The Analysis of the Ability of Preservice Teachers in Compiling an Analysis Rubric for Learning Performance Assessments

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Abstract. This study aimed to explore techniques to make analysis rubrics on performance assessments based on the teaching experience of preservice teachers. The method of this study was descriptive qualitative. The random sampling technique was used to select the final semester of Biology Education Study Program students who had taken the Learning Evaluation course, Curriculum Development, Community Service Program, and Field Experience Practices. The data was collected using a closed-ended questionnaire with a Likert scale, interviews to obtain data related to students' ability to compile an analysis rubric, and documentation to determine the suitability of the analysis of performance assessment rubrics in the sample lesson plan. The results showed that the ability of some preservice teachers to compile an analysis rubric on performance assessment was still inadequate (35.49%). The obstacles experienced by the preservice teachers were in determining rubric criteria, compiling rubric descriptions, integrating biology-specific material with scientific work capabilities, and scoring the analysis rubric. This showed that the preservice teachers needed to have sufficient training in compiling an assessment rubric that is specific for biology material to optimize the assessment of learning performance.

Keywords: Analysis Rubrics, Performance Assessment, Preservice Teachers.

1. Introduction
Assessment is an activity that must be carried out by teachers and students from a series of teaching and learning that have been implemented [1]. Etymologically, performance assessment is divided into 2 words, namely "assessment" which means measuring, and "performance" which means meaningful activities [2]. Performance-based assessment can show a complex and real situation compared to other assessments [3]. Therefore, performance assessment is a highly recommended implementation in the teaching and learning process.

The Regulation of the Ministry of Education and Culture (Permendikbud) No. 66 of 2013 concerning the 2013 Curriculum Assessment Standards contains the use of rubrics, checklists, and
rating scales. A rubric is an assessment instrument to consider the quality of student performance on the performance response that has been done [4]. A rubric can also be a tool used by evaluators to help them make explicit systematic evaluative judgments on the performance that has been done by students [5]. Herman said that there are 4 good or effective rubric criteria to be considered, namely (1) having a clear description so that students know what is expected of them, (2) having various scale standards for various kinds of performance, (3) having a quality gradation or scale based on the level of standards that have been met, and finally (4) having an exemplary capital of expected performance at different levels on the scale [6]. 3 parts must be considered in making a rubric, namely the preparation of criteria, description, and scoring [7]. Also, the use of language is no less important in the preparation of a rubric [8].

A rubric is divided into 2 types, namely analysis rubric and holistic rubric [9]. Wiseman states that analytical scoring, which involves the separation of the various features of a composition into components for scoring purposes, has also received considerable scholarly attention [6]. One advantage of the analysis rubrics is that it has varied criteria descriptions compared to a holistic rubric. Besides, the analysis rubric is the most effective instrument to be used in assessing students' performance because it can provide feedback to students on the performance that has been done. This is in line with the opinion of Nitko who states that the degree of feedback offered to students to teachers is significant. Students receive specific feedback on their performance to each of the individual scoring criteria [10]. Another advantage is that it can measure the ability of cognitive skills of students on a higher scale (Higher-Order Thinking Skills) such as skills in applying, analyzing, evaluating, and creating [11]. The analysis rubric can also analyze the weaknesses and strengths of a student from the available criteria [12].

The importance of the use of the analysis rubric as an instrument for evaluating the psychomotor domain must be balanced with the ability of preservice teachers in compiling the analysis rubric. Educational institutions need to pay attention to good feedback and also the benefits for students, one of which is obtained from the use of the analysis rubric as an instrument of performance assessment [13]. Besides understanding of item by item from the analysis rubric, preservice teachers also play an important role in the process of observation and evaluation during the teaching and learning process [14]. In a pandemic where the teaching and learning process is done online, learning is more directed to performance projects where students are given certain tasks that can be done at their respective homes.

