



Performance and Project Assessment in Science Learning

I Wayan Widiana^{1*} 

¹ Jurusan Pendidikan Guru Sekolah Dasar, Universitas Pendidikan Ganesha, Singaraja, Indonesia

*Corresponding author: wayan_widiana@yahoo.co.id

Abstrak

Masih banyak guru yang kurang tepat dalam melaksanakan asesmen dalam pembelajaran. Tujuan penelitian ini yaitu mengembangkan asesmen kinerja dan asesmen proyek dalam pembelajaran sains. Jenis penelitian ini adalah pengembangan penelitian, menggunakan model pengembangan ADDIE. tes subjek terdiri dari ahli uji konten, ahli desain, penilaian ahli dan uji lapangan diperoleh dengan menggunakan kuesioner / angket. Data yang diperoleh dianalisis dengan deskriptif kualitatif, analisis deskriptif kuantitatif dan analisis statistik inferensial. Hasil penelitian ini adalah kualitas penilaian kinerja proyek oleh para ahli Review dalam penilaian kinerja adalah kualifikasi yang sangat baik yaitu 90,00%. Hasil uji ahli mata pelajaran yaitu 96,00%. Ahli desain uji instruksional dalam kualifikasi sangat baik yaitu 92,00%, sedangkan untuk penilaian proyek yang di kualifikasi sangat baik yaitu 92%. Ahli penilaian pembelajaran tes dalam kualifikasi sangat baik yaitu 90,00%, sedangkan untuk penilaian proyek yang di kualifikasi sangat baik yaitu 94% dan uji coba lapangan dalam kualifikasi sangat baik 90,76%. 91,7% untuk penilaian proyek. Efektivitas pengembangan penilaian kinerja yang diperoleh menunjukkan signifikansi adalah $t = 4,612 > \text{tabel} = 2,000$, sedangkan untuk penilaian hasil pengembangan penilaian efektivitas proyek yang diperoleh menunjukkan signifikansi adalah $t = 6,93 > \text{table} = 2,000$. Disimpulkan bawa terdapat perbedaan yang signifikan dalam hasil belajar siswa sebelum dan sesudah menggunakan penilaian kinerja dan penilaian proyek pada pembelajaran sains.

Kata kunci: Asesmen Kinerja, Asesmen Proyek, Sains

Abstract

There are still many teachers who are less precise in carrying out assessments in learning. The purpose of this research is to develop a performance assessment and project assessment in science learning. This type of research is research development, using the ADDIE development model. The subject test consists of content test experts, design experts, expert judgments, and field tests obtained using a questionnaire/questionnaire. The data obtained were analyzed by qualitative descriptive, quantitative, and inferential statistical analysis. The result of this research is that the quality of project performance appraisal by review experts in performance appraisal is a very good qualification, namely 90.00%. The results of the subject expert test are 96.00%. Instructional test design experts in very good qualifications, namely 92.00%, while for project assessment, the qualifications are very good, namely 92%. Experts in the assessment of learning tests with very good qualifications are 90.00%, project assessments with very good qualifications are 94%, and field trials with very good qualifications are 90.76%. 91.7% for project appraisal. The effectiveness of the development of the performance appraisal obtained shows the significance is $t = 4.612 > \text{table} = 2,000$, while for the assessment of the results of the development of the project effectiveness assessment obtained, the significance is $t = 6.93 > \text{table} = 2,000$. It is concluded that there is a significant difference in student learning outcomes before and after using performance and project assessments in science learning.

Keywords: Performance Assessment, Project Assessment, Science Learning

History:

Received : March 24, 2022
Revised : March 28, 2022
Accepted : June 26, 2022
Published : July 25, 2022

Publisher: Undiksha Press

Licensed: This work is licensed under a Creative Commons Attribution 4.0 License



1. INTRODUCTION

The learning process will have a significant influence on the high and low learning outcomes achieved by students. Learning realized in schools has a goal as in science learning (Afni et al., 2018; Siswono, 2017; Yuliati, 2017). *Science learning* is a learning activity that aims to study and investigate natural phenomena (Raharjo et al., 2017; Siswono, 2017).

Science can develop scientific abilities and process skills in students. Science learning can also make students understand natural phenomena (Aiman et al., 2020; Tania & Murni, 2017). In addition, science learning can also increase religious values and open attitudes (Nisa et al., 2015; Taqiyyah et al., 2017). Science learning can lead students to master concepts to solve problems in learning. Through science learning, students not only know or memorize concepts but must also understand the concept (Trisniawati et al., 2018; Wahyuni et al., 2020). The success of science learning is determined by many factors, both teacher factors, student factors, and learning factors. The teacher's ability to prepare lesson plans, learn, choose learning strategies or models, and determine the assessment system will significantly determine the learning process's success level (D'Elia, 2019; Kyrgiridis et al., 2014; Sutarto et al., 2020). To determine the expected goals' success, the teacher needs to evaluate learning. Assessment is a stage in the learning cycle whose role cannot be ignored (Kartowagiran & Jaedun, 2016; Sugihartini & Agustini, 2017). It is said that the evaluation can produce at least two things: first, as feedback on the learning process, and second, it can provide information about the quality of acquisition in students (Rokhim et al., 2021; Winata et al., 2021).

