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# THE DEVELOPMENT OF STUDENTS' PERFORMANCE ASSESSMENT THROUGH SELF-ASSESSMENT TECHNIQUE

**Hairida[1]✉, Ramlawati[2]✉**

[1]Chemistry Education Program, Faculty of Education of Universitas Tanjungpura
[2]Science Education Program, Faculty of Mathematics and Natural Science of Universitas Negeri Makassar

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## Abstract

This study aims to develop a performance assessment model through self-assessment techniques possible to measure students' science process skills in science-based inquiry teaching learning process. The research used simplified design of Research and Development from needs analysis, product development stage, and validation. Validation score indicates three aspects; usefulness 80%, model construction 83.33%, and readability model 81.67% all rated as very good criteria. In addition, the results of questionnaire about the implementation of the model obtained positive approval from the users. The results show that the measurement model is uniquely useful to measure the student skills of science processing in a junior high school level.


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✉Correspondence author:
[1]**Hairida**
Chemistry Education Program, Faculty of Education of Universitas Tanjungpura
Email: hairida@fkip.untan.ac.id
[2]**Ramlawati**
Science Education Program, Faculty of Mathematics and Natural Science of Universitas Negeri Makassar
Email: ramlawati@unm.ac.id

## INTRODUCTION

The learning process of science in Indonesia's 2013 Curriculum demands students to actively explore their knowledge and thinking skills through scientific method. Scientific method can be developed by teachers through practicum. Practicum is an important method in science education (Abrahams & Millar, 2008), because investigation skills develop trhough practicum (Roberts & Gott, 2004). An initial observation to Junior High School students in Pontianak shows that teachers are still dominant in practicum. Students were not active in exploring a new concept, since they depend on teacher's instruction. The result of the practicum is already known right before the practicum. Hence, teachers do not develop students' science processing skills. Wahyuni et al. (2017) find that Indonesian learning process tends to make the students active. Teachers usually give students task directly from textbook, worksheet, or simply just ask the student to summarize the materials.

Inquiry Based Learning is a learning approach which can develop students' science processing skills. The inquiry model can be executed in the laboratory or outdoor (Sarwi, 2010). In Maxwell, Lambeth, & Cox (2015), inquiry based learning can improve students' skills in solving problems and develop their higher order thinking skills. Students' involvement in learning is improved where they can investigate something in sequences of steps, discover new things, make conclusion, and report their finding. Defining phenomena, asking question, making hypothesis, and planning an experiment is included as students' activity in an open inquiry (Sadeh & Zion, 2009). The learning of science through inquiry method is an effective strategy to develop the skills of arguing (Katchevich et al., 2014), improve science processing skills, (Gormally et al., 2009), and add more dynamics in the classroom (Astuti & Setiawan, 2013).

Many activities can be used to develop students' science processing skills in an inquiry-based practicum. Teacher should do a variative scoring. One of the scoring ways to measure students' working performance is performance assessment. This scoring is also called as performance scoring since it values all of students' capability during the learning process. Each learning activity of the students is measured using appropriate assessment. Performance Assessment is an assessment system which does not only require students to answer or choose questions; instead, it emphasizes on the performing skills of the students (Wren, 2009). Performance assessment is an assessment system which actively involves the students to work (Ardli, 2012). According to Omidi & Sridhar (2012), there is a significant influence from performance assessment to students' overall metacognitive skills.

The marking of students' performance in the learning process uses the help of a rubric. Scoring rubric is defined as a detail picture of the performance assessment (Arends, 2008). Assessment rubric helps the teacher to evaluate students' performance through indicators and criteria. Students will also be more motivated in learing since they know what aspects they need to develop in the classroom.

Performance assessment in practicum is associated with assessment given to a lot of students with variative background. The most used model of performance assessment is self assessment. Self assessment has a function to measure students' formative and summative aspects. Formative assessment is a reflective and evaluative assessment for students. The assessment has an explicit goal on identifying the strength and weakness of task given to the students (Andrade & Boulay, 2003). Meanwhile, summative assessment is an assessment with self-grading (Andrade & Du, 2007).

