SEKOLAH TINGGI KEGURUAN DAN ILMU PENDIDIKAN
PERSATUAN GURU REPUBLIK INDONESIA
STKIP PGRI SUMENEP
Website : www.stkippgrisumenep.ac.id
Jl. Trunojoyo Gedungan Sumenep Telp. (0328) 664094 – 671732 Fax. 671732

SURAT PERNYATAAN PENGECEKAN
SIMILARITY ATAU ORIGINALITY

Yang bertanda tangan dibawah ini atas nama Petugas Check Plagiasi STKIP PGRI Sumenep, menyatakan dengan sebenarnya bahwa karya ilmiah ini telah dilakukan cek dan dinyatakan lolos plagiasi menggunakan Aplikasi Turnitin dengan batas maksimal toloransi 20% atas nama:

Nama : **YETTI HIDAYATILLAH, M.Pd**
NIDN : **0711028901**
Program Studi : **PENDIDIKAN PANCASILA DAN KEWARGANEGARAAN**

No	Judul	Jenis Karya	Hasil
1	**IPAS Learning Assessment To Measure Science Process Skill In Elementary School**	**Artikel**	**14 %**

Demikian surat ini saya buat untuk dipergunakan sebagaimana mestinya

Sumenep, 14 Juni 2023

turnitin
STKIP PGRI SUMENEP

Pemeriksa

YETTI_3.pdf

by Yetti Yetti

Submission date: 14-Jun-2023 01:14PM (UTC+0700)
Submission ID: 2115767798
File name: YETTI_3.pdf (324.84K)
Word count: 8964
Character count: 50714

International Journal of Elementary Education
Volume 6, Number 3, Tahun 2022, pp. 612-623
P-ISSN: 2579-7158 E-ISSN: 2549-6050
Open Access: https://doi.org/10.23887/ijee.v6i4.54217

IPAS Learning Assessment To Measure Science Process Skill In Elementary School

Framz Hardiansyah[1*], Muhammad Misbahudholam AR[2], Yetti Hidayatillah[3]

[1,2] Elementary Teacher Education Study Program, STKIP PGRI Sumenep, Indonesia
[3] Pancasila and Citizenship Education Study Program, STKIP PGRI Sumenep, Indonesia

ARTICLE INFO

Article history:
Received September 03, 2022
Revised September 09, 2022
Accepted November 14, 2022
Available online November 25, 2022

Kata Kunci:
Pengembangan Penilaian, Keterampilan Proses Sains, IPAS

Keywords:
Assessment Development, Science Process Skills, IPAS

ABSTRAK

Hasil analisis kebutuhan, terlihat kenyataan di lapangan bahwa di sekolah proses pembelajaran sudah dilaksanakan tetapi belum dimanfaatkan secara maksimal. Penelitian ini bertujuan untuk mengembangkan asesmen untuk mengukur keterampilan proses sains dan untuk mengetahui kelayakan pengembangan asesmen. Jenis penelitian yang digunakan adalah Research and Development (R&D). Model pengembangan yang digunakan adalah 4-D dengan 4 tahap: define, design, develop, dan disebarluaskan. Subjek penelitian ini yaitu siswa kelas 4 sebanyak 30 orang. Teknik analisis data yang digunakan dalam penelitian ini adalah Persentase kriteria kelayakan produk, Reliabilitas, menggunakan kriteria uji reliabilitas, Analisis daya pembeda, menggunakan kriteria daya pembeda. Hasil pengembangan penilaian untuk mengukur keterampilan proses sains pada mata pelajaran IPA di sekolah dasar diperoleh dari validasi ahli penilaian 73,3%, ahli materi 89,28%, dan ahli bahasa 89,28%. Kelayakan penilaian IPA untuk mengukur keterampilan proses sains siswa didasarkan pada validator ahli; hasilnya memenuhi syarat dan berdasarkan validitas butir soal yang valid dan reliabel yang dapat digunakan untuk mengukur keterampilan proses sains. Butir soal dinyatakan baik dan reliabel sehingga dapat digunakan untuk mengukur keterampilan proses sains Pembuatan penilaian pembelajaran IPA untuk mengukur keterampilan proses sains memerlukan tim ahli, sehingga soal yang dikembangkan perlu referensi lebih banyak untuk menghasilkan soal yang berkualitas, kreatif dan bervariasi.

ABSTRACT

The results of the needs analysis show that the learning process in schools has been carried out but has not been utilized optimally. This study aims to develop an assessment to measure science process skills and to determine the feasibility of developing an assessment. The type of research used is Research and Development (R&D). The development model used is 4-D with 4 stages: define, design, develop, and disseminate. The subjects of this study were 30 grade 4 students. The data analysis technique used in this study is the percentage of product eligibility criteria, reliability, using reliability test criteria, differentiating power analysis, using differentiating criteria. The results of developing an assessment to measure science process skills in science subjects in elementary schools were obtained from the validation of 73.3% assessment experts, 89.28% material experts, and 89.28% linguists. The feasibility of the science assessment to measure students' science process skills is based on expert validators; the results meet the requirements and are based on the validity of valid and reliable test items that can be used to measure science process skills. The items are stated to be good and reliable so that they can be used to measure science process skills. Making science learning assessments to measure science process skills requires a team of experts, so the questions developed need more references to produce quality, creative and varied questions.

1. INTRODUCTION

The quality of learning can be seen in the process and learning outcomes in schools. One of the characteristics of the 2013 curriculum is an assessment that emphasizes learning methods and products to measure mastery or achievement of understanding a competency that has been studied (Andrian & Rusman, 2019; Thoyyibah et al., 2019). Based on concerning Educational Assessment Standards, which explains that the assessment of student learning outcomes includes attitudes, knowledge, and skills competencies that are carried out in a balanced manner (Hardiansyah & Misbahudholam, 2022; Hardiansyah & Zainuddin, 2022; Juliantari et al., 2017). So, it can be seen the implementation concerning Educational Assessment Standards has an impact on the assessment process, including models and techniques as well as assessment procedures that should be carried out in the classroom (Hardiansyah, 2022; Sukmasari & Rosana, 2017). The assessment of learning outcomes can be carried out by educators, education units, and the government (Anna Juniar et al., 2018; Krismony et al., 2020). Class assessment is one of the main evaluation points in

*Corresponding author.
E-mail addresses: framz@stkippgrisumenep.ac.id (Framz Hardiansyah)

the 2013 curriculum. Class assessment can be done in various ways, including performance assessment, attitude assessment (affective aspect), written assessment (paper and pencil test), project assessment, product assessment, assessment through a collection of student work/portofolio, and self-assessment or self-reflection (Juniar et al., 2021). Teachers must use various approaches, strategies, and methods to improve the quality of their learning in the classroom in multiple subjects, including Natural Sciences (Anwar et al., 2016; Duda & Susilo, 2018).

