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Research paper

Scientific Performance E-Rubric-Assisted Problem-based Learning for Improving Learning Effectiveness

Muhammad Nur Hudha[1], Arief Rahman Hakim[1], Sudi Dul Aji[1], Maria Ignasia Tasi[1], Chandra Sundaygara[1], Eko Pramudya Laksana[2], Syarief Fajaruddin[3], Tri Andi[4], Andista Candra Yusro[5], Hartoto[6], Uwes Anis Chaeruman[7]

[1]*Universitas Kanjuruhan Malang, Malang, Indonesia*
[2]*Universitas Negeri Malang, Malang, Indonesia*
[3]*Universitas Negeri Yogyakarta, Indonesia*
[4]*Universitas Mercu Buana Yogyakarta, Indonesia*
[5]*Universitas PGRI Madiun, Indonesia*
[6]*Universitas Negeri Makassar, Indonesia*
[7]*Jakarta State University, Indonesia*
**Corresponding author E-mail: muhammadnurhudha@unikama.ac.id*

Abstract

The use of online assessment nowadays has been increasingly necessary in the learning process. In relation to the statement, E-rubric is an online application that might be helpful in improving the learning effectiveness within the classroom. Then, in order to identify how the E-rubric might be helpful in such situation a study should be conducted in order to describe the use of Scientific Worksheet E-Rubric Problem-Based Learning for improving the Learning Effectiveness on the Heat topic. The study was a descriptive research that involved the students from Grade VII I and Grade VII J State Junior High Schools Academic Year 2017/2018 in the City of Malang. The results of the study show that most of the educators are satisfied with the presence of e-rubric application for assessing the students' scientific performance. Therefore, the use of e-rubric application is very helpful for improving the learning effectiveness within the learning process in the classroom.

Keywords: *E-Rubric, PBL, Scientific Work*

1. Introduction

Problem-Based Learning in the learning process of Natural Science is very effective for improving the learning quality [1]. In addition, PBL is believed to be a learning model that might improve the students' metacognitive and thinking skills [2].

In addition, PBL is also able to improve any learning process that tends to emphasize the students' scientific performance [3]. The reason is that PBL has learning phases/syntaxes that guide both individual and communal investigation.

However, during the assessment that tends to involve more experiments PBL still lacks of these learning phases/syntaxes. As a result, any educator who wants to implement PBL should perform certain modifications by involving online-based tools [4] [5]. One of these online-based tools that might be relied upon is e-rubric assessment [6] [7].

Online-based assessment nowadays are very necessary within the learning process. In relation to that matter, electronic rubric, or also known as e-rubric, is an alternative assessment tool that assists teachers in determining and explaining how the students are expected to learn and also in providing the performance criteria that will be involved in the assessment activities through brief and specific examples [8].

Any assessment that involves the use of e-rubric assists the students to monitor their progress immediately [9]. Then, e-rubric in a formative assessment might improve the students' performance through the process of feedback provision and self-regulation in order to strengthen and improve the learning effectiveness [9]. Furthermore, assessment rubric is also useful for guiding the conduct of the learning process.

The use of e-rubric-based assessment is very appropriate for meeting the demands of the century due to the extremely rapid development of science and technology, the form of assessment that emphasizes the process and results, and also the efforts to solve several problems during the conduct of the learning process. specifically, the use of e-rubric-based assessment is very appropriate for solving several problems during the conduct of Natural Science/Physics learning process. As a result, the effectiveness of the learning process might be improved since the model and the instrument within the e-rubric-based assessment is already appropriate. It is such situation that encourages the conduct of the present study.

2. Reseach and Method

The study was a descriptive research. Consequently, the study should observe and gather the data or the information about the E-Rubric-Assisted PBL Learning Model in order to monitor the students' scientific performance during the conduct of Physics learning process among the students of Grade VII I and VII J Negeri 10 Junior High Schools Malang in Academic Year 2017/2018.

The study consisted of 5 meetings and each meeting was divided into two stages namely Stage I and Stage II. Stage I consisted of three meetings and the materials that had been delivered during the three meetings were related to the principles of heat and their implementation. Then, Stage II consisted of two meetings and the materials that had been delivered during the two meetings were related to the heat transfer by means of conduction. The design of the study might be consulted in Table 1.

Table 1:. Design Method

	Stage 1 (Principles of Heat and Their Implementation)
3 Meetings	Portofolio/Worksheet Scientific Performance Assessment
	Stage 2 (Heat Transfer by Means of Conduction)
2 Meetings	Portofolio/Worksheet Scientific Performance Assessment

Then, the instruments that had been implemented for gathering the data in the study were students' discussion worksheet and students' laboratory practice worksheet. In addition, the data were also attained from the observation on the students' scientific performance, the results of the students' interview with regards to the use of e-rubric-assisted instrument, and the results of questionnaire distribution.

3. Result and Discusion

The questionnaire regarding the use of e-rubric was distributed to 5 observers who had been involved altogether with the researcher during the conduct of the learning process and who operated the e-rubric assessment in assessing the students' scientific performance. The questionnaire distribution was intended to identify the observers' responses on the effectiveness of the e-rubric use in assessing the students' scientific performance. The data from the results of questionnaire distribution were summarized in Figure 1.
In addition to relying on questionnaire distribution, the analysis on the use of e-rubric assessment was also conducted using interview. In order to identify the effectiveness on the use of e-rubric assessment, an interview was conducted to the five teachers who became the e-rubric users and to the five teachers who became the non-e-rubric users in assessing the students' scientific performance. The interview itself was conducted based on the interview guidelines that had been prepared.