Most performance assessments during practical work have never been conducted by teachers. Even if the assessment has been carried out, its use in schools is still very limited. Other study results reveal the difficulties of teachers in carrying out performance assessments in schools because they do not understand the performance assessments [15] which link assessment items in the rubric with the content of teaching materials as well as choosing the right performance assessment according to the content of the material being taught. Another difficulty is the difficulty in providing feedback on the results of the assessment conducted because the assumption of the scoring already represents the interpretation of feedback. The novelty of this study is the suitability description of the analysis rubric compiled by preservice teachers presented in addition to the explanation of the implementation of performance assessment in learning.

Judging from these conditions, an evaluation of the application of performance assessment instruments in the form of an analytical rubric for preservice biology teachers in the learning process was needed. The evaluation had been carried out to determine the ability of preservice teachers in preparing the analysis rubric. The results of the evaluation can be used as input and improvement for the parties concerned.

2. Study Method
This study was qualitative descriptive research that employed instruments such as questionnaires, interviews, and documentation. This study was conducted in March-May 2020 which used
triangulation techniques to obtain valid data. Data collection was done online and offline due to adjustments to the current condition of the COVID-19.

The population of this study was the final semester Biology Education Study Program students who had taken Learning Evaluation, Curriculum Development, Community Service Program (KKN), and Field Experience Practices (PPL). Samples that can represent the entire population were taken from the population. Based on the calculation of the Slovin formula by using a fault tolerance limit of 10% (for education) and population size of 242 students, the number of samples obtained in this study were 71 students determined by using the following formula:

\[ n = \frac{N}{1 + Ne^2} \]

Information:
- \( n \) = Sample Size
- \( N \) = Population Size
- \( e \) = Error tolerance limit of 5% or 0.05

There were three instruments used in this study, namely a questionnaire that had been validated by experts and had been proven to be feasible through empirical tests, the questionnaire filled by the samples, interviews with biology education lecturers who pursue learning evaluation and curriculum development, and documentation by taking data on the lesson plan complete with performance assessment instruments performed.

This study used three study procedures, including data reduction, data display, and conclusion. In a qualitative study, it is necessary to summarize the data (data reduction) obtained from the field because the longer the observation, the more data can be obtained. Then, the data will be arranged and simplified to be concluded (data display). Finally, conclusions will be drawn.

3. Result and Discussion

3.1. Result

The Profile of the Abilities of Preservice Biology Teachers in Compiling Analysis Rubrics on Performance Assessments. Process Assessments can describe techniques and problems that teachers must consider when they design and do the assessments. Assessment characteristics influence what is learned and the level of meaningful involvement by students in the learning process. The ability profile of preservice biology teachers in compiling analysis rubrics on performance assessments can be determined by looking at questionnaire instrument data on the sub-indicators of student’s understanding in making analysis rubrics, implementing performance assessments in learning, and using analysis rubrics on performance assessments, as well as the suitability of the description and sample rubric criteria based on the lesson plans. From the data obtained, the ability of preservice biology teachers in compiling analysis rubrics on performance assessments was 35.49% in the low category. The data can be observed by looking at the table as follows:

| No. | Criteria                                             | Score  | Information |
|-----|------------------------------------------------------|--------|-------------|
| 1   | The preparation of the analysis rubric               | 25.8%  | Low         |
| 2   | Implementation of performance assessments and the use of rubrics in the learning process | 38.31% | Low         |
| 3   | Appropriate description and criteria of sample rubrics | 42.37% | Low         |

**Average**

35.49% Low
**Table 2. The Preparation of Analysis Rubric**

| No. | Criteria                                                                 | Score | Information |
|-----|--------------------------------------------------------------------------|-------|-------------|
| 1   | I do not understand how to assess students based on the psychomotor domain. | 65.8% | Low         |
| 2   | I do not have enough knowledge about the preparation of the analysis rubric. | 72.6% | Low         |

**Average** 69.2% Low

Table 1 shows the results of the questionnaire filled out by the preservice teachers. The questionnaire data in table 2 shows that 65.8% of preservice teachers did not understand how to judge students based on the psychomotor domain and 72.6% of preservice teachers did not have sufficient knowledge regarding the preparation of the analysis rubric.