Natural Science studies natural phenomena through facts, concepts, and laws tested for truth (Sari et al., 2018; Subali et al., 2019). The science learning process combines relevant science concepts so that it has more potential to develop the experience and competence of students to understand the natural surroundings (Limatahu & Prahani, 2018; E. Suryawati & Osman, 2017). Science learning has an essential role in producing quality students who are capable of receiving lessons and then applying them in everyday life, possessing rational and objective thinking skills, so that students are not only talented and skilled in the psychomotor field, not just memorization experts, but can seek and investigate a symptom/problem (Kurniawati & Sukardiyono, 2018; Evi Suryawati & Osman, 2018). The process of learning science occurs by doing science, where students who learn do not become spectators but are active from an early age in real experiences (Artun et al., 2020; Setiawan et al., 2017). So that the science learning process it must be designed to emphasize direct experience to develop competence so that students can understand the natural surroundings through the process of "finding out" and "doing"; this will help students to gain a deeper understanding (Ping et al., 2020). By developing science process skills, students can discover and develop their facts and concepts and cultivate and develop a scientific attitude within themselves (Anif et al., 2020; Darmaji et al., 2019).

The process of carrying out science-related activities is usually called Science Process Skills. Process skills are a series of events that students must carry out in finding and processing their acquisition results to be used as new knowledge for themselves (Astra & Wahidah, 2017; Yamin et al., 2020). Science Process Skills are new, so to develop them, it is necessary to know and analyze the profile of Science Process Skills of Students first to find out the situation (Hayati et al., 2019; Yang et al., 2019). The concept discovery process involves basic skills through scientific experiments that can be carried out and improved through laboratory activities (Cairns & Areepattamannil, 2019; Wahyudi & Lestari, 2019). The role of the Science Process Skills approach in teaching and learning is very important to learning success. Training and developing Science Process Skills in students will be very useful for students as a process for building knowledge in learning and in everyday life. Hence, Science Process Skills are very important for students because they prepare and practice dealing with society's realities (Nurhabibah et al., 2018; Wartono et al., 2018). After all, students are trained to think logically in solving a problem that exists in society. In the 2013 curriculum, it is explained that student assessment in the learning process is very closely related to thinking skills. Students' thinking skills can be trained by providing meaningful learning experiences. Students' thinking skills in building new concepts in science learning can be trained through the development of Science Process Skills (McNew et al., 2019).

Based on observations in one of the elementary schools in Sumenep Regency shows that the reality in the field is that teachers still need to use Science Process Skills fully, and the printed books used by schools have yet to be able to develop science process skills. For example: when students answer the question, what the order in which green bean plants reproduce is? Many students still need to answer correctly, such as the question, What is the first thing that comes out when the seeds are planted? Many students answered stems, even though the correct answer was rooted. So students, in this case, still need to improve in observing and inferring aspects. At the time of the experiment, students needed to be properly guided in applying every aspect of the process skills. So, to find out whether the learning that has been done is successful or not, a test instrument is needed to measure it. The test instrument is made based on the abilities of the Science Process Skill. Currently, the Science Process Skill test instrument developed consists of six Science Process Skill indicators, namely observation, measurement, inference, prediction, classification, and communication. With this Science Process Skill, students are expected to be able to discover and develop the knowledge they have acquired. Based on the fact that has been explained that the assessment used by teachers often does not help students optimally in dealing with contextual problems that are focused on students' Science Process Skills problems, the measurement of Science Process Skills becomes very important to find out to what extent students have achieved Science Process Skills so that efforts to increase the Management of Science Learning increase.

The approach needed to achieve skills in learning is a process skills approach, where these process skills can develop students' scientific skills to be more advanced and according to the demands of the times (Gumilar et al., 2019; Nurmaliah et al., 2018). Science is viewed from three dimensions: product, process, and scientific attitudes (Marzuki, 2019; Rosnaeni et al., 2018). Process skills included in the process dimension are taught to students so that in the future, the Indonesian people will be good at using science and producing science. Being skilled in science is more than just understanding, meaning that science process skills require exercises such as observing, classifying, interpreting, and so on (Marzuki, 2019; F. P. Sari et al., 2019). In addition, selecting the Science Process Skill approach is more effective because students are actively involved in the learning process, and the teacher is only a facilitator who guides and coordinates student learning activities. Students are directed to discover various facts for themselves and build concepts and new values needed for life (Mamurov, 2019; Pratono et al., 2018). Science Process Skills are the ability of students to apply the scientific method in understanding, developing science, and discovering knowledge (Ahdhianto et al., 2020; Mamurov, 2019). Science Process Skills are very important for every student as a provision to use the scientific method in developing science to gain new knowledge or develop the knowledge they have. The concept discovery process involves basic skills through scientific experiments that can be carried out and improved through laboratory activities as science process skills (Ahdhianto et al., 2020).

Specifically, the aspect of process skills developed for elementary school students is basic process skills. There are six basic science process skills: observing, classifying, measuring, inferring, predicting, and communicating (Manu & Nomleni, 2018; Ulfah et al., 2018). Teachers should engage students with various experiences that help optimally develop every aspect of process skills. Science process skills will not be separated from the assessment used. Assessment in science learning so far is often done at the end of the learning process. It can be said that the teacher has not assessed during the learning process, so students are only evaluated in terms of the product, not the process. At the same time, the function of the assessment is to monitor the process, progress, and improvement of student learning outcomes on an ongoing basis (Rumalolas et al., 2021; Sudirman et al., 2020; Sukmasari & Rosana, 2017). The assessment is carried out during the learning process, from preparing teaching materials for the summative evaluation. Assessment for learning provides feedback (feedback) and facilitates students' self-assessment to monitor progress and improve the learning and teaching process (Putriadi, 2020; Serevina et al., 2018). The feedback done at the end of the lesson, in the form of grades and descriptions on the report card, does not provide opportunities for students to improve their learning process during teaching and learning activities. Therefore, feedback should not only be done at the end of the learning process but also during the learning process (Krismony et al., 2020; Putriadi, 2020).