However, the problems that occur today are that there are still many teachers who are not appropriate for carrying out assessments in learning (Kartowagiran & Jaedun, 2016; Rokhim et al., 2021). Previous findings also stated that the regular assessment carried out by teachers only assessed students' cognitive abilities (Dewi & Lestari, 2020; Winata et al., 2021). Other findings also state that some teachers have difficulty carrying out a skill or attitude assessments when students carry out learning activities (Anwar & Jurotun, 2019; Novrianti, 2014). It is because teachers are less able to develop assessment instruments. Previous findings also stated that teachers had difficulties developing performance assessment instruments (Srirahayu & Arty, 2018). Other findings also state that teachers are less able to develop project instruments (Sukmasari & Rosana, 2017; Wardana et al., 2013). Based on the results of initial observations and interviews with Natural Science teachers in grade V SD, it was found that teachers had never conducted a performance assessment in evaluating science learning in grade V. In addition, teachers only used tests to evaluate students' abilities. Hence, teachers had difficulty evaluating the extent to which students' ability to study the material being studied. It certainly affects students' performance and project abilities, which have not been appropriately measured.

Assessment (assessment) is a general term that includes procedures used to obtain information about student learning (observations, average written tests) and learning progress assessment formats (Gupta et al., 2019; Rahayu et al., 2020; Sorensen, 2013). In assessing learning outcomes in schools, there is a tendency for teachers to prioritize the use of tests as the only tool (Febriyanti et al., 2017; Kharismawati, 2022; Zhao, 2014). Even though the test has limitations because it cannot measure students' actual abilities and only focuses on a few aspects. It also does not provide opportunities for students to show their respective abilities or potential because implementing assessments in schools must include various types of measuring instruments (Pramesti et al., 2018; Sholikhah et al., 2018). Measuring tools that can measure students' abilities authentically need to be done to provide an accurate picture of the achievement of student competencies. Based on the learning outcomes of the national exam, the tendency of evaluation in schools is more focused on one evaluation system, namely the use of objective tests. Tests like this have minimal contribution to student learning outcomes, so they are inappropriate for all students' abilities. The inaccuracy of using objective tests for all types of assessments is related to the limitations in the objective tests themselves (Krismony et al., 2020; Pratiwiningtyas et al., 2017). Most teachers use tests that only measure students' cognitive abilities. Teachers rarely use alternative assessments to measure students' abilities, especially student performance assessments. Such conditions have

an impact on student learning outcomes. For this reason, it is necessary to improve learning practices in schools, including assessment practices. The assessment must be done in an authentic (actual, natural, like a student's daily life) way.

The solution offered is to develop project instruments and performance assessments in learning. *Project assessment* is a task assessment that includes competencies that must be completed by students (Amri & Tharikh, 2018; Wardana et al., 2013). Project assignments given by students are usually in the form of investigations. A performance assessment is part of an alternative assessment that requires students to demonstrate performance instead of answering or choosing answers from the alternative answers provided (Barrios et al., 2014; Srirahayu & Arty, 2018). In performance research, the teacher observes students at work, checks the product being made, and assesses the skills demonstrated. Observations are used to provide subjective opinions on the level of student achievement. The evaluation is based on comparing student performance against predetermined standards (Abu-Eisheh & Ghanim, 2021; Sun & Fan, 2022). On the other hand, it is also stated that there are three main components in performance assessment: performance tasks (performance tasks), performance rubrics (performance rubrics), and scoring guides. There are three ways of assessing work: one holistic scoring, namely giving a score based on the inspiration of a general assessment of the quality of performance. Two analytic scorings give a score to aspects that contribute to a performance. Three primary traits are scored based on several dominant performance elements (Al Fariz & Lestari, 2020; Wei et al., 2021).

Assessment does not provide only "one correct answer" but challenges students to explore answers openly, solve complex problems, and draw conclusions independently (Chien et al., 2020; Fan & Smith, 2017). The six characteristics of the assessment are as follows. First, ask students to display, create, produce, or do something. Second, it stimulates higher-order thinking and problem-solving (Koyuncu & Firat, 2020; Xiao & Yang, 2019). Third, using tasks that represent meaningful learning activities. Fourth, real-world applications. Fifth, make a score using human judgment. Sixth, it requires new learning and assessment roles for teachers (Hairida & Junanto, 2018; Winata et al., 2021). Thus, students' progress can be seen holistically, so student achievement is expected to increase. Previous findings stated that the instrument was needed in learning activities (Krismony et al., 2020; Pratiwiningtyas et al., 2017). Other findings also state that developing the right instrument is crucial for measuring students' learning abilities (Safitri & Harjono, 2021). Other findings also reveal that a valid instrument can measure students' abilities (Astiwi et al., 2020; N. F. Lestari & Harjono, 2021). There is no study on the effectiveness of performance and project assessment in science learning. The purpose of this research is to develop a performance assessment and project assessment in science learning. It is hoped that teachers in science learning can use the performance and project assessments.