**Table 3. The Implementation of Performance Assessments and the Use of Rubrics in the Learning Process**

| No. | Criteria                                                                 | Score | Information |
|-----|--------------------------------------------------------------------------|-------|-------------|
| 1   | As a preservice biology teacher, I have included a performance assessment of the lesson plans. | 45.2% | Low         |
| 2   | I administer the pre-test in assessing the learning performance of students. | 72.6% | Low         |
| 3   | I assess by looking at the study or exam results.                        | 83.6% | Low         |
| 4   | I have low knowledge regarding assessment performance.                   | 78.1% | Low         |
| 5   | I use a checklist in performing student's learning performance assessments. | 53.4% | Low         |
| 6   | I have never compiled any analysis rubric and used it as an instrument of assessment on performance assessment. | 90.4% | Low         |
| 7   | I just heard the term rubric after reading this questionnaire.           | 68.5% | Low         |

**Average** 70.25% Low

Table 1 shows the implementation of performance assessments and the use of rubrics in the learning process obtained from the questionnaire responses filled by the respondents. The questionnaire data in table 3 shows that 45.2% of preservice biology teachers had used performance assessments into lesson plans and applied them in learning. They gave assignments such as discussion, practicum, and others to students but did not end them with an evaluation. Notes in the field during the study showed that the preservice teachers who became the study sample were more focused on cognitive assessment only. Students were given a performance task but no assessment of the performance that had been done was done. The preservice teachers used pretest questions in assessing students’ learning performance (72.6%). They also admitted that they often carry out performance assessments by looking at student learning outcomes or examinations (83.6%).

The preservice teachers stated that they had low knowledge about performance assessments (78.1%). They used checklists as an assessment instrument in performance assessments (53.4%). Other data showed that the preservice biology teachers admitted they had never compiled an analysis rubric and use it as an assessment instrument in performance assessments (90.4%). They knew the term rubric after reading the distributed questionnaire (68.5%).

The third item of Table 1 describes the suitability of the description and criteria of the sample rubric obtained from the results of the lesson plan analysis.
Figure 1 shows the results of the lesson plans prepared by the sample. Out of 71 samples, only 5 samples (7%) used the analysis rubric to assess student performance in the form of discussion.

![Percentage of Use of Assessment Instruments in Assessments](image)

**Figure 1.** The Percentage of Use of Assessment Instruments in Assessments

### Table 4. The Assessment Results

| No. | Sample Name | Value of Conformity Criteria | Value of Conformity Description | Average | Information |
|-----|-------------|------------------------------|---------------------------------|---------|-------------|
| 1   | RF          | 41.5%                        | 33.25%                          | 37.37%  | Low         |
| 2   | NDL         | 54%                          | 33.25%                          | 43.62%  | Low         |
| 3   | NA          | 54%                          | 33.25%                          | 43.62%  | Low         |
| 4   | N           | 54%                          | 33.25%                          | 43.62%  | Low         |
| 5   | D           | 54%                          | 33.25%                          | 43.62%  | Low         |
|     | **Average Total** | 51.5%                        | 33.25%                          | 42.37%  | Low         |

The analysis rubric assessment showed that the average value of the analysis rubric criteria compiled by the sample was 51.5% in the low category. The average suitability value of the analysis rubric of the compiled sample was 33.25% in the low category. This result was relevant to the results of interviews with related lecturers who stated that the constraint in compiling the analysis rubric was in constructing the rubric description.