Previous research stated that the average science process skills used in science textbooks were examined to increase students' understanding (yalçinkaya önder et al., 2022). Furthermore, other studies stated that the number of KPS for grade IV science learning outcomes was higher than the integrated KPS, and the KPS for integrated science learning outcomes was increased at all other grade levels (Ozkan & Umdu Topsakal, 2021). Measurement of science process skills must use a clear, valid, and coordinated assessment so that teachers and students can use the results as information in the field (Kol & Yaman, 2022; Tok & Ünal, 2020). The assessment carried out by teachers currently only uses two assessment techniques, namely written tests and questions and answers, causing teachers to be less able to determine student progress and learning difficulties (Fadlilah et al., 2021; Tok & Ünal, 2020). The advantage of science process skills is that this assessment can measure students' performance in carrying out various aspects of skills and can reveal students' abilities in understanding concepts, problem-solving, reasoning, and communication (Siswono, 2017; Wahyuni et al., 2018). In addition, this assessment method is considered more appropriate than the written test because what is assessed shows students' actual abilities. Based on the above advantages, it is necessary to research how to develop science learning assessments to measure science process skills in elementary schools. This study aimed to develop an assessment instrument for learning science to measure KPS in elementary schools.

2. METHOD

This type of research uses Research and Development (R&D). The R&D model that will be used is 4D which consists of 4 stages of development (Kramer et al., 2018). First, defining this stage as a requirement and defining the instrument's primarily analytical specifications. The developed instrument aims to measure process skills during learning. The preparation of a grid in the form of indicators that will be a reference for writing instruments. Second, design, this stage is writing, determining the scale, and determining the existing instruments. Then, after the instrument specification is done, the next step is to write an assessment. At the time of writing the assessment, the scale and determination of the assessment system were also carried out. The scale used in this study is the Likert scale, which consists of four categories (the maximum is 4 and the smallest is 1). The scoring system depends on the measurement scale, namely the Likert scale. Third, development, this stage modifies the assessment. Although it has been carried out at the defined stage, these results must be considered from the reviewer's input. At the development stage, there must be feedback by evaluating developments and appropriate and corrected materials. This stage also consists of reviewing the assessment, testing, analyzing the assessment, compiling the assessment, carrying out the measurements, and interpreting the measurement results. Fourth, disseminate; this stage is the last stage used in the assessment developed in a small trial. And at this stage, the product is distributed in schools.

This research was conducted at SDN Poja II Sumenep City, involving 30 grade 4 students. The data collection technique in this research uses a questionnaire distributed to validation experts, teachers, and students as an assessment to measure science process skills. The data collection instruments used in the assessment development research were used in the stages of analysis, needs, expert validation, one-on-one trials, small group trials. Instrument Of Feasibility Development Assessment showed in Table 1.

Table 1. Instrument Of Feasibility Development Assessment

No	Aspect	Indicator
1	Instructions For Use	• Product Content Conformity
2	Questions	• The questions made include the concept of material pressure of substances • The validity of the items with the science process skill indicator to be measured • The suitability of the item with the question indicator • The formulation of a sentence in the form of a question sentence that requires a choice of answers • Tables, pictures or the like are meaningful
3	Assessment rubric and answer key	• The suitability of the answer key with the question • The completeness of the assessment rubric is easy to use

The data analysis techniques used in this study are percentage of product eligibility criteria showed in Table 2. Reliability, using reliability test criteria showed in Table 3. Distinguishing power analysis, using discriminatory power criteria showed in Table 4.

Table 2. Eligibility Criteria

Percentage (%)	Category
81-100	Very worth it
61-80	worthy
41-60	not worth it
21-50	not worthy
0-20	very unworthy

Table 3. Reliability Test Criteria

Reliable Test	Criteria
0,80 < rxy ≤ = 1,00	very high
0,60< rxy ≤ = 0,80	high
0,40< rxy ≤ = 0,60	medium
0,20< rxy ≤ = 0,40	low
0,00< rxy ≤ = 0,20	Very low

Table 4. Criteria for Distinguishing Power of Questions

Distinguishing Questions	Criteria
< 0,20	bad
0,20 – 0,40	enough
0,40 – 0,70	good
0,70 – 1,00	Very good

3. RESULT AND DISCUSSION

Result

The definition stage begins with collecting information that causes problems, so it is necessary to develop an assessment instrument. The data obtained were obtained from the results of interviews at school; the problems found by the teacher were still using teaching materials which caused few obstacles to achieving competence in student skills. The reason is the teacher's use of teaching materials other than modules, which can make it easier for students because they can be used independently (kalemkuş, bayraktar, & çiftçi, 2021). This will make students have little difficulty understanding the concept when the experimental activity occurs. Teachers know modules that are still conventional and have yet to utilize technology. The material explained is still structured based on the concept of certain Basic Competencies rather than a theme. A theme-based science module was developed from the problems found to help teachers. The subsequent analysis is curriculum analysis to determine Basic Competencies and themes. Basic Competency used is 3.4 regarding the characteristics of the substance. The material content used to explain the theme of pressure on liquids is linked to the connected integration model so that students can master all competencies regarding knowledge, skills, and attitudes (Molefe & Aubin, 2021). Based on the material analysis and curriculum analysis that has been summarized, the researcher formulates learning objectives which are integrated with the objectives of product development, namely the assessment of science learning through science process skills in training science communication skills. One of the learning objectives is that students can present experimental data regarding the pressure of substances and capillaries in liquids. To achieve these learning objectives, students present data on the activity results in an experimental report and a video, which can train students' scientific communication orally and in writing.

The second step is planning through the analysis carried out at the definition stage. This planning aims to develop a framework for the contents of the assessment instrument as a whole, including writing the instrument, determining the scale, and determining the system. The form of developing the assessment chosen in this study was a questionnaire. Questionnaire sheets in developing assessments can be carried out more carefully because researchers can give the questionnaires directly to students. The preparation of this observation sheet is adjusted to the aspects of science process skills. The preparation based on the indicators assessed in the development of this assessment is determined by each aspect of the science process skill, which is then adjusted to the substance pressure material. The instrument grids are prepared based on material review and science process skill indicators. Then this grid is translated into question items. The researcher also made a test grid as a validator's consideration to check the validity of the test instrument to measure science process skills. The instrument grids are tested and designed based on or referring to the science process skill indicators in each question; the answer sheets contain the steps for completing each question to train science process skills. In addition, the researcher also designed a scoring guideline that was used to make it easier for researchers, teachers or other researchers to provide an assessment of the results of the science process skill test that students had worked on. The writing of this instrument is based on the grid that has been made, which is then arranged into questions. The researcher developed 30 questions. These question items were derived according to the indicators of science process skills through the questions that were made apart from being derived from the indicators of science process skills were also derived through KI and Basic Competency from the 2013 curriculum. The material for this research was about substance stress which was then adapted to the indicators of science process skills and topics to be taught.