Self assessment gives positive contribution in the learning process. Brown & Harris (2014) concludes that self assessment has positive influence to students' performance and self regulation. Self assessment can also build students' character (Asriningrum et al., 2013). In a group activity, self assessment can unveil the information of students' personal achievement. Due to the importance of the assessment, this research discusses the importance of self-assessment based performance assessment for High School Students in Pontianak.

One of a developing skills in learning science is science processing skills (Aktamis, 2009).

Science processing skills is an intellectual skills required in scientific investigation (Sheba, 2013). The skills are defined as the mental, physical, and competence ability for learning science and technology (Akinbobola, 2010). Science processing skills is important for students in processing scientific information, investigation, and problems (Aktamis & Ergin, 2008). Students can solve problems, think critically, make decision, find answers, and fulfill their curiosity (Ergul et al*.,* 2011).

Developing science processing skills can be done through inquiry-based learning. The purpose of inquiry-based learning is to develop students' critical thinking through logical, critical, and systematic way regarding facts, concepts, and principles (Hairida, 2016). Besides, science processing skills develops through experience and through mental and physical action (Nworgu & Otum, 2013). The use of science processing skills in science can create an active learning environment where students can develop and use ideas in exploreing the nature. Students can observe, proposing hypothesis, predicting, interpreting data, making conclusion, and communicating the result of investigation (Osman, 2012).

The material of separating chemical substantives can be taught through practicum. Some practicums for the materials are filtration, distillation, chromatography, sublimation, and evaporation. The aspects of processing skills in the practicum are observation, formulation of problems, hypothesis, planning procedures of practicum, and conducting experiments. The included experiments include the use of filtering paper, tube, and volume measurement tool. This performance has not been done due to limited number of observer and the high number of students. Teachers opine that the arrangement of performance assessment is very difficult. Hence, they do not want to do the assessment. Thus, it is urgent to conduct a study on the use of self assessment based performance assessment in an inquiry-based learning to measure Junior High School students' skills in separating chemical substance.

## METHODS

This research refers to the procedures developed by Borg and Gall (2003), which are: 1) need analysis, 2) product development, and 3) validation and experiment. The expected product of this study is a self assessment based performance assessment to measure students' science processing skills. The subject of the research in the need analysis step is four science teacher and 35 VIII grade students randomly picked from a Junior High School in Pontianak. The limited and extended field observation was done in the same school, which is to 32 students (1 class) in the limited experiment and 65 students (2 classes) in the extended experiment.

The purpose of the need analysis is to know all things required for the performance assessment. The sub-steps of need analysis are 1) survey and 2) literature review. Field survey is used to gather information regarding the necessity of teachers and students in the fields and the understanding of teacher on performance assessment and self assessment. The researcher did this step through giving questionnaire, administering interview, documentation, observation, and training.

Based on the survey, most teachers have difficulties in planning and implementing performance assessment, specifically in measuring students' processing skills. Their difficulties come from the high number of students and lack of understanding to assessment procedures. Therefore, the researchers aim to design an efficient assessment to help the teacher in conducting that.

The finding of the need analysis is important for the initial product development. The development of performance assessment begin with formulating tasks and rubrics. These elements was the included as a self assessment. The initial form of the assessment was validated to measure its appropriateness as an assessment system.

The validation of the assessment was done by the experts of assessment and materials of science through a Focus Group Discussion. The instruments of the assessment are the readability, construction, and usability. The revision of this step is used to develop the product and prepare

it before the experiment for the teacher and the students. During the experiment, the researcher gave questionnaires to teacher and students to know their perspective to this assessment in measuring the science processing skills.

## RESULTS AND DISCUSSION

The result of the research is related to the propriety of the product and the understanding of the teacher in executing self-assessment based performance assessment. The discussion of this research is related to the relevance of the result with the previous researches.