**Obstacles Experienced by Preservice Biology Teacher of UIN teachers Raden Intan Lampung in Arranging an Analysis Rubric on Performance Assessment**

The analysis rubric is an assessment instrument that is more complicated than other instruments and takes longer to make. It is common to find obstacles in the process of making the rubric. The obstacles experienced by the preservice teachers can be displayed in the table below:

### Table 5. Constraints on Rubric Compilation

| No | Statement Items                                                                                                                                                                                                 | Percentage | Criteria |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------|
| 1  | I cannot integrate biology material into rubric criteria (accuracy, easy to understand, observable, different from each other, complete, can support quality descriptions) correctly.                               | 84.9%      | Low      |
| 2  | I have difficulty in assigning a scoring to the analysis rubric.                                                                                                                                                  | 89%        | Low      |
| 3  | I have difficulty in combining biology-specific material with scientific work skills.                                                                                                                                 | 94.5%      | Low      |
| 4  | I cannot make a well and easily understood description                                                                                                                                                            | 89%        | Low      |
Based on data obtained, 84.9% of preservice teachers admitted that they could not integrate biology content and processes into rubric criteria. Table 3 also shows that 89% of preservice teachers admitted that they were unable to make a well and easily understood description in the analysis rubric. Table 3 also shows that 94.5% of preservice teachers admitted that they had difficulty in integrating biology-specific material with assessed scientific work abilities. Also, 89% of preservice teachers had difficulty in setting the scoring in the analysis rubric.

3.2. Discussion
3.2.1. The Profile of the Abilities of Preservice Biology Teachers in Compiling Analysis Rubrics
Assessment is an important stage in the learning process. Assessment is the step of gathering information regarding learning, the use of time, knowledge, expertise, and available resources [16]. Biology requires students to take part in learning by displaying all the skills that are directed both cognitively and psychomotorly to find a concept, principle, or theory to describe the existing concepts or to deny the existence of findings [17]. According to Puspitasari, science learning aims to develop logical thinking skills which can then be concluded deductively [18]. Therefore, it is important to carry out a performance assessment in learning.

The government aims to introduce assessment instruments in the form of rubrics as a form of socialization and an invitation to teachers to use new assessment instruments to measure the psychomotor domain of students so that they can use varied assessment instruments. The use of rubrics in assessment is considered important because the rubric is considered as the most effective instrument used in assessing student performance compared to other instruments. This is because of the availability of criteria that can provide feedback to students to improve subsequent performance. The intended feedback can come from scores, comments, response models, responses to abilities, and performance of certain skills [11]. Rubrics are also used to diagnose and assess student performance[19, 20].

The first item in Table 1 indicated that the ability of preservice biology teachers in preparing the analysis rubric was relatively low. Understanding the process of constructing rubrics becomes the main capital if teachers want to make rubrics as an instrument of assessment in the psychomotor domain. It includes the understanding of approaches in making rubrics, determining appropriate criteria, preparing a description of a good level of ability, determining the scale, and determining the assessment/scoring techniques. One of the competencies that must be achieved by teachers is pedagogical competence. Pedagogic competencies are competencies possessed by teachers related to the understanding of the management of learning [21]. One of the achievements of pedagogics is the ability of teachers in implementing assessments in the classroom[22].

The second item of Table 1 indicated that the implementation of performance assessments and the use of rubrics in the learning process was relatively low. In some sub-items, 72.6% of preservice biology teachers administered pretest questions in assessing students' learning performance. This certainly needs to be clarified that the test in the form of item tests like pretest and posttest is an assessment for the cognitive domain. Preservice biology teachers also admitted that they often carry out performance assessments by looking at student learning outcomes or examinations (83.6%). This data certainly indicated that preservice teachers did not fully understand the meaning of performance assessments and how to apply actual performance assessments. This assessment requires students to demonstrate understanding, skills, and strategies by modifying products [2]. Certainly, this learning concept is suitable to be applied for learning. Other data showed that 90.4% of preservice biology teachers admitted that they had never compiled an analysis rubric and used it as an assessment.
instrument in performance assessment. The preservice teachers knew the term rubric after reading the distributed questionnaire (68.5%). This data showed that the analysis rubric had not been exposed as an effective instrument in learning performance assessment.

