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Validity Analysis of a Science Process Skills Assessment Instrument for High School Students in Chemistry

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Abstract: The assessment of students' science process skills in several senior high schools in Kupang City is still limited to the final learning outcomes, such as written test scores, and does not optimally measure the scientific thinking process that takes place. The assessment instruments used by teachers still tend to measure only cognitive aspects, so that aspects of science process skills are neglected. The assessment instruments used to measure these skills must have content validity so that the assessment results are accurate and reliable. This study aims to analyze the content validity of assessment instruments for science process skills of senior high school students in grades X, XI, and XII. The research method used is content validity through expert judgment. The science process skills assessment instruments were assessed by six expert validators, namely two learning experts, two chemistry experts, and two evaluation experts. The expert assessment data were analysed using Aiken's V. The results showed that the assessment instruments for science process skills of high school students in grades X, XI, and XII were classified as valid with an average V score of 0.74, which means that the assessment instruments are ready and suitable for use by teachers and schools. The assessment instrument meets the content validity criteria and can be used to assess students' skills in the chemistry learning process at school, but it still needs improvement in several aspects and indicators to enhance the overall quality of the instrument.

Keywords: Assessment instrument; Chemistry; Content validity; High school students; Science process skills

Introduction

Chemistry or science education at the senior secondary school (SMA) level aims not only to transfer concepts, but also to equip students with applicable scientific thinking skills (Alfian et al., 2024). In chemistry education at SMA, mastery of science process skills is very important to help students understand concepts through scientific processes rather than simply memorizing facts (Jaya et al., 2022). One approach to achieving this is through the development and strengthening of scientific process skills (Astuti, 2020). Scientific process skills are a person's basic skills in using their mind, reasoning and actions effectively and efficiently to achieve a certain result (Fatwini et al., 2025). Science Process Skills are an integral part of contextual-based learning activities that describe and illustrate systematic procedures in organising learning experiences and learning to achieve specific learning objectives and serve as guidelines for teaching planning for teachers in carrying out learning activities (Daud, 2018). Science process skills include the ability to

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observe, classify, measure, predict, interpret data, formulate hypotheses, conduct experiments, and communicate (Idris et al., 2022). These skills not only support conceptual understanding but also equip students with the scientific thinking essential for facing the challenges of the 21st century. Science Process Skills are necessary in practical work because with Science Process Skills, students can better understand the importance of a process carried out in practical work (Hardiyani et al., 2025). Students will better understand concepts when applied in practical work, and they will also gain experience in the form of skills when doing practical work because they carry out the experiments themselves in practical work (Hindriana & Nur, 2020).

Assessment is one of the tasks and responsibilities of teachers as educators. One of the functions of assessment is to determine the extent to which students have achieved learning objectives, which is then used to make decisions (Rahmah & Festiyed, 2025). Currently, learning outcome assessment in schools is generally carried out by teachers, with students only being treated as objects of assessment. This type of assessment does not accurately reflect students' actual abilities because the information obtained is based on the teacher's interpretation of the assessment, not information from the students (Supahar et al., 2017). In chemistry learning in senior high schools, the assessment of students' scientific process skills must be carried out systematically and objectively. The assessment instruments used must be valid in terms of content so that they are able to represent the skills to be measured. However, in practice, many of the instruments used by teachers have not undergone a formal validation process. This can result in assessment results that are less objective or not in accordance with the skill constructs that should be measured. Field observations show that the assessment of students' scientific process skills in several high schools in the city of Kupang is still limited to the final learning outcomes, such as written test scores, and does not optimally measure the scientific thinking process that takes place. Teachers tend to assess cognitive aspects through written tests, while the assessment of process skills has not been comprehensively designed (Astalini et al., 2020). The assessment instruments used by teachers still tend to measure only cognitive aspects, so that scientific process skills are neglected (Kriswantoro et al., 2021). One of the reasons for this is the lack of assessment instruments with adequate content validity (Firanti et al., 2025). Assessment instruments are an integral part of the assessment process in learning; what is to be measured in learning is related to the availability of the measurement tools developed. Invalid instruments can produce biased assessment data and lead to inappropriate learning decisions.

Content validity is a very important aspect because it ensures the extent to which the items in the instrument reflect the indicators and learning objectives to be measured. Content validity in science process skills assessment instruments needs to be analysed because often the questions or instruments created by teachers have not undergone systematic testing (Haniah et al., 2018). As a result, the assessment results cannot describe students' abilities comprehensively. This becomes more complex in chemistry learning because the material is abstract and requires proof through laboratory activities (Rehiara, 2025). In the context of chemistry materials, each science process skills indicator must be adjusted to the characteristics of chemistry concepts, phenomena, and experimental activities in secondary schools so that the assessment results truly reflect students' scientific process skills (Kriswantoro et al., 2025). Therefore, content validity analysis involving expert judgement, such as Aiken's V, is an important step in developing instruments (Yusup, 2018).