The third step is the development process which will produce a test assessment instrument to measure the validity that will be validated. This stage includes an expert review of the instrument, revision, trial, analysis of trial results, revision, measurement, and interpretation of results. This instrument review was carried out by experts in the field of instruments being developed. The validity test was carried out on three expert lecturers: assessment experts, material experts, and language experts. The validator provides an assessment of the development of assessments to measure science process skills. From the validation of the three expert lecturers, criticism and suggestions for instrument improvement were obtained. After getting suggestions and input from experts, the researcher made improvements according to the existing input and produced revision 1. From the trial results, the assessment calculations obtained valid items, where the items were revised so that they received questions valid will result in revision II. Valid and revised questions will be reassembled into a complete instrument. These items will be the final product of this development research for further measurement. This measurement was carried out after being tested and revised. The measurement results are in the form of a score, and to interpret the measurement results, a criterion is needed. The criteria used depend on the number of items used.

The development of the science learning assessment resulting from the product is in the form of multiple choice questions to measure the science process skills of the concept of substance pressure, totaling 30 questions composed of 10 selected indicators after selecting the indicators that have been formulated. On the one hand, each conception is developed into 1 question with the same level according to the sub-indicators. The questions made apart from being derived from the science process skill indicators were also derived through core competencies and basic competencies from the 2013 curriculum. The material taken for this research was about the characteristics of substances which were then adjusted to the indicators of science process skills and the topics to be taught. The scoring system used in this study is the acquisition score which refers to the scale used, namely a scale of 1 to 4 based on the appearance of the choice of observations available for each item given by the observer.

Validation Questionnaire results get a score of 73.3% (Worthy). After validating the questions related to the material characteristics of the substance, the material expert results are by the science process skills and deserve to be tested and get a percentage of 89.28% with a very feasible category. At the same time, the language validation experts' results improved spelling rules and deserved to be tested without revision and obtained a percentage of 87.5% with a very decent category. The teacher's response before the validation was carried out by the science process skills and got a rate of 89.28% with a very proper category. Questionnaire student responses to the development of science learning assessment showed in Table 5.

Table 5. Student Response Questionnaire

No	Statement	Evaluation			
		1	2	3	4
1	The instruments are there, the questions are easy to understand	0	0	5	10
2	Ability test instrument can be done	0	0	9	6
3	Student understanding of the questions	0	0	7	8
4	Instructions for implementing the instrument questions are easy to understand	0	0	2	13
5	Science process skill instruments are easy to understand	0	0	9	6
6	the time provided is in accordance with the time to do the questions	0	0	5	10
7	Consistency of using symbols	0	0	7	8
	Total Score	**0**	**0**	**44**	**61**
	Total	**105**			
	Criteria	**Very good**			

The data obtained from the test results on students were then converted into a scale of 4. Based on the student response questionnaire results, the number who chose the "very good" category was 61; in the good category, there were 44 students. So the test results on students with very good criteria, so that overall students understand the questions given. Field trials use large groups of 30 students by distributing 30 multiple choice questions that experts have validated, so there are 20 valid and 10 invalid questions. The value of the validity of each item is seen by comparing the Pearson correlation value on the total item with the r product moment table using the value = 5% and n (number of samples = 15), which is said to be valid if the Pearson correlation value in the total item is more than 0.514. The value of Cronbach's alpha obtained is 0.775. This study used 30 samples using a value of = 5% with an r table value of 0.514. Assessment of items can be reliable because the value of Cronbach's alpha 0.775 is more significant than 0.514.

Testing the difficulty level in this study is in the form of multiple choice questions that have been developed to determine the criteria of the question. A question is said to be good if it has moderate difficulty. And the level of difficulty also affects the function of the question in measuring the desired ability. The following is the result of the difficulty level of the question. Based on data analysis, it can be seen that of the 30 questions that have been developed, 9 items can be considered good because they have moderate criteria. At the same time, the 2 items can be said to be not good because they have difficult criteria. The other 19 items are included in the easy category.

Discussion

The form of the development of the science learning assessment resulting from the product is in the form of multiple choice questions to measure the science process skills of the concept of material characteristics of substances in grade 4 students, totaling 30 questions composed of 10 indicators consisting of observation, interpreting observations, classifying, measuring, conducting communication, propose hypotheses, apply concepts, plan experiments, ask questions, formulate ideas. At the stage of developing a test plan, the first thing to plan is a construct (science learning assessment grid) material characteristic of substances that will be used as a reference for a science process skill test. The next step is to analyze the 2013 curriculum for science subjects, which consists of core competencies and basic competencies. This analysis is carried out to determine the position, breadth, and depth of material characteristics of substances in the 2013 curriculum, which is used as a reference in developing science process skill indicators. The use of science process skill-based science assessments in schools has yet to be applied to students, but teachers still use C2 to C6 levels in conducting assessments (Bulut, 2021; Helendra & Sar, 2021). While the questions developed include Core Competencies, Basic Competencies, and indicators of science process skills.

Apart from covering these grids, the questions developed have also gone through the expert validation stages and have been revised according to expert suggestions. This aims to provide guidance and make it easier for the user of the questions to use the questions that have been developed (Bulut, 2021; Helendra & Sar, 2021; Pantiwati, 2016; Srirahayu & Arty, 2018).. After validating the assessment experts, media, and language, these test questions are tested on students to know the feasibility of a science process skills-based science assessment that has been developed and is said to be feasible. Used or not. The science process skills-based science assessment that has been developed is by the procedure for preparing questions (Desnita & Susanti, 2017; Nuswowati et al., 2020). This is by the theory, which states that a good assessment or item is prepared procedurally, which includes determining the purpose of the test, determining the competence and material to be tested, determining the distribution of item items based on competence, material and the form of writing (multiple choice, descriptions and practical tests), compiling the questionnaires, writing the items, then validating the items, assembling the questions into test kits, compiling scoring guidelines (Ping et al., 2020; Rosidin et al., 2019). The items are tried out, then analyzing the items that have been tried out and improving the items based on the results of the analysis. Science process skill-based science assessment developed by product development procedures. Development research is a process or steps to develop a new learning product or perfect an existing one, then validate the learning product so that it can be accounted for and used in the learning process.