2. METHODS

This study used the ADDIE development model (Analysis, Design, Development, Implementation or Delivery and Evaluations). The ADDIE model is one of the systematic learning design models (Wulandari et al., 2020). The selection of this model is based on systematic considerations and the theoretical foundation of learning. This model is structured programmatically with systematic sequences of activities to solve learning problems related to a learning resource tailored to the needs and characteristics of students. The subjects of this research are 2 subject matter experts, 2 learning design expert tests, 2 learning assessment expert tests. The test subjects were 26 students of class V. This study used two methods of collecting data to answer problems regarding the design of performance assessment development, the quality of the results of the development of performance assessments, and

the effectiveness of product development, namely the questionnaire and test methods. The questionnaire method is used to determine product quality by testing product validity in developing performance assessments. The instrument used for the questionnaire method in this development research is a questionnaire. Questionnaires are used to collect review data from content experts in the field of study or subject matter experts, design experts, learning assessment experts, and during field tests. The test method used in this study is a learning outcome test, namely an objective or multiple-choice test. This objective or multiple-choice test is used to test the effectiveness of student learning outcomes

In this development research, three data analysis techniques were used: qualitative descriptive analysis techniques, quantitative descriptive analysis techniques, and inferential/inductive statistical analysis methods. Qualitative descriptive analysis is a technique of analyzing data in the form of input given by experts. This data analysis technique is carried out by grouping information from qualitative data in the form of input, feedback, criticism, and suggestions for improvement contained in the questionnaire. The results of this analysis are then used to revise the developed product. Quantitative descriptive analysis is a technique of analyzing data in the form of expert scores. This study used quantitative descriptive analysis to process the data obtained through a questionnaire in the form of scores. Determining the results of validation and product testing is used, using the PAP conversion level of achievement with a scale of 5.

Inferential statistical analysis was used to determine the level of product effectiveness on student learning outcomes in elementary school students before and after using interactive learning multimedia development products. The target group's trial data were collected using pretest and posttest on the subject matter being tested. The pretest and posttest results were then analyzed using the t-test to determine the difference between the results of the pretest and posttest. Prior to testing the hypothesis (correlated t-test), prerequisite tests (normality and homogeneity) were conducted. The normality test was conducted to determine whether the distribution of scores on each variable was normally distributed or not. For that, the Chi-Square formula could be used. Hypothesis testing was carried out in this study using t-test analysis because this research is a study comparing the results of the pretest and the results of the posttest. Testing the research hypothesis was conducted using a correlated sample t-test analysis. All hypothesis testing was carried out at a significance level of 5%. The test criteria are that if the calculation results get the value of $t_{count} > t_{table}$, then H_0 is rejected, and H_1 is accepted.

3. RESULTS AND DISCUSSION

Result

The product produced in this research is a handbook for teachers in the form of performance assessment instruments and project assessments. Before producing a development product, it is necessary to carry out the analysis and planning stages. The analysis phase aims to determine the appropriate competencies for performance appraisal and develop process indicators and learning outcomes based on competence and design tasks used in performance appraisals. Furthermore, at the planning stage, what needs to be done, namely, one composes an instrument grid, two composes an instrument scale, and three makes assessment criteria or rubrics. The quality of product development results, in this case, four main points will be presented: subject content expert tests, learning design expert tests, learning assessment expert tests, and field trials. The four data will be presented successively according to the results obtained from each trial stage. Subject content expert test, this product is assessed by a content expert and a science teacher in elementary school. The instrument used for this subject matter expert trial was a questionnaire. The method used to

collect data is the questionnaire method. Based on the assessment results from subject content experts, the percentage of the achievement level of 90.00% is very good qualifications. So in terms of the content presented in this performance assessment product. It does not need to be revised.

Learning design expert test, this performance assessment product was tested on a learning design expert. Based on the assessment results from the learning design expert, the percentage of the achievement level of 92.00% is in very good qualification. There is no need to revise the point of view of learning media in the performance and project assessment products. Learning assessment expert test, performance assessment product is tested on a learning assessment expert. Based on the results of the assessment from the learning assessment expert, the percentage of the achievement level of 90.00% is in very good qualification. So that in terms of the content/substance of the material presented in the performance assessment and project assessment products, there is no need for revision. Field trials, as test subjects in field trials, namely class V students. These students include students with high, medium, and low learning achievements. Based on the assessment results, the average percentage is 90.76%. The average percentage of 90.76% is in very good qualification, so the developed performance assessment and project assessment products do not need to be revised. The revision of this development product will describe four main points, namely the revision of one subject content expert test, two learning design tests, three learning assessment expert tests, and four field trials. In the sixth stage, nothing meaningful needs to be revised, but there are only a few additions and input from experts and test subjects. Pre-requisites for data analysis, in the pre-requisite test sub-chapter for data analysis using performance assessment and project assessment products. This project goes through two stages before the hypothesis stage, namely, normality and homogeneity tests from the pretest and posttest results that have been carried out. The explanation of this is as follows.

The normality test was carried out to test an empirical distribution following the characteristics of a normal distribution or to investigate the f_o (observation frequency) of the investigated symptoms not deviating significantly from f_e (expected frequency) in a normal distribution. The normality test of the data was carried out on students' science learning outcomes data, consisting of two groups. Namely, the first science learning outcomes of students who took part in learning without using a performance assessment (pretest), and secondly, science learning outcomes of students who took part in learning using a performance assessment (posttest). The results of calculations using the chi-square formula show that the pretest data is normal, which is shown from $X^2_{count} = 4.08 < X^2_{table} = 5.591$. While the posttest data is also normal, it is shown from $X^2_{count} = 2.79 < X^2_{table} = 3.481$. Thus, all data on students' science learning outcomes scores are normally distributed.