### Results

***Need Analysis***

In this step, there are two activities included: 1) literature review and 2) field study. The review of the literature is done by interpreting data from journals, research report, textbook, and curriculum. The result of the study shows that there are some problems in including performance assessment in the learning process. The data in the study were gathered through observation, questionnaire, and interview. A questionnaire is given to four science teacher and 35 Junior High School students in Pontianak. The provision of the questionnaire aims to give teacher insights regarding the practicum, performance assessment, teacher's expectation, and difficulties of conducting performance assessment (Picture 1). The provision of the questionnaire for students aims to know the execution of the curriculum, the scoring, and students' performance during the practicum (Figure 2). This idea is similar to the finding of Saputra (2014) that a scoring of competence in practicum is mostly given through written test and students' worksheet.

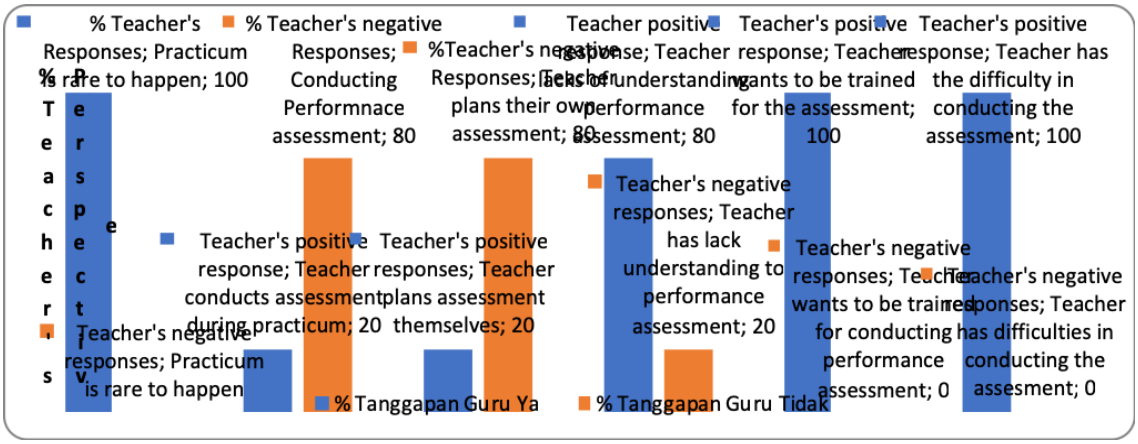


**Figure 1.** Questionnaire for Teacher

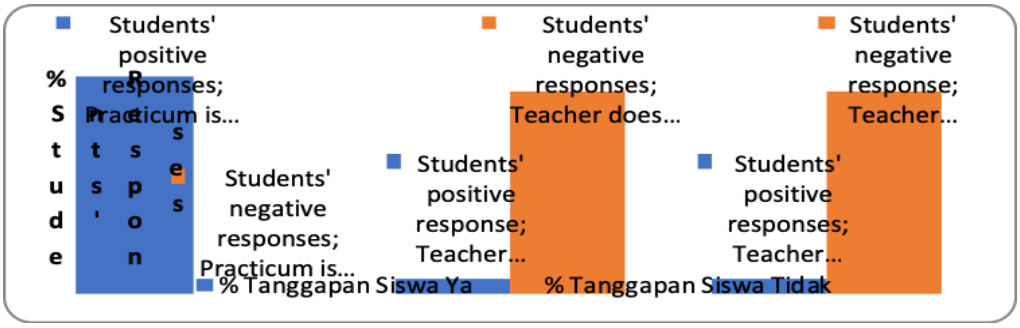


**Figure 2.** Questionnaire for students

In Figure 1, teacher has the most difficulties in arranging the rubric for performance assessment. Thus, the researcher attempts to address this difficulty by formulating the best rubric for them. Both questionnaires show that practicum is rare to happen as well as the scoring inside of it. In order to complete the data of teachers' difficulty, the researcher did an interview to the teachers.