The feasibility of science process skill-based science assessment can be seen from the results of expert validity and empirical validity tests (Suratmi et al., 2020; Wei et al., 2021). The validity of the expert can be seen from the validation results of linguists, assessment experts, and material experts. The results of the experts' responses are used to obtain input to improve the product and indicate that the assessment developed is effective. Linguists get an average percentage of 90% with a very decent category. Before validation, the questions needed to pay attention to good punctuation. Then after validation, the questions developed use good and correct language, so the questions are worth trying out. This is to the advice of linguists who state that a good question in terms of language is when the formulation of communicative sentences uses good and correct language and refers to Enhanced Spelling, the formulation of sentences does not cause double interpretation or misunderstanding, uses common language and The formulation of the questions does not contain words that offend students (Hamidah & Wulandari, 2021; Sudirman et al., 2020). The assessment experts obtained an average percentage of 89% with a very decent category. Before validation, the pictures on the questions did not match the statements, sentences, or words in foreign languages that were italicized, and the use of punctuation marks and conjunctions was not in sync with the question sentences.

Field trials using a large scale in grade 4 with a sample of 30 students, at this stage, an assessment that has been revised or improved according to the results of the validity test shows that the development of an assessment to measure science process skills is ready to be used. Based on the tests conducted, it is known that 17 students are less than the minimum completeness. However, according to the criteria for individual and classical completeness, the learning outcomes of grade 4 students are categorized as complete. This is by the opinion, which says that the success of the teaching and learning process is always associated with learning outcomes, meaning that the operation can be optimal if the results obtained (as a result of the process) are as expected (Lestari & Harjono, 2021; Uslan et al., 2018). The science assessment to measure the developed science process skills is by the procedure for preparing questions and beginning with compiling a grid of questions, writing questions, validating items, assembling questions into test kits, compiling scoring guidelines, then testing things, after that analyzing items, and improving questions based on the results of data analysis (Çaycı & Örnek, 2019; Krismony et al., 2020).

Item analysis includes difficulty level, differentiating power, and distractor function analysis. We obtained 20 easy questions, 8 moderate questions, and 2 difficult questions based on the analysis results. Some questions are easier than the questions in the medium and difficult categories. Items in the easy category could be because the distractor didn't work or most students answered correctly, meaning most students have understood the material (Koyunlu Ünlü & Dökme, 2020; Şahintepe et al., 2020). The questions given to students must balance difficult: medium: and easy with a ratio of 3:4:3 or 2:5:3 (Şahintepe et al., 2020). Based on the data obtained, it can be seen that the questions are in the form of easy questions. , moderate and loud, with a ratio of 31:28:1. So it can be seen from the problems that developers have difficulty levels with unequal proportions. Furthermore, the results of calculating the discriminating power were obtained by questions with bad:good: bad discriminating power sequentially 25:17:4. Based on the discriminating power analysis of empirical trials, questions categorized as bad had a higher proportion than the others. Questions that have poor discriminating power are possible because the answer key to the question item is incorrect, the item has two or more correct answer keys, the competency being measured is not clear, the distractor is not functioning, the material being asked is too difficult, so many students guess, some Most students who understand the material being asked think there is wrong information in the item, namely the question (koyunlu ünlü & dökme, 2020). The higher the coefficient that distinguishes the power of an instrument, the more able it is to distinguish between students who master competence and students who lack competence (Fanani, 2018; Kopacz & Handlos, 2021). It can be generalized that the power of discriminating questions is mostly bad, so it cannot be said to be able to distinguish students in upper and lower grades.

The teacher's response questionnaire obtained 89.28% with a very decent category, by the eligibility criteria as stated in the questionnaire scoring using a rating scale. This non-test measurement instrument uses a measurable procedure to obtain information on something that has been researched (Hamdani et al., 2017; Limatahu & Prahani, 2018). The results of the development above are by the opinion, that the assessment of science process skills is appropriate because it can assess the process of acquisition, application, and student skills, through a learning process that shows students' abilities in processes and products (Desnita & Susanti, 2017; Diella & Ardiansyah, 2019). With the science process skills, students can develop their basic process skills so that students become more active in learning in class. The data that has been presented illustrates the increase in students' abilities in science process skills. The research results show that the development of science learning assessments to measure science process skills in elementary schools is considered successful.

4. CONCLUSION

The development of an assessment to measure science process skills is based on ten indicators, including observation, interpreting observations, classification, measuring, communicating, submitting hypotheses, applying concepts, planning experiments, asking questions, and formulating hypotheses. The development of science process skills in the material characteristics of the fourth-grade items is by the steps for preparing good questions. The feasibility of the science assessment to measure science process skills can be seen from expert validation, material, and language, namely the very feasible category. The questions developed the science process skills-based science assessment, and the language used was good and correct.

5. REFERENCES

Ahdhianto, E., Marsigit, H., Haryanto, H., & Nurfauzi, Y. (2020). Improving fifth-grade students' mathematical problem-solving and critical thinking skills using problem-based learning. *Universal Journal of Educational Research*, *8*(5), 2012–2021. https://doi.org/10.13189/ujer.2020.080539.

Andrian, Y., & Rusman, R. (2019). Implementasi pembelajaran abad 21 dalam kurikulum 2013. *Jurnal Penelitian Ilmu Pendidikan*, *12*(1), 14–23. https://doi.org/10.21831/jpipfip.v12i1.20116.

Anif, S., Sutopo, A., & Prayitno, H. J. (2020). Lesson study validation: Model for social and natural sciences teacher development in the implementation of national curriculum in Muhammadiyah schools, Indonesia. *Universal Journal of Educational Research*, *8*(1), 253–259. https://doi.org/10.13189/ujer.2020.080132.

Anwar, H., Jamaluddin, J., & A.W., J. (2016). Pengembangan Perangkat Pembelajaran IPA Model 5E Di SMP. *Jurnal Cakrawala Pendidikan*, *1*(1), 142–151. https://doi.org/10.21831/cp.v1i1.8385.

Artun, H., Durukan, A., & Temur, A. (2020). Effects of virtual reality enriched science laboratory activities on pre-service science teachers' science process skills. *Education and Information Technologies*, *25*(6), 5477–5498. https://doi.org/10.1007/s10639-020-10220-5.

Astra, I. M., & Wahidah, R. S. (2017). Peningkatan Keterampilan Proses Sains Siswa Melalui Model Guided Discovery Learning Kelas XI MIPA pada Materi Suhu dan Kalor. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *3*(2), 181–190. https://doi.org/10.21009/1.03209.

Bulut, A. S. K. (2021). The Effect of the Integration of Science and Mathematics on Critical Thinking and Scientific Process Skills of the Gifted Students. *International Journal of Curriculum and Instruction*, *13*(1), 290–312.