The homogeneity of the data was analyzed by F-test, with the criteria of homogeneous data if $F_{count} < F_{table}$, and the data is not homogeneous $F_{count} > F_{table}$. The test results obtained $F_{count} = 1.59$ while $F_{table} = 2.042$ with a significance level of 5%. So it can be concluded that $F_{count} < F_{table}$ so that the two data have a homogeneous data distribution. Hypothesis Testing: After calculating the normality and homogeneity tests, the data obtained were normally distributed and homogeneous, then continued with the t-test. Based on this, it will be continued in testing the research hypothesis (H1). From the results of the t-test obtained $t_{count} = 4,612$ and $t_{table} = 2,000$ for $db = 50$ from a significance level of 5%. It means that $t_{count} > t_{table}$, so H_0 is rejected and H_1 is accepted. Based on the test criteria, H_0 is rejected, H_1 is accepted, which means that there are differences in student learning outcomes before using the performance assessment and project assessment and after using the performance assessment and project assessment in science learning for class V students.

Discussion

Based on the results of data analysis, it was found that there were differences in student learning outcomes before using the performance assessment and project assessment due to the following reasons. First, performance assessment helps teachers in assessing student performance. The product produced in this research is a guidebook for teachers. The performance and project assessments are developed by the school's needs (teachers and students). Valid based on science content, learning design, learning assessment, and field testing, can provide attractiveness and motivate students to learn so that the use of performance assessment in learning science will affect student learning outcomes in science learning. Assessment is a collection of data that can provide an overview of the development of student learning outcomes (Imania & Bariah, 2019; H Purnomo & Wilujeng, 2016). These learning outcomes ensure that students experience the learning process well and clearly (N. Lestari et al., 2020; Heru Purnomo & Wilujeng, 2016). Assessment is based on the teacher's observations of student activities. This assessment is carried out to assess students' abilities through the assignment. The assignments given to students are by the competencies to be achieved to assist teachers in assessing student performance (Abu-Eisheh & Ghanim, 2021; Barrios et al., 2014). This performance assessment has several characteristics, such as the tasks given by the teacher are realistic and complex to encourage students to think (Hairida & Junanto, 2018; Xiao & Yang, 2019). The findings of previous assessments also suggest that assessments require more time (Floryantini et al., 2019; Tomoliyus et al., 2013). The findings of previous studies also state that the performance assessment rubric can provide information about the learning outcomes that students have obtained (Jehanus et al., 2019; Sukmawa et al., 2019). In performance assessment, a teacher must choose and use procedures that are fair to all students regardless of cultural background, language, and gender.

Second, project assessment assists teachers in assessing student projects. *Assessment* is an activity that the teacher must do. Learning activities are practical if useful things support them. *Project assessment* is a mandatory assessment that must be completed by students (Amri & Tharikh, 2018; Wardana et al., 2013). Project assignments given by students are usually in the form of investigations. Project assessment is an evaluation model for evaluating learning activities that carry out project implementation (Parmiti et al., 2021; Rahayu et al., 2020). Project assessment has advantages. Namely, first, the learning process is standardized and meaningful for students (Cifrian et al., 2020; Fardhila & Istiyono, 2019). Second, it provides students opportunities to express what they need to master. Third, this rate is more efficient. Fourth, competency excellence can be accounted for (Agustina, 2016; Río & Rodríguez, 2022). A quality project must be generability, authentic, multiple foci, fair, feasible, and scorability (Hairida & Junanto, 2018; Wiana et al., 2017). Generability, namely the project assessment, is sufficient to be generalized to other tasks. Authenticity is a given task similar to the practice of life. Some focus, namely the task is given, has measured more than one ability. Teachability means that the tasks given are getting better results. Fairness of tasks assigned fair. Eligibility of the assigned task is relevant.

Third, performance and project assessments can make it easier for teachers to assess the learning process. Performance assessment is intentionally designed to ensure the authenticity and honesty of the assessment and that the results are reliable (Abu-Eisheh & Ghanim, 2021; Barrios et al., 2014). In the project appraisal model, the form of the tasks usually reflects the skills needed in everyday life. Paper models and project assessments can measure the success of teachers in teaching material because the evaluation is carried out not only on the cognitive side but on all aspects (Liao et al., 2018; Sun & Fan, 2022). The performance assessment is part of an alternative assessment that requires students to demonstrate performance instead of answering or choosing answers from the alternative

answers provided (Barrios et al., 2014; Srirahayu & Arty, 2018). In performance research, teachers observe students at work or check products and assess the skills shown (Al Fariz & Lestari, 2020; Wei et al., 2021). Observations are used to provide subjective opinions on the level of student achievement. The evaluation is based on comparing student performance against predetermined standards (Abu-Eisheh & Ghanim, 2021; Sun & Fan, 2022). This research implies that teachers can use the performance and project assessment instruments in assessing students. Performance and project assessment in science learning can help teachers understand student learning outcomes after participating in learning activities.