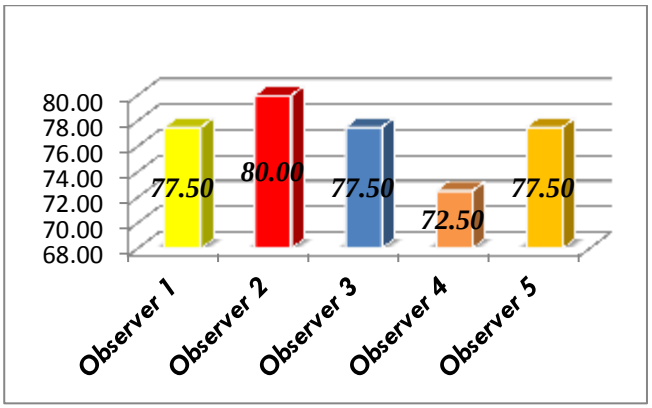

Figure 1:. The Use of E-Rubric Application

Based on the interview summary, in general the responses from the questions that had been asked to each teacher had similarities. The results of the interview were provided in Table 2.

Table 2:. Summary of the Interview to the E-Rubric Users

Questions	**Answers**
Have you ever used such assessment (e-rubric assessment)?	No, I have not.
During the implementation, are you happy with the use of e-rubric assessment? Why?	I am very happy because e-rubric assessment is more practical.
What are the difficulties that you have to deal with the implementation of e-rubric assessment? Explain!	We should learn more on the use of the e-rubric in order to be more advanced with the e-rubric.
With regards to these difficulties, have the teachers provided any improvement or solutions?	They have, but the use of e-rubric assessment should be trained more
How is the improvement? Has the improvement been helpful to you?	The improvement is more practical and quite helpful.
What is the assistance that you attain during the implementation e-rubric assessment? Explain!	Assessment period becomes shorter.
In comparison to the typical assessment, according to your opinion what are the strengths of the implementation of e-rubric assessment?	E-rubric assessment is modern, advanced, practical, and time-efficient.
Are you satisfied with the e-rubric assessment?	I am very satisfied.
What is your impression after performing e-rubric assessment?	I am very satisfied because e-rubric assessment is practical and time-efficient.
What is the improvement that the teachers should pursue in relation to the e-rubric implementation?	It will be better if each school is able to implement the e-rubric assessment.

Based on the results of the interview with the e-rubric users, it was found that most educators had been satisfied with the presence of the e-rubric in assessing the students' scientific performance. The satisfaction was related to the fact that e-rubric application assisted the assessment process, saved the assessment time, and identified immediately the students' level of scientific performance achievement. With the easy-and-effective feature, e-rubric might be recommended as an alternative instrument for assessing the students' scientific performance. In addition, e-rubric might also be implemented as an appropriate model for improving the effectiveness in the learning performance.
On the contrary, the summary from the interview results might be consulted in Table 3.

Questions	**Answers**
Have you ever been assessed with regards to scientific performance?	Yes, I have.
Do you know **what** kind of instrument that a teacher should implement in assessing scientific performance?	Yes, I do.
Do you immediately notify the results o your scientific performance? If you do know it, then from where do you attain the results?	No, I do not know. I know the results of my scientific performance only after I ask about it.
Have you been assessed by using computer application? If you have, when were you assessed?	Yes, I have. I was assessed by using computer application when I had to attend teacher competence test.
What is the difficulty that you have to deal with in relation to scientific performance assessment?	I should deal more with the aspect of practicality.
What have the teachers done in order to adopt to the difficulties that you experience?	The teachers have done so many things in order to adopt to our difficulties and we have to learn more about the computer application.
With regards to the teachers' efforts, have these efforts been able to overcome your difficulties?	Yes, they have been able to overcome our difficulties.
What is the easiness that you experience in relation to the scientific performance assessment by means of computer application?	The scientific performance assessment by means of computer application is time-efficient.

What are your expectations in relation to the assessment for the future by the teachers, especially with regards to scientific performance assessment (the teachers might refer to e-rubric)?	I should learn more to operate the computer application and I should be more persistent with that.
Have you ever heard about e-rubric assessment before? If you have, from where do you find out about it?	I have heard about it. I find about e-rubric assessment from Natural Science teachers.
Will you agree if later on in your classroom you have to use e-rubric-assisted assessment?	I will be totally agree.

Different than the E-Rubric users, the results of the interview to the non-e-rubric users showed that the non-e-rubric users had difficulties in performing their assessment. These users were accustomed to the manual technique and consequently they took longer time to identify the students' level of scientific performance achievement. In addition, these users had not identified the presence of another instrument, such as e-rubric, that might assist the conduct of their assessment.

The online e-rubric assists the teachers to communicate and to interact with their students in relation to the students' learning progress and learning achievement within immediate time through the e-rubric-based reporting system. E-rubric offers wider interaction and assists the students to be more autonomous during the assessment of their competency [10]. As a result, in the same time students might provide detailed information to the educators so that the educators might define the level of competence achievement that the students possess.

4. Conclusion

The availability of online e-rubric assists the teachers to communicate and to interact with the students in relation to the students' learning progress and this situation can be achieved by the e-rubric-based reporting system. Therefore, the use of e-rubric application is very helpful in improving the effectiveness of the learning process within the classroom.

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