Cairns, D., & Areepattamannil, S. (2019). Exploring the relations of inquiry-based teaching to science achievement and dispositions in 54 countries. *Research in science education*, *49*(1), 1–23.

Çaycı, B., & Örnek, G. T. (2019). Effect of Stem-Based Activities Conducted in Science Classes on Various Variables. *Asian Journal of Education and Training*, *5*(1), 260–268. https://doi.org/10.20448/journal.522.2019.51.260.268.

Darmaji, D., Kurniawan, D. A., & Irdianti, I. (2019). Physics Education Students' Science Process Skills. *International Journal of Evaluation and Research in Education*, *8*(2), 293–298. https://doi.org/10.11591/ijere.v8i2.28646.

Desnita, D., & Susanti, D. (2017). Science Process Skills-Based Integrated Instructional Materials to Improve Student Competence Physics Education Prepares Learning Plans on Teaching Skills Lectures. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *3*(1), 35. https://doi.org/10.21009/1.03105.

Diella, D., & Ardiansyah, R. (2019). Pelatihan pengembangan LKPD berbasis keterampilan proses sains dan instrumen asesmen KPS bagi guru IPA. *Publikasi Pendidikan*, *9*(1), 7–11. https://doi.org/10.26858/publikan.v9i1.6855.

Duda, H. J., & Susilo, H. (2018). Science Process Skill Development: Potential of Practicum through Problems Based Learning and Authentic Assessment. *Anatolian Journal of Education*, *3*(1), 51–60. https://doi.org/10.29333/aje.2018.315a.

Fadlilah, A. U. N., Sabtiawan, W. B., & Widodo, W. (2021). Penerapan Asesmen Pembelajaran Jarak Jauh Materi Kalor dan Perpindahannya Secara Daring dan Luring Di Kelas VII SMP Negeri 1 Sumberrejo. *PENSA: E-JURNAL PENDIDIKAN SAINS*, *9*(2), 199–204.

Fanani, M. Z. (2018). Strategi Pengembangan Soal Higher Order Thinking Skill (HOTS) dalam Kurikulum 2013. *Edudeena*, *2*(1), 57–76. https://doi.org/10.30762/ed.v2i1.582.

Gumilar, R. P., Wardani, S., & Lisdiana, L. (2019). The implementation of guided inquiry learning models on the concept mastery, scientific attitude, and science process skill. *Journal of Primary Education*, *8*(5), 148–154.

Hamdani, H., Mursyid, S., Sirait, J., & Etkina, E. (2017). Analisis Hubungan antara Sikap Penyelesaian Soal dan Hasil Belajar Mahasiswa Calon Guru Fisika. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*. https://doi.org/10.21009/1.03205.

Hamidah, M., & Wulandari, S. S. (2021). Pengembangan Instrumen Penilaian berbasis HOTS menggunakan Aplikasi Quizizz. *Efisiensi: Kajian Ilmu Adminsitrasi*, *18*(1). https://doi.org/10.21831/efisiensi.v18i1.36997.

Hardiansyah, F. (2022). Snowball Throwing: A Method To Uplift Elementary School Students' Responsibility on Environment. *AL-ISHLAH: Jurnal Pendidikan*, *14*(3), 3853–3864. https://doi.org/10.35445/alishlah.v14i3.1966.

Hardiansyah, F., & Misbahudholam, M. (2022). Enhancing Students' Learning Motivation through Changing Seats in Primary School. *Mimbar Sekolah Dasar*, *1*(9). https://doi.org/10.53400/mimbar-sd.v9i1.43002.

Hardiansyah, F., & Zainuddin, Z. (2022). The Influence of Principal's Motivation, Communication, and Parental Participation on Elementary School Teachers' Performance. *Al Ibtida: Jurnal Pendidikan Guru MI*, *9*(2), 319–334. https://doi.org/10.22624/AIMS/ABMIC2021-V2-P12.

Hayati, I. A., Rosana, D., & Sukardiyono, S. (2019). Pengembangan modul potensi lokal berbasis SETS untuk meningkatkan keterampilan proses IPA Development of SETS based local potential modules to improve science process skills. *Jurnal Inovasi Pendidikan IPA*, *5*(2), 248–257. https://doi.org/10.21831/jipi.v5i2.27519.

Helendra, & Sar, D. R. (2021). Pengembangan Instrumen Asesmen Berbasis Literasi Sains Tentang Materi Keanekaragaman Hayati Kelas X. *Journal for Lesson and Learning Studies*, *4*(1), 17–25. https://doi.org/10.23887/jlls.v4i1.34270.

Juliantari, luqman azhar, Florentinus, totok sumaryanto, & Wibawanto, H. (2017). Pengembangan e-Rapor Kurikulum 2013 Berbasis Web di SMK Negeri 1 Slawi. *Innovative Journal of Curriculum and Educational Technology*, *6*(1), 11–16. https://doi.org/10.15294/ijcet.v6i1.15571.

Juniar, A, Fardilah, R. D., & Tambunan, P. M. (2021). The Distinction of Students' Science Process Skill and Learning Activities between Guided Inquiry and Conventional Learning with Experiment. *Journal of Physics: Conference Series*, *1788*(1), 12043. https://doi.org/10.1088/1742-6596/1788/1/012043.

Juniar, Anna, Silalahi, A., & Suyanti, R. D. (2018). Development of Science Process Skill for Chemistry Teacher Candidate Through Analytical Chemistry Learning with Guided Inquiry-Based and eXe Media. *3rd Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL 2018)*, 500–503.

KALEMKUŞ, J., BAYRAKTAR, Ş., & ÇİFTÇİ, S. (2021). Comparative Effects of Argumentation and Laboratory Experiments on Metacognition, Attitudes, and Science Process Skills of Primary School Children. *Journal of Science Learning*, *4*(2). https://doi.org/10.17509/jsl.v4i2.27825.

Kol, Ö., & Yaman, S. (2022). The Effects of Studies in the Field of Science on Scientific Process Skills: A Meta-Analysis Study. *Participatory Educational Research*, *9*(4), 469–494. https://doi.org/10.17275/per.22.100.9.4.

Kopacz, D. M., & Handlos, Z. (2021). Less is More: Course Redesign and the Development of an Atmospheric Science Process Skills Assessment. *International Journal for the Scholarship of Teaching and Learning*, *15*(2), 1–13. https://doi.org/10.20429/ijsotl.2021.150212.