4. CONCLUSION

Based on the results of data analysis, the performance assessment and project assessment instruments get very good qualifications from experts so that the performance assessment and project assessment products developed are feasible to use. In addition, the results of data analysis also found that there were differences in student learning outcomes before using performance assessments and project assessments and after using performance assessments and project assessments in science learning for fifth-grade students. Performance assessments and projects could improve science learning outcomes for fifth-grade students.

5. REFERENCES

- Abu-Eisheh, S. A., & Ghanim, M. S. (2021). Improving senior-level students' performance in Traffic Systems Management using multimedia contents. *Ain Shams Engineering Journal*, *xxxx*. <https://doi.org/10.1016/j.asej.2021.05.025>.
- Afni, N., Agung, M., Fitk, R., Sunan, U., & Yogyakarta, K. (2018). Literasi Sains Peserta Didik Kelas V di MIN Tanuraksan Kebumen. *Al-Bidayah : Jurnal Pendidikan Dasar Islam*, *10*(1), 47–68. <https://doi.org/10.14421/AL-BIDAYAH.V10I1.129>.
- Agustina, N. (2016). Assessment Of Project-Based Learning In Science Class. *Jurnal Siliwangi*, *2*(2). <https://doi.org/10.37058/jspendidikan.v2i2.95>.
- Aiman, U., Amelia, R., & Ahmad, R. (2020). Model Pembelajaran Berbasis Masalah (PBL) Terhadap Literasi Sains Siswa Kelas V Sekolah Dasar. *Jurnal Pendidikan Dasar Flobamorata*, *1*(1), 1–5. <https://doi.org/10.51494/jpdf.v1i1.195>.
- Al Fariz, A. B., & Lestari, C. A. (2020). Does Internet Usage Frequency Give Impact To Student's Academic Performance? *Indonesian Journal of Educational Assesment*. <https://doi.org/10.26499/ijea.v3i1.57>.
- Amri, & Tharihk, A. J. (2018). Pengembangan perangkat asesmen pembelajaran proyek pada materi pencemaran dan kerusakan lingkungan. *Jurnal Penelitian Pendidikan Biologi*, *2*(2). <https://doi.org/10.32502/dikbio.v2i2.1283>.
- Anwar, K., & Jurotun, J. (2019). Peningkatan Aktivitas dan Hasil Belajar Siswa SMA Pada Dimensi Tiga Melalui Model Pembelajaran PBL Berbantuan Alat Peraga. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *10*(1), 94–104. <https://doi.org/10.15294/kreano.v10i1.19366>.
- Astiwi, K. P. T., Antara, P. A., & Agustiana, I. G. A. T. (2020). Pengembangan Instrumen Penilaian Kemampuan Berpikir Kritis Siswa SD pada Mata Pelajaran PPKn. *Jurnal Ilmiah Pendidikan Profesi Guru*, *3*(2), 461–469. <https://doi.org/10.23887/jippg.v3i3>.
- Barrios, M., González-Teruel, A., Cosculluela, A., Fornieles, A., & Turbany. (2014). Structure and performance assessment in traditional face-to-face and blended learning statistics courses. *Procedia-Social and Behavioral Sciences*. *Procedia-Social and Behavioral Sciences*, *141*. <https://doi.org/10.1016/j.sbspro.2014.05.217>.
- Chien, S.-Y., Hwang, G.-J., & Jong, M. S.-Y. (2020). Effects of peer assessment within the