The third item of Table 1 showed that the average value of the suitability of the criteria and description of the analysis rubric compiled by the sample was 42.37% in the low category. This result is relevant to the results of interviews conducted by the researchers with related lecturers who stated that the obstacle in compiling the analysis rubrics was the part of making the description. If the rubric arranged does not meet the standards, then the rubric goal such as to make scoring more accurate, unbiased, and consistent will not be achieved [23].

Obstacles Experienced by Preservice UIN teachers Raden Intan Lampung in Arranging an Analysis Rubric on Performance Assessment.

Based on questionnaire data, it was known that the preservice teachers had difficulties in determining rubric criteria, compiling rubric descriptions, combining biology-specific material with assessed scientific works, and scoring in the analysis rubric. The data are relevant to the data obtained through interviews with related lecturers who said that preservice teachers had problems in determining performance achievements and descriptors. This problem arose because preservice teachers were less thorough in analyzing core competencies and basic competencies. Goldberg raises several problems that often disrupt rubrics, problems such as the lack of consistency and the interrelation between descriptions and the degree of imbalance in criteria [24]. According to Jay, the University as a place of learning for preservice teachers must ensure the readiness of preservice teachers in terms of skills, including skills in terms of assessment and learning techniques in the class [19]. This certainly can be overcome by expanding the horizons of preservice teachers through literacy reading about assessment techniques. According to Lecturer A, not all preservice teachers displayed a great curiosity about assessment techniques. In teaching science, teachers must master the nature of the science learning process which includes aspects of knowledge (cognitive), attitude (affective), and skills (psychomotor) [25]. Considering the short learning time, it is expected that preservice teachers who will become future teachers have an awareness of the importance of deepening knowledge so that they can meet the standards of teacher criteria set by the government.

The novelty of this lies in the suitability description of the analysis rubric compiled by preservice teachers as an addition to the explanation on the implementation of performance assessment in learning. The main cause of the low ability of the preservice teachers in compiling an analysis rubric was the lack of curiosity on the assessment instrument of the psychomotor domain since they focused only on the assessment of the cognitive domain. The preservice teachers also used less varied assessment instruments. Also, the short time of learning in class caused less exposure to the rubric as an assessment instrument.

4. Conclusion
The overall results of the study showed that preservice teachers cannot prepare the analysis rubric. This becomes the material of mutual evaluation to improve each other by their respective tasks and functions. It is expected that university graduates who will become teachers can compete and be competent in their fields to change the world of education in Indonesia.

References
[1] S. Suwandi 2018Model-Model Asesmen Dalam Pembelajaran(Surakarta: Yuma Pustaka)
[2] A. A. I . Marhaeni, L. P. Artini, and N. M. Ratminingsih 2017Asesmen Autentik dalam Pembelajaran Bahasa Inggris 1st ed. (Depok: Rajawali Pers)
[3] R. Santagata and J. H. Sandholtz 2018Preservice Teachers ’ Mathematics Teaching Competence : Comparing Performance on Two Measures.J. Teach. Educ. 70 5 472–484
[4] C. Castle and K. Borowiec 2019Using Rater Cognition to Improve Generalizability of an Assessment of Scientific ArgumentationPract. Assessment, Res. Eval. 24 1 8
[5] K. S. R. Martens 2018 Rubrics in program evaluationEval. J. Australas. 18 1 21–44
[6] T. K. Ghalib and Abdulghani A. Al-Hattami 2015Holistic versus Analytic Evaluation of EFL Writing: A Case StudyEnglish Lang. Teach. 8 7 225–236

[7] M. Álvarez-Díaz, L. M. Muñiz-Bascón, A. Soria-Alemany, A. Veintimilla-Bonet, and R. Fernández-Alonso 2020On the Design and Validation of a Rubric for the Evaluation of Performance in a Musical ContestInt. J. Music Educ. 0255761420936443

[8] M. K. Mace and D. Pearl 2019Rubric Development and Validation for Assessing Comprehensive Internationalization in Higher education. Stud. Int. Educ. 1028315319865790