KOYUNLU ÜNLÜ, Z., & DÖKME, İ. (2020). The Effect of Technology-Supported Inquiry-Based Learning in Science Education: Action Research. *Journal of Education in Science, Environment and Health*, *6*(2), 120–133. https://doi.org/10.21891/jeseh.632375.

Kramer, M., Olson, D., & Walker, J. D. (2018). Design and assessment of online, interactive tutorials that teach science process skills. *CBE—Life Sciences Education*, *17*(2), ar19. https://doi.org/10.1187%2Fcbe.17-06-0109.

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/jippg.v3i2.28264.

Kurniawati, A., & Sukardiyono, S. (2018). The Development of Authentic Assessment Instrument to Measure Science Process Skill and Achievement based on Students' Performance. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *4*(2), 65–74. https://doi.org/10.21009/1.04203.

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/jjpgsd.v9i1.33379.

Limatahu, I., & Prahani, B. K. (2018). The effectiveness of CCDSR learning model to improve skills of creating lesson plan and worksheet science process skill (SPS) for pre-service physics teacher. *Journal of Physics: Conference Series*, *997*(1), 12032. https://doi.org/10.1088/1742-6596/997/1/012032.

Mamurov, B. (2019). Scientific basis of the acmeological approach to the process of training and education. *Scientific Journal of Polonia University*, *33*(2), 125–128.

Manu, T. S. N., & Nomleni, F. T. (2018). Pengaruh metode pembelajaran karya kelompok terhadap keterampilan proses sains dengan kovariabel kemampuan berpikir kreatif siswa pada mata pelajaran Biologi. *Scholaria: Jurnal Pendidikan dan Kebudayaan*, *8*(2). https://doi.org/10.24246/j.js.2018.v8.i2.p167-179.

Marzuki, A. (2019). The development of students worksheet based on Predict, Observe, Explain (POE) to improve students' science process skill in SMA Muhammadiyah Imogiri. *Journal of Physics: Conference Series*, *1153*(1), 12148. https://doi.org/10.1088/1742-6596/1153/1/012148.

McNew, M. E., Todd, J. T., Zambrana, K., Hart, K. C., & Bahrick, L. E. (2019). Individual differences in intersensory processing predicts executive functioning and preliteracy skills. *Poster presented at the meeting of the Society for Research in Child Development, Baltimore, MD*. https://doi.org/10.1037%2Fdev0000575.

Molefe, L., & Aubin, J. B. (2021). Exploring how science process skills blend with the scientific process: Pre-service teachers' views following fieldwork experience. *South African Journal of Education*, *41*(2), 1–13. https://doi.org/10.15700/saje.v41n2a1878.

Nurhabibah, S., Hidayat, A., & Mudiono, A. (2018). Pengaruh Model Pembelajaran Inkuiri Terbimbing Terhadap Keterampilan Proses Sains dan Hasil Belajar Muatan IPA di Kelas IV. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan*, *3*(10), 1286–1293. https://doi.org/10.20414/jb.v8i1.56.

Nurmaliah, N., Ilyas, S., & Apriana, E. (2018). Penggunaan Metode Karyawisata Untuk Meningkatkan Pemahaman Konsep Dan Keterampilan Proses Sains Pada Materi Keanekaragaman Hayati. *Biotik: Jurnal Ilmiah Biologi Teknologi dan Kependidikan*, *2*(1). https://doi.org/10.22373/biotik.v2i1.231.

Nuswowati, M., Azzahra, A., & Purwanti, E. (2020). The Effectiveness of Nature-Based Practicum Worksheet on Acid-Base Titration Material Towards Students' Science Process Skills. *Journal of Physics: Conference Series*, *1567*(2). https://doi.org/10.1088/1742-6596/1567/2/022040.

Ozkan, G., & Umdu Topsakal, U. (2021). Analysis of Turkish Science Education Curricula's Learning Outcomes According to Science Process Skills. *Mimbar Sekolah Dasar*, *8*(3), 295–306. https://doi.org/10.53400/mimbar-sd.v8i3.35746.

Pantiwati, Y. (2016). Hakekat Asesmen Autentik Dan Penerapannya Dalam Pembelajaran Biologi. *Jurnal Edukasi Matematika dan Sains*, *1*(1), 18. https://doi.org/10.25273/jems.v1i1.773.

Ping, I. L. L., Halim, L., & Osman, K. (2020). Explicit Teaching of Scientific Argumentation as an Approach in Developing Argumentation Skills, Science Process Skills and Biology Understanding. *Journal of Baltic Science Education*, *19*(2), 276–288.

Pratono, A., Sumarti, S. S., & Wijayati, N. (2018). Contribution of Assisted Inquiry Model of E-Module to Students Science Process Skill. *Journal of Innovative Science Education*, *7*(1), 62–68. https://doi.org/10.15294/jise.v7i1.20633.

Putriadi, D. N. (2020). Pengembangan Asesmen Kinerja Pada Praktikum Ipa Berbasis Pendekatan Saintifik Dalam Meningkatkan Kemampuan Berpikir Kritis Siswa Kelas Vii Smp. *Wahana Matematika dan Sains: Jurnal Matematika, Sains, dan Pembelajarannya*, *14*(2), 125–143. https://doi.org/10.23887/wms.v14i2.16120.

Rosidin, U., Suyanta, A., & Abdurrahman, A. (2019). A combined HOTS-based assessment/STEM learning model to improve secondary students' thinking skills: A development and evaluation study. *Journal for the Education of Gifted Young Scientists*, *7*(3). https://doi.org/10.17478/jegys.518464.

Rosnaeni, Muslimin, & Saehana, S. (2018). Perbandingan Keterampilan Proses Sains antara Kelompok Siswa yang Diajar dengan Model POE dan Model Discovery. *Jurnal Pendidikan Fisika*, *VI*(1), 43–53. https://doi.org/10.24127/jpf.v6i1.1260.

Rumalolas, N., Rosely, M. S. Y., Nunaki, J. H., Damopolii, I., & Kandowangko, N. Y. (2021). The inquiry-based student book integrated with local resources: The impact on student science process skill. *Journal of Research in Instructional*, *1*(2), 133–146. https://doi.org/10.30862/jri.v1i2.17.

Şahintepe, S., Erkol, M., & Aydoğdu, B. (2020). The Impact of Inquiry Based Learning Approach on Secondary School Students' Science Process Skills. *Open Journal for Educational Research*, *4*(2), 117–142. https://doi.org/10.32591/coas.ojer.0402.04117s.