- context of spherical video-based virtual reality on EFL students' English-Speaking performance and learning perceptions. *Computers & Education*, 146. <https://doi.org/10.1016/j.compedu.2019.103751>.
- Cifrián, E., Andrés, A., Galán, B., & Viguri, J. R. (2020). Integration of different assessment approaches: application to a project-based learning engineering course. *Education for Chemical Engineers*, 31. <https://doi.org/10.1016/j.ece.2020.04.006>.
- D'Elia, F. (2019). The training of physical education teacher in primary school. *Journal of Human Sport and Exercise - Autumn Conferences of Sports Science*, 14, S100–S104. <https://doi.org/10.14198/jhse.2019.14.Proc1.12>.
- Dewi, M. S. A., & Lestari, N. A. P. (2020). E-Modul Interaktif Berbasis Proyek terhadap Hasil Belajar Siswa. *Jurnal Imiah Pendidikan Dan Pembelajaran*, 4(3), 433–441. <https://doi.org/10.23887/jipp.v4i3.28035>.
- Fan, J., & Smith, A. P. (2017). Mental Workload: Assessment, Prediction and Consequences. *Communications in Computer and Information Science*, 726, 18–29. <https://doi.org/10.1007/978-3-319-61061-0>.
- Fardhila, R. R., & Istiyono, E. (2019). An assessment instrument of mind map product to assess students' creative thinking skill. *Research and Evaluation in Education*, 5(1), 41–53. <https://doi.org/10.21831/reid.v5i1.22525>.
- Febriyanti, A. L., Harsiati, T., & Dermawan, T. (2017). Pengembangan Instrumen Asesmen Menulis Kreatif Cerita Fantasi Untuk Siswa Kelas VII SMP. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, 2(10). <https://doi.org/10.17977/jptpp.v2i10.10105>.
- Floryantini, K. N., Sudana, D. N., & Sumantri, M. (2019). Pengaruh Model Sfae Berbasis Penilaian Kinerja Terhadap Keterampilan Berbicara Bahasa Indonesia Siswa Kelas V. *Mimbar Ilmu*, 24(1), 114–123. <https://doi.org/10.23887/mi.v24i1.17468>.
- Gupta, S. D., Abdullah, F. A., & Xueshuang, Y. (2019). Peer assessment in writing: A critical review of previous study. *Journal of Advances in Linguistics*, 10, 1478–1487. <https://doi.org/10.24297/jal.v10i0.7992>.
- Hairida, & Junanto, T. (2018). The Effectiveness of Performance Assessment in Project-Based Learning by Utilizing Local Potential to Increase the Science Literacy. *International Journal of Pedagogy and Teacher Education (IJPTE)*, 2. <https://doi.org/10.20961/ijpte.v2i0.25722>.
- Imania, K. A., & Bariah, S. K. (2019). Rancangan Pengembangan Instrumen Penilaian Pembelajaran Berbasis Daring. *Jurnal Petik*, 5(1), 31–47. <https://doi.org/10.31980/jpetik.v5i1.445>.
- Jehanus, C. R., Ayu, H. D., & Sundaygara, C. (2019). Pengaruh Problem Based Learning Berbasis Asesmen Kinerja Terhadap Penguasaan Konsep Fisika Ditinjau Dari Kerja Ilmiah. *Jurnal Pendidikan Fisika JPF*, 7(1). <https://doi.org/10.24127/jpf.v7i1.1359>.
- Kartowagiran, B., & Jaedun, A. (2016). Model Asesmen Autentik Untuk Menilai Hasil Belajar Siswa Sekolah Menengah Pertama (Smp): Implementasi Asesmen Autentik Di Smp. *Jurnal Penelitian Dan Evaluasi Pendidikan*, 20(2), 131. <https://doi.org/10.21831/pep.v20i2.10063>.
- Kharismawati, S. A. (2022). Evaluasi Pelaksanaan Asesmen Nasional Berbasis Komputer di Sekolah Dasar Terpencil. *Ideguru: Jurnal Karya Ilmiah Guru*, 7(2). <https://doi.org/10.51169/ideguru.v7i2.372>.
- Koyuncu, İ., & Firat, T. (2020). Investigating reading literacy in PISA 2018 assessment. *International Electronic Journal of Elementary Education*, 13(2), 263–275. <https://doi.org/10.26822/iejee.2021.189>.
- Krismony, N. P. A., Parmiti, D. P., & Japa, I. G. N. (2020). Pengembangan Instrumen Penilaian Untuk Mengukur Motivasi Belajar Siswa SD. *Jurnal Ilmiah Pendidikan*

- Profesi Guru*, 3(2), 249. <https://doi.org/10.23887/jppg.v3i2.28264>.
- Kyrgiridis, P., Derri, V., Emmanouilidou, K., Chlapoutaki, E., & Kioumourtzoglou, E. (2014). Development of a questionnaire for self-evaluation of teacher effectiveness in physical education (SETEQ-PE). *Measurement in Physical Education and Exercise Science*, 18(2), 73–90. <https://doi.org/10.1080/1091367X.2013.866557>.
- Lestari, N. F., & Harjono, N. (2021). Pengembangan Instrumen Penilaian Karakter PPK Aspek Kemandirian Pembelajaran Tematik Terpadu Siswa SD Kelas 4. *MIMBAR PGSD Undiksha*, 9(1), 19–29. <https://doi.org/10.23887/jjpsd.v9i1.33379>.
- Lestari, N., Gito Hadiprayitno, & Muhlis, M. Yamin, M. L. A. (2020). Pelatihan Teknik-Teknik Analisis Instrumen Penilaian Ranah SMPN 21 Mataram. *Jurnal Pengabdian Masyarakat Sains Indonesia*, 2(1), 36–39. <https://doi.org/10.29303/jpmsi.v2i1.8>.
- Liao, S., Hong, J.-C., Wen, M.-H., Pan, Y.-C., & Wu, Y.-. (2018). Applying Technology Acceptance Model (TAM) to explore Users' Behavioral Intention to Adopt a Performance Assessment System for E-book Production. *EURASIA Journal of Mathematics, Science and Technology Education*, 14(10). <https://doi.org/10.29333/ejmste/93575>.
- Nisa, A., Sudarmin, & Samini. (2015). Efektivitas Penggunaan Modul Terintegrasi Etnosains Dalam Pembelajaran Berbasis Masalah Untuk Meningkatkan Literasi Sains Siswa. *USEJ - Unnes Science Education Journal*, 4(3), 1049–1056. <https://doi.org/10.15294/usej.v4i3.8860>.
- Novrianti, N. (2014). Pengembangan Computer Based Testing (CBT) Sebagai Alternatif Teknik Penilaian Hasil Belajar. *Lentera Pendidikan: Jurnal Ilmu Tarbiyah Dan Keguruan*, 17(1). <https://doi.org/10.24252/lp.2014v17n1a3>.
- Parmiti, D. P., Rediani, N. N., Antara, I. G. W. S., & Jayadiningrat, M. G. (2021). The Effectiveness of Local Culture-Integrated Science Learning through Project-Based Assessment on Scientific Attitudes and Science Process Skills of Elementary School Students. *Jurnal Pendidikan IPA Indonesia*, 10(3). <https://doi.org/10.15294/jpii.v10i3.31301>.
- Pramesti, U. D., Pramesti, U. D., & Effendi, E. E. (2018). Peningkatan Hasil Belajar Menulis Paragraf Pada Mku Bahasa Indonesia Di Universitas Negeri Padang Melalui Model Stad (Student Team-Achievement Divisions) Metode Menulis Berantai. *KREDO: Jurnal Ilmiah Bahasa Dan Sastra*. <https://doi.org/10.24176/kredo.v2i1.2565>.
- Pratiwiningtyas, B. N., Susilaningsih, E., & Sudana, I. M. (2017). Pengembangan Instrumen Penilaian Kognitif untuk Mengukur Literasi Membaca Bahasa Indonesia Berbasis Model Pirls pada Siswa Kelas IV SD. *Journal of Research and Educational Research Evaluation*, 6(1), 01–09. <https://doi.org/10.15294/jrer.v6i1.16199>.
- Purnomo, H., & Wilujeng, I. (2016). Pengembangan Bahan Ajar dan Instrumen Penilaian IPA Tema Indahnya Negeriku Penyempurnaan Buku Guru dan Siswa Kurikulum 2013. *Jurnal Prima Edukasia*, 4(1), 67–78. <https://doi.org/10.21831/jpe.v4i1.7697>.
- Purnomo, Heru, & Wilujeng, I. (2016). Pengembangan Bahan Ajar dan Instrumen Penilaian IPA Tema Indahnya Negeriku Penyempurnaan Buku Guru dan Siswa Kurikulum 2013. *Jurnal Prima Edukasia*, 4(1), 67–68. <https://doi.org/10.21831/jpe.v4i1.7697>.
- Raharjo, M. W. C., Suryati, S., & Khery, Y. (2017). Pengembangan E-Modul Interaktif Menggunakan Adobe Flash Pada Materi Ikatan Kimia Untuk Mendorong Literasi Sains Siswa. *Hydrogen: Jurnal Kependidikan Kimia*, 5(1), 8. <https://doi.org/10.33394/hjkk.v5i1.102>.
- Rahayu, W. P., Hidayatin, & Madziatul. (2020). Development of a Project-Based Learning Assessment System to Improve Students' Competence. *Jurnal Pendidikan Ekonomi & Bisnis*, 8(2). <https://doi.org/10.21009/JPEB.008.2.1>.
- Río, T. G., & Rodríguez, J. (2022). Design and assessment of a project-based learning in a

