knowledge; 3) knowledge of various communication skills, drawing, artwork and more; 4) product (project result); 5) attitude (related to feelings, values, interests, motivation). In this case performance appraisal can measure competence which includes knowledge, skills and attitudes (Moch, 2019). Therefore performance assessment allows students to make their own responses rather than selecting answers based on available choices (Wisnuwardani & Masrukan, 2021).

There are three main components in the performance assessment, namely, performance assignments, performance rubrics (performance rubrics), and methods of assessment (Pryantini et al., 2016). Performance assessment itself has advantages and disadvantages, the advantage of this assessment is that it provides a more detailed assessment of various types of reasoning, oral communication, and motor skills so that it can assess learning processes and outcomes in more complex skills. (Wulan, 2018). The lack of this performance assessment is that it requires a lot of time and effort and costs a lot (Arifin, 2012). So even though performance assessment has advantages in assessing students' abilities, it is necessary to pay attention to aspects in developing performance assessments, including: (1) not all learning objectives listed in each basic competency must be assessed through performance assessment; (2) in preparing the instrument, it is necessary to pay attention to the criteria for scoring and the quality of each criterion; and (3) it is necessary to pay attention to the time to work on and check performance tasks (Moch, 2019). Performance assessment

is divided into two assessments, namely process performance and product performance. This is in accordance with what was suggested by Dinda et al., (2022) that the performance assessment is divided into two aspects, namely process and product. Assessment of process performance is an activity carried out by students from the beginning of the activity to the end of the activity while product performance is the result obtained from student activities during the activity (Budhiwaluyo et al., 2016).

Although performance assessment is very important, performance rubrics in science learning are rarely found. This study will focus on to find out the categories of student performance in STEM-EDP learning by providing a simple project, namely making a "miniature flood-resistant house" using the STEM EDP approach.

## **METHOD**

This research uses quantitative descriptive research. The subjects in this study were class VII students at SMP Negeri 21 Samarinda. This research uses cluster random sampling, the basic consideration of this technique is because each class gets the same opportunity to do research. Meanwhile, the sample in this study was class VII F, which consisted of 31 students. Group division was carried out in this research, with the criteria of group members being balanced in the division. Students in this class are divided into 5 groups, of which there are 4 groups totaling 6 students and 1 group with 7 students. This research used descriptive analysis which is used to determine the categories of process and product student performance results, namely the presentation of data in the form of average values (means) and standard deviations.

Data collection uses performance assessment instruments, and student worksheets. The instrument in this research is a student worksheet that has been adapted to the STEM-EDP learning stage. The student worksheet contains the stages of learning namely define, learn, plan, try, test and decide and an assessment sheet that follows the rubric. The rubric used in this research is an adaptation of (Dinda et al., 2022) research. The assessment instrument there are observed and written aspects. In each aspect observed or written there is the performance of the process and product. In the observable aspect there are 4 rating numbers on process performance and 5 product performance rating numbers. Meanwhile, in the written aspect, there are 5 process performance assessment numbers and there are 5 product performance assessment numbers.

The assessment instruments are in the form of a process performance assessment rubric and a product assessment. In this rubric there are 3 scores, namely score 1 which means below the target, at a score of 2 which means at the target, and at a score of 3 which is above the target Student worksheets are project sheets to support student responses obtained through performance assessments on the topic of climate change.

Student performance data were analyzed descriptively obtained from the observers in the performance rubric. The rubric assessment was carried out by 1 observer supervising 1 group. If students answer correctly, they will get 1-3 points in the rubric. Student scores are then converted to a scale of 100. Based on the value of student performance on process and product performance, then look for the average value of student performance. Student performance categories are determined based on five levels of categories as shown in Table 1.

Table 1 Categories of Student Performance

Criteria	Performance categories
$80 \leq \bar{x} \leq 100$	Very high
$61 \leq \bar{x} < 80$	High
$53 \leq \bar{x} < 67$	High enough
$40 \leq \bar{x} < 53$	Not high enough
$0 \leq \bar{x} < 40$	Very less high

(Miyati, 2019)

**RESULT AND DISCUSSION**

Based on the results of data analysis with descriptive statistics, descriptive process and product performance data were obtained from 5 groups, each of which was assessed by 1 observer in each group presented in Table 2.

Table 2 Acquired Student Performance Scores

Performance	N	Mean	Std. Deviation
Observed process	5	78,3	4,5
Written process	5	78,6	5,5
Observed product	5	81,3	8,6
Written product	5	83,9	3,6

There are 2 aspects to the assessment of process performance and product performance, namely observed performance and written performance. Based on the results of analysis of student product and process performance data in STEM-EDP learning, an average process performance of 78.3 with a standard deviation of 4.5 and 78.6 with a standard deviation of 5.5 is obtained. Based on the predefined categories, student process performance is in the High category.

While the average value of product performance is 81.3 with a standard deviation of 8.6 and 83.9 with a standard deviation of 3.6. The product performance category is in the very high category. In the process evaluation stage, there are EDP stages, namely define,

learn, and plan, while in the product evaluation stage, there are EDP stages, namely try, test, and decide. Students are directed to work on a project to make a flood-resistant house in groups.

Based on the predefined categories, student process performance is in the High category. The product performance category is in the very high category. The learning process is carried out with group discussions, according to research by Marsya et al. (2022) learning with the STEM approach in which there are student activities that give students direct experience through simple discussions and experiments make learning more interesting and motivating, which has an impact on the results Good. This is in accordance with the results of the student process and product performance categories in STEM-EDP. The number of group members is appropriate which makes all members active in the simple project work process as shown in Figure 1, and makes performance good or high.



Figure 1 Learning in Groups

Very high product performance was also obtained as evidenced by the results of the student group project in making flood-resistant miniatures shown in Figure 2. It can be seen that the miniature houses comply with the criteria and limitations that have been determined in the study.



Figure 2 Product Results of Student Groups

The high to very high categories were obtained because students met the assessment standards assessed using the performance assessment rubric. This is in accordance with the process and product performance trials conducted by Budhiwaluyo et al. (2016) obtained the classification of process and product performance evaluation that is good. During the observation process the students discussed with their groups, not only the discussion the students also wrote down the answers from the LKS work that had been given. In research Putri & Istiyono (2017) also obtained results from the work of worksheets that are categorized as good to very good. In this research, the results of the products created in STEM-EDP learning by students were in the very good category, this is also in accordance with Selly et al. (2023) research which was stated in her research showing that in the performance assessment the products in STEM learning produced by students were in the very good category. Widianas (2022) research also found that using performance assessments and project assessments can improve students' science knowledge. This shows that STEM-EDP can facilitate students to have good performance (Abdurrahman et al., 2022).

### CONCLUSION

Based on the results and discussion, it can be concluded that the process and product performance of students fall into the good and very good categories in STEM EDP learning which makes miniature flood-resistant houses. The performance of students need to be promoted by more STEM EDP learning especially in junior high school level.

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