Sari, F. P., Ratnaningtyas, L., Wilujeng, I., & Kuswanto, H. (2019). Development of android comics media on thermodynamic experiment to map the science process skill for senior high school. *Journal of Physics: Conference Series*, *1233*(1), 12052. https://doi.org/10.1088/1742-6596/1233/1/012052.

Sari, P. M., Sudargo, F., & Priyandoko, D. (2018). Correlation among science process skill, concept comprehension, and scientific attitude on regulation system materials. *Journal of Physics: Conference Series*, *948*(1), 12008. https://doi.org/10.1088/1742-6596/948/1/012008.

Serevina, V., Astra, I., & Sari, I. J. (2018). Development of E-Module Based on Problem Based Learning (PBL) on Heat and Temperature to Improve Student's Science Process Skill. *Turkish Online Journal of Educational Technology-TOJET*, *17*(3), 26–36.

Setiawan, Innatesari, D. K., Sabtiawan, W. B., & Sudarmin, S. (2017). The development of local wisdom-based natural science module to improve science literation of students. *Jurnal Pendidikan IPA Indonesia*, *6*(1), 49–54. https://doi.org/10.15294/jpii.v6i1.9595.

Siswono, H. (2017). Analisis Pengaruh Keterampilan Proses Sains Terhadap Penguasaan Konsep Fisika Siswa. *Momentum: Physics Education Journal*, *1*(2), 83. https://doi.org/10.21067/mpej.v1i2.1967.

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.

Subali, B., Kumaidiac, Aminah, N. S., & Sumintono, B. (2019). Student achievement based on the use of scientific method in the natural science subject in elementary school. *Jurnal Pendidikan IPA Indonesia*, *8*(1), 39–51. https://doi.org/10.15294/jpii.v8i1.16010.

Sudirman, S., Kistiono, K., Akhsan, H., & Ariska, M. (2020). Pengembangan Instrumen Penilaian Pengetahuan, Sikap Dan Keterampilan Ipa Berbasis Berpikir Kritis Pada Konsep Listrik Siswa SMP. *Jurnal Inovasi dan Pembelajaran Fisika*. https://doi.org/10.36706/jipf.v7i1.10903.

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), 101–110. https://doi.org/10.21831/jipi.v3i1.10468.

Suratmi, S., Laihat, L., & Asnimar, A. (2020). Development Of Assessment Instruments Based On Higher Order Thinking Skills (HOTS) For Elementary School Students. *JPsd (Jurnal Pendidikan Sekolah Dasar)*, *6*(2). https://doi.org/10.30870/jpsd.v6i2.7356.

Suryawati, E., & Osman, K. (2017). Contextual learning: Innovative approach towards the development of students' scientific attitude and natural science performance. *Eurasia Journal of mathematics, science and technology education*, *14*(1). https://doi.org/10.12973/ejmste/79329.

Suryawati, Evi, & Osman, K. (2018). Contextual learning: Innovative approach towards the development of students' scientific attitude and natural science performance. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(1), 61–76. https://doi.org/10.12973/ejmste/79329.

Thoyyibah, N., Hartono, R., & Bharati, D. A. L. (2019). The Implementation of Character Education in the English Teaching Learning Using 2013 Curriculum. *English Education Journal*, *9*(2), 254–266. https://doi.org/10.15294/eej.v9i2.30058.

Tok, Y., & Ünal, M. (2020). Examining the correlation between resilience levels and math and science process skills of 5-year-old preschoolers. *Research in Pedagogy*, *10*(2), 203–228. https://doi.org/10.5937/istrped2002203t.

Ulfah, M., Harahap, M. B., & Rajagukguk, J. (2018). The effect of scientific inquiry learning model for student's science process skill and self efficacy in the static fluid subject. *3rd Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL 2018)*, 446–449. https://doi.org/10.2991/aisteel-18.2018.96.

Uslan, U., Basri, I., & Muh, A. S. (2018). Pengembangan Perangkat Asesmen Pembelajaran Proyek Pada Materi Perkembangbiakan Tumbuhan. *Jurnal Ilmiah Profesi Pendidikan*, *3*(1). https://doi.org/10.29303/jipp.v3i1.58.

Wahyudi, W., & Lestari, I. (2019). Pengaruh Modul Praktikum Optika Berbasis Inkuiri Terhadap Keterampilan Proses Sains dan Sikap Ilmiah Mahasiswa. *Jurnal Pendidikan Fisika dan Keilmuan (JPFK)*, *5*(1), 33. https://doi.org/10.25273/jpfk.v5i1.3317.

Wahyuni, N. L. P. ., Wibawa, I. M. C., & Renda, N. . (2018). Pengaruh Model Pembelajaran Kooperatif Tipe Group Investigation Berbantuan Asesmen Kinerja Terhadap Keterampilan Proses Sains. *International Journal of Elementary Education*, *2*(3), 202. https://doi.org/10.23887/ijee.v2i3.15959.

Wartono, J. T., Batlolona, J. R., & Grusche, S. (2018). Inquiry-discovery empowering high order thinking skills and scientific literacy on substance pressure topic. *INQUIRY*. https://doi.org/10.24042/jipfalbiruni.v7i2.2629.

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*. https://doi.org/10.1016/j.compedu.2020.104097.

YALÇINKAYA ÖNDER, E., ZORLUOĞLU, S. L., GÜVENÇ, E., TİMUR, B., ÖZERGUN, I., TİMUR, S., & ÖZDEMİR, M. (2022). Investigation of Science Textbooks in terms of Science Process Skills. *International Journal of Contemporary Educational Research*. https://doi.org/10.33200/ijcer.1031338.

Yamin, Y., Permanasari, A., Redjeki, S., & Sopandi, W. (2020). Implementing project-based learning to enhance creative thinking skills on water pollution topic. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, *6*(2), 225–232. https://doi.org/10.22219/jpbi.v6i2.12202.

Yang, K.-K., Hong, Z.-R., Lee, L., & Lin, H.-S. (2019). Exploring the significant predictors of convergent and divergent scientific creativities. *Thinking Skills and Creativity*, *31*, 252–261. https://doi.org/10.1016/j.tsc.2019.01.002.

YETTI_3.pdf

ORIGINALITY REPORT

14%	14%	8%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

MATCH ALL SOURCES (ONLY SELECTED SOURCE PRINTED)

3%

★ Mutammimah, Jumadi, Insih Wilujeng, Heru Kuswanto. "Developing Learning Instruments using Tracker in Measuring Students’ Science Process Skills", Journal of Physics: Conference Series, 2019

Publication

Exclude quotes	On	Exclude matches	< 1%
Exclude bibliography	On		