- laboratory for integrating knowledge and improving engineering design skills. *Education for Chemical Engineers*. <https://doi.org/10.1016/j.ece.2022.04.002>.
- Rokhim, D. A., Rahayu, B. N., Alfiah, L. N., Peni, R., Wahyudi, B., Wahyudi, A., Sutomo, S., & Widarti, H. R. (2021). Analisis Kesiapan Peserta Didik Dan Guru Pada Asesmen Nasional (Asesmen Kompetensi Minimum, Survey Karakter, Dan Survey Lingkungan Belajar. *Jurnal Administrasi Dan Manajemen Pendidikan*, 4(1). <https://doi.org/10.17977/um027v4i12021p61>.
- Safitri, K., & Harjono, N. (2021). Pengembangan Instrumen Penilaian Sikap Sosial Aspek Tanggung Jawab Pembelajaran Tematik Terpadu Siswa Kelas 4 SD. *Mimbar PGSD Undiksha*, 4(1), 111–121. <https://doi.org/10.23887/jp2.v4i1.33352>.
- Sholikhah, Z., Kartana, T. J., & Utami, W. B. (2018). Efektifitas Model Pembelajaran Open-Ended Terhadap Prestasi Belajar Matematika Ditinjau Dari Kreativitas Siswa. *JES-MAT (Jurnal Edukasi Dan Sains Matematika)*, 4(1), 35. <https://doi.org/10.25134/jes-mat.v4i1.908>.
- Siswono, H. (2017). Analisis Pengaruh Keterampilan Proses Sains Terhadap Penguasaan Konsep Fisika Siswa. *Momentum: Physics Education Journal*. <https://doi.org/10.21067/mpej.v1i2.1967>.
- Sorensen, E. (2013). Implementation and student perceptions of e-assessment in a Chemical Engineering module. *European Journal of Engineering Education*, 38(2), 172–185. <https://doi.org/10.1080/03043797.2012.760533>.
- Srirahayu, R. R. Y., & Arty, I. S. (2018). Validitas dan reliabilitas instrumen asesmen kinerja literasi sains pelajaran Fisika berbasis STEM. *Jurnal Penelitian Dan Evaluasi Pendidikan*, 22(2), 168–181. <https://doi.org/10.21831/pep.v22i2.20270>.
- Sugihartini, N., & Agustini, K. (2017). Asesmen Otentik sebagai Pendukung Desain Instruksional Jaringan Komputer Berstrategi Blended-Learning dengan Pendekatan Konstruktivistik. *Journal of Education Research and Evaluation*, 1(2), 82. <https://doi.org/10.23887/jere.v1i2.10072>.
- Sukmasari, V. P., & Rosana, D. (2017). Pengembangan Penilaian Proyek Pembelajaran IPA Berbasis Discovery Learning untuk Mengukur Keterampilan Pemecahan Masalah. *Jurnal Inovasi Pendidikan IPA*, 3(1). <https://doi.org/10.21831/jipi.v3i1.10468>.
- Sukmawa, O., Rosidin, U., & Sesunan, F. (2019). Pengembangan Instrumen Asesmen Kinerja (Performance Assessment) Praktikum Pada Mata Pelajaran Fisika Di Sma. *Jurnal Pendidikan Fisika*, 7(1). <https://doi.org/10.24127/jpf.v7i1.1397>.
- Sun, B., & Fan, T. (2022). The effects of an AWE-aided assessment approach on business English writing performance and writing anxiety: A contextual consideration. *Studies in Educational Evaluation*, 72. <https://doi.org/10.1016/j.stueduc.2021.101123>.
- Sutarto, S., Sari, D. P., & Fathurrochman, I. (2020). Teacher Strategies in Online Learning to Increase Students ' Interest in Learning During COVID-19 Pandemic. *Jurnal Konseling Dan Pendidikan*, 8(147800), 129–137. <https://doi.org/10.29210/147800>.
- Tania, & Murni. (2017). Penerapan Model Pembelajaran Learning Cycle 5e Untuk Meningkatkan Keterampilan Proses Sains Siswa. *Jurnal Ilmiah Penelitian Dan Pembelajaran Fisika*, 3(1). <https://doi.org/10.30870/gravity.v3i1.2413>. 31.
- Taqiyyah, S. A., Subali, B., & Handayani, L. (2017). Implementasi Bahan Ajar Sains Berbahasa Inggris Berbasis Metakognitif Untuk Meningkatkan Kemampuan Pemecahan Masalah Siswa SMP. *Jurnal Inovasi Pendidikan IPA*, 3(2), 224–234. <https://doi.org/10.21831/jipi.v3i2.14859>.
- Tomoliyus, Margono, & Sujarwo. (2013). Kemampuan guru tentang pendidikan jasmani dan penilaian berbasis kinerja. *Cakrawala Pendidikan*, 32(2), 231–239. <https://doi.org/10.21831/cp.v0i2.1481>.
- Trisniawati, Rahayu, A., & Rhosyida, N. (2018). Implementasi Pembelajaran Origamasains