**Table 1.** Teachers' difficulties in conducting performance assessment

| No | Description of Difficulties | Number of Teacher (%) |
|---|---|---|
| 1. | Arranging rubric and tasks, specifically in the varieties of performance. | 100 |
| 2. | Scoring format of the performance assessment | 100 |
| 3. | Assessment regarding behavior, knowledge, and skills in relevance to teachers' real life | 100 |
| 4. | The implementation of performance assessment in the inquiry learning. | 75 |
| 5. | Assessment for measuring the aspects of knowledge. | 100 |
| 6. | Arranging authentic assessment for students | 100 |

Based on the interview, it is concluded that teachers have difficulties in 1) arranging varieties of rubric criteria, 2) arranging authentic assessment, 3) having extended knowledge of assessment, and 4) the integration withing inquiry learning.

***Development***

The result of the need analysis is used as the reference in developing the performance assessment in inquiry science learning. Table 2 shows the task assessments in the practicum of separation of chemical substance.

**Table 2.** Performance Assessment in Practicum

| No | Sequences of Tasks |
|---|---|
| 1 | Formulating problem |
| 2 | Proposing Hypothesis |
| 3 | Planning Experiment |
| 4 | Conducting Experiment |
| 5 | Making Conclusion |

The tasks in the inquiry learning is adjusted to develop students' science processing skills. In the materials, the researchers divide the practicum into: 1) Practicum of filtration, 2) practicum of distillation, 3) practicum of chromatography, 4) practicum of sublimation, and 5) practicum of evaporation. Each practicum has a scoring rubric in relation to the inquiry learning based on specific indicators and criteria. The rubric is then adapted for students' self-assessment.

***Validation and Trials***

The developed product is validated by one expert of evaluation and three experts of content. The validation of the experts was qualitative by interpreting the development of the product quantitatively. The result of the data collection shows 1) there is a change of self assessment item, and 2) to the decription of tasks in relation to students' science processing skills.

The quantitative assessment of the experts was done using questionnaire with instruments based on the aspects of usability, constructability, and readability. The validation of the aspects aim to know the usability of the product for the users. The validation of construct shows the construction of the assessment based on its content, appropriateness, scope, and rubric's propriety. The aspect of readability is related with the instrument's fonts, contrasts of color, quality of pictures, and grammars of the words. The detail of the instruments can be seen in Table 3.

**Table 3.** Experts Validation

| No | Scored Aspects | Percentage (%) | Criteria |
|---|---|---|---|
| 1. | Usability | 80 | Very High |
| 2. | Construction | 83.33 | Very High |
| 3. | Readability | 81.67 | Very High |
| | Average | 80.16 | Very High |

The average percentage of validator responses is in the category of very high. Therefore, the instrument of performance assessment in self assessment for the materials of chemical substance's separation is able to measure students' science processing skills.

The result of quantitative and qualitative validation can be used as a reference in revising the developed product. The next step to do is field experiment for teachers and students to get the evaluation of the product through the questionnaire. The questionnaire is given to get feedback from the target.

***Discussion***

This research aims to model a self-assessment based performance assessment to measure students' science processing skills. Through self assessment, students should be aware on the purpose and meaning of learning as well as to know the weakness and strength in learning, thereby it prepares them well in studying.

The development of the assessment is based on the need analysis which finds that teachers have the difficulties in in 1) arranging varieties of rubric criteria, 2) arranging authentic assessment, 3) lacking of knowledge regarding the materials and the assessment, and 4) the integration withing inquiry learning. Besides, teachers also have difficulty in adjusting the method with the number of the students. Making the skills of the students difficult to develop individually. In Wulan (2008), the high workload of the teacher to apply performance assessment is always be faced in the practicum. Hence, students are mostly not marked during the practicum. Wenzel (2007) says that the incapability of teachers in applying the scoring is also making them rarely marking students for the performance assessment.