[9] L. N. Jescovitch, E. E. Scott, J. A. Cerchiara, J. H. Doherty, and M. P. Wenderoth 2019Deconstruction of Holistic Rubrics into Analytic Rubrics for Large-Scale Assessments of Students ’ Reasoning of Complex Science Concepts Deconstruction of Holistic Rubrics into Analytic Rubrics for Large-ScalePract. Assess. , Res. , Eval. 24 1 7

[10] C. A. Mertler 2001 Designing Scoring Rubrics for Your ClassroomPract. Assessement, Res. Eval. 7 1 25

[11] Herman Yosep Sunu 2014 Aplikasi Rubrik Untuk Penilaian Siswa (Sleman: PT Kannisius)

[12] H. Meutia, R. Johar, and A. Ahmad 2013Kemampuan Mahasiswa Calon Guru Menerapkan Penilaian Kinerja Untuk Menilai Hasil Belajar Siswa Dalam Pembelajaran MatematikaJ. Pelayan 1 2 61–70

[13] C. G. Coogle, J. R. Ottley, S. Storie, N. L. Rahn, and A. Kurowski-Burt 2018 Performance-Based Feedback to Enhance Preservice Teachers ’ Practice and Preschool Children ’ s Expressive CommunicationJ. Teach. Educ. 71 2 188–202

[14] E. S. Johnson, Y. Zheng, A. R. Crawford, and L. A. Moylan 2018 Developing an Explicit Instruction Special Education Teacher Observation RubricJ. Spec. Educ. 53 1 28–40

[15] T. Oktriawan, N. Fadiawati, and I. Rosilawati 2015 Pengembangan Instrumen Asesmen Kinerja Pada Praktikum Pengaruh Luas Permukaan Terhadap Laju ReaksiJ. Pendidik. dan Pembelajaran Kim. 4 2593–604

[16] D. Scholtz 2020 Assessing workplace-based learningInt. J. Work. Learn. 21 1 25–35

[17] L. Puspita 2019 Pengembangan modul berasis keterampilan proses sains sebagai bahan ajar dalam pembelajaran biologi Module development based on science process skills as teaching materials in biological learningJ. Inov. Pendidik. IPA 5 1 79–87

[18] N. B. Haka, A. Hamid, A. Dwi, M. Rudhini, and R. A. Riski 2019 Pengembangan Instrumen Evaluasi Two-Tier Multiple Choice Terhadap Literasi Sains Berbantuan Personal ComputerBiosf. J. Tadris Biol. 10 2 201–214

[19] Z. B. Akashe, A. R. N. Esfahani, M. R. Nili, and S. M. S. Tabatabaei 2020 Investigating the desirable assessment methods of the performance of the BA Law students during internshipsInt. J. Work. Learn. 20 1 13–24

[20] K. Young, K. James, and S. U. E. Noy 2016 Exploration of a reflective practice rubricAsia-Pacific J. Coop. Educ. 17 2 135–147

[21] E. Pujiastuti, T. J. Raharjo, and A. T. Widodo 2012 Kompetensi Profesional, Pedagogik Guru IPA, Persepsi Siswa Tentang Proses Pembelajaran dan Kontribusinya Terhadap Hasil Belajar IPA di SMP/MTs Kota Banjarbaru,” Innov. J. Curric. Educ. Technol. 1 1 22–29

[22] N. Irwantoro and Y. Suryana 2016 Kompetensi Pedagogik, 1st Edition(Sidoarjo: Genta Group Production)

[23] S. Karkehabadi 2008 Using Rubrics to Measure and Enhance Student Performance(Washington: Northern Virginia Community College)

[24] K. Schoepp, M. Danaher, and A. A. Kranov 2018 An Effective Rubric Norming ProcessPract. Assessment, Res. Eval. 23 1 11

[25] N. Kurniasih and N. B. Haka 2017 Penggunaan tes diagnostik two-tier multiple choice untuk menganalisis miskonsepsi siswa kelas X pada materi archaeabacteria dan eubacteriaBiosf. J. Tadris Biol. 8 1 114–127