- Matematika Dan Sains Sejak Dini the Implementation of Origamasains Learning To Emerge Fondness To Mathematics and Science. *Jurnal Ilmiah VISI PGTK PAUD Dan Dikmas*, 13(2), 91–99. <https://doi.org/10.21009/JIV.1302.3>.
- Wahyuni, S., Reswita, & Afidah, M. (2020). Pengembangan Model Pembelajaran Sains , Technology , Art , Engineering And Mathemathic Pada Kurikulum PAUD. *Jurnal Golden Age, Universitas Hamzanwadi*, 04(2), 297–309. <https://doi.org/10.29408/goldenage.v4i02.2441>.
- Wardana, I. W., Sudatha, S., & Wawan, I. G. (2013). Pengaruh Model Pembelajaran Group Investigation Berbantuan Asesmen Proyek Terhadap Prestasi Belajar Ipa Siswa Kelas V Sekolah Dasar Gugus Iii Tampaksiring. *Mimbar PGSD Undiksha*, 1. <https://doi.org/10.23887/jjpsd.v1i1.1196>.
- Wei, X., Saab, N., & Admiraal, W. (2021). Assessment of cognitive, behavioral, and affective learning outcomes in massive open online courses: A systematic literature review. *Computers & Education*, 163, 104097. <https://doi.org/10.1016/j.compedu.2020.104097>.
- Wiana, P. J. A. E., Gading, I. K., & Kusmariyatni, N. (2017). The Application of Authentic Assessment to Improve the Learning Outcomes of Science in the fourth-grade students of SD Negeri 2 Pupuan. *Journal of Education Research and Evaluation*, 1(2), 106. <https://doi.org/10.23887/jere.v1i2.9841>.
- Winata, A., Widiyanti, I. S. R., & Cacik, S. (2021). Analisis Kemampuan Numerasi dalam Pengembangan Soal Asesmen Kemampuan Minimal pada Siswa Kelas XI SMA untuk Menyelesaikan Permasalahan Science. *Jurnal Educatio FKIP UNMA*, 7(2). <https://doi.org/10.31949/educatio.v7i2.1090>.
- Wulandari, I. G. A. A. M., Sudatha, I. G. W., & Simamora, A. H. (2020). Pengembangan Pembelajaran Blended Pada Mata Kuliah Ahara Yoga Semester II di IHDN Denpasar. *Jurnal Edutech Undiksha*, 8(1), 1. <https://doi.org/10.23887/jeu.v8i1.26459>.
- Xiao, Y., & Yang, M. (2019). Formative assessment and self-regulated learning: How formative assessment supports students' self-regulation in English language learning. *System*, 81, 39–49. <https://doi.org/10.1016/j.system.2019.01.004>.
- Yuliati, Y. (2017). Literasi Sains Dalam Pembelajaran IPA. *Jurnal Cakrawala Pendas*, 3(2), 21–28. <https://doi.org/10.31949/jcp.v3i2.592>.
- Zhao, H. (2014). Investigating teacher-supported peer assessment for EFL writing. *ELT Journal*, 68(2), 155–168. <https://doi.org/10.1093/elt/cct068>.