The result of the research shows that there are some teachers of Junior High School in Pontianak who has never implemented performance assessment. They lack of understanding to the assessment and how to apply it. Based on Budhiwaluyo, Asyhar, & Hariyadi (2016), teachers are unable to do the assessment since they do not have the guidance of scoring instrument in the practicum. They tend to use written test like quiz or simple question and answer session (Muslich, 2014). Teachers also tend to make questions referring to the existing materials (Osnal, Suhartoni, & Wahyudi, 2016). The development of the educational orientation demands teacher not only to develop their knowledge *(*Adeyemo, 2010).

In developing self assessment based performance assessment, teachers have the difficulty of making the rubric. Thus, the researchers formulate simple rubric for helping the teacher to implement the model (Hairida, 2017a). Fraenkel and Wallen (2008) says that tasks of assessment should be made in simple way that it does not lose the essential of developing students' science processing skills.

The expert validation of the usability, constructability, and readability of the product shows that the assessment is very appropriate to use in measuring students' science processing skills. The validation obtained very high score. The model has been adjusted to the criteria provided by Moskal (2003), including: 1) clear rubric and task criteria; 2) using observable behavior; 3) using clear grammar; 4) rational total point; 5) clear difference of scoring; and 6) objective and just criteria. Apart of that, the steps of inquiry learning and practicum is included with the guidance of using it which eases the students to do all tasks.

Students have positive responses to self-assessment based performance assessment. Students feel that the scoring makes them able to develop themselves in clear criteria. However, in the beginning, students tend to be hesitant in providing the information for the self assessment. They are afraid that their assessment will lead to bad judgment from their teacher and affect their final mark. The fact supports Siswaningsih, Dwiyanti, & Gumilar (2013) that there is still some obstacle in doing the self-assessment, which are the timing, honesty, and

the less of confidence by the students to value their progress.

Confidence is a characteristic which should be possessed by the students. Hairida (2017b) shows that students are actually able to do science exercise; however, their confident makes them hesitant and unable to answer their teacher's questions. The idea is similar when the students to the self assessment. They are less confident in judging themselves that they do not do that in accordance to teacher's observation. Besides, the dishonesty of the students are supported by the fear that if they say honestly that they do not understand the materials, they will get a bad score.

In this research, teachers have positive responses in measuring the students' science processing skills. The result means that teachers are happy in measuring students' performance during the practicum. The only difficulty the teachers face is the development of the rubric. They are unable to monitor the students' overall development due to their incapability of creating the comprehensive rubric. The application of self assessment based performance assessment makes teacher not having the difficulty in assessing students in the inquiry learning. Teachers can observe and communicate the result of their investigation comprehensively. The finding is similar to Wahyuningsih, Wahyuni, & Lesmono (2016) that teachers have positive responses to web-based self assessment.

The hesitation of the students in filling the statement in self assessment is a new thing for the students. Shofiyah (2013) states that the adaptation of self assessment is essential for students. The statement comes under the reason that self assessment is a trend in assessing the students (McMillan & Hearn, 2008). Therefore, for the scoring, teachers need to check their students' honesty in filling the self assessment form. The result can be matched to teacher's assessment. If the lecturer only value students' performance, there is also an observation sheet available for teacher to help them judging the students. As inWilujeng (2014), there is a similarity of score between students' self assessment and lecturer's assessment. According to Suarta (2015), self assessment for vocational school students has similar result to teachers' assessment.

## CONCLUSION

Based on the result of the research, there are some point to be brought up: 1) teachers have some problems regarding performance assessment, which are: a) having strong tendency of only measuring through multiple choice and short essay, b) lack of understanding and knowledge in assessment and teaching materials, and c) incapability of integrating the assessment to the inquiry learning, 2) the experts validation shows that the product is able to develop for measuring students' science processing skills, specifically for the chemical substance separation, and 3) both teachers and students have positive responses for the assessment. From the conclusion, it is inferred that teachers can implement the modle for their lesson plan based on 2013 curriculum. Teachers should also use the assessment model for the other material. For the school, the result of this research can be a reference for modelling an assessment which values the performance of the students. In wider significance, the official of education and culture can conduct coaching of the performance assessment in 2013 curriculum.

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