Therefore, this study was conducted to analyze the content validity of the science process skills assessment instrument for Grade X, XI, and XII science students, which will later be used by chemistry teachers in assessing students' skills in several senior high schools in Kupang City. By knowing the level of instrument validity, schools and teachers can improve the quality of student skills assessment in a more accurate and measurable manner (Yosa et al., 2025). Valid instruments will assist teachers in designing more appropriate learning strategies, encouraging active learning, and facilitating the development of scientific thinking skills needed in the era of the Industrial Revolution 4.0 (Salosso et al., 2018). Valid instruments will help teachers obtain a more accurate picture of students' abilities and can be used as a basis for improving the quality of learning (Yanti & Fuadiyah, 2025). This study is novel in its development and analysis of the content validity of science process skills assessment instruments for high school chemistry materials. These instruments are not widely available and are rarely validated systematically using expert judgment and validity indices. This research is important because science process skills are a key 21st-century competency and a curriculum requirement, but they have not been optimally measured due to limitations in evaluation instruments. A validated instrument will help teachers assess students' scientific abilities objectively and support the improvement of chemistry learning and assessment in schools (Rusmansyah et al., 2025).

Method

This research was conducted from July to September 2025 in an academic environment (lecturers

specialising in learning, chemistry and evaluation (measurement), without involving schools because the research was only at the expert validation stage. This type of research is research and development (R&D), but it is limited to the expert validation stage. The population in this study was all science process skills assessment instruments for high school students in chemistry, with the research sample being the science process skills assessment instruments developed by the researcher, which included indicators for observing, classifying, measuring, concluding and interpreting data. The research method was content validity through expert judgment. The stages of the research included the analysis of needs and literature review of science process skills in chemistry; the preparation of an assessment instrument grid; the preparation of instrument items; expert validation; expert validation analysis; and instrument revision based on validator input.

The data collection technique used in this study was validation using an expert validation sheet filled out by expert validators. The assessment on the validation sheet was compiled based on a Likert scale (1-5). The experts in this study were selected based on their areas of expertise. The expert validators consisted of two learning experts, two chemistry experts, and two evaluation (measurement) experts. The components assessed in the validation process were material, construct, language, usefulness, and appearance. The researchers provided the validators with an outline and instrument items along with a scoring rubric to obtain input. The expected suggestions/input included the suitability of the instrument with the indicators, the suitability of the indicators with the statement items, the accuracy of the statement items, and the clarity of the sentences in the items (Utami et al., 2024). Data analysis in this study used the Aiken formula with the following formula (Nurjanah et al., 2023).

$$V = \frac{S}{[n(c-1)]} \quad (1)$$

Explanation:
S: r-l_0 (the score given by the validator minus the lowest score)
r: evaluator score (scale 1-5)
l_0: lowest score
n: number of validators
c: highest validity assessment score

Expert assessment data is calculated using Aiken's V. The criteria for assessing the content validity correlation coefficient are presented in Table 1.

Table 1. Validity Test Correlation Coefficient (Aliyah et al., 2025)

V Value Range	Validity Category
V≤ 0.40	Not Valid
0.41 ≤ V≤ 0.60	Sufficiently Valid
0.61 ≤ V ≤ 0.80 V ≥ 0.81	Valid Highly Valid

The content validation instrument grid for learning evaluation experts, chemistry and evaluation (measurement) is shown in Tables 2, 3 and 4.

Table 2. Content Validation Instrument Grid for Learning Experts

Aspect	Indicators
Content Suitability	Relevance to Basic Competencies (KD) and learning objectives; relevance of material/suitability of material to learning concepts, Coverage of basic science process skills aspects.
Instrument construction	Clarity of science process skills indicators. Appropriateness of question/task format
Language	Appropriateness of scores and assessment rubrics , Compliance with language rules; clarity of statements/sentences
Learning aspects	Integration with the learning approach (contextual approach) Suitability for secondary school students/suitability for application at secondary school level
Technical presentation	Clear instructions; format and neatness/tidiness and systematics of the instrument

Table 3. Content Validation Instrument Grid for Chemistry Experts

Aspect	Indicators
Content Suitability	Relevance to basic competencies (KD) and learning objectives; relevance of material/suitability of material to learning concepts; comprehensiveness of basic science process skills aspects.
Accuracy of chemical concepts instrument construction.	Conceptual accuracy; contextual appropriateness; clarity of indicators; appropriateness of question/task format.
Language	Scoring and assessment rubric feasibility; clarity of chemical language; ease of understanding.
Technical presentation	Clear instructions; format and neatness/tidiness and systematics of the instrument.

Table 4. Content Validation Instrument Grid for Evaluation Experts (Measurement) (Aliyah et al., 2025)

Aspect	Indicators
Content Suitability	Item suitability with basic KPS indicators; relevance to measurement objectives; sufficiency of item quantity.
Instrument construction	Clarity of indicators; clarity of item wording; appropriateness of format and assessment scale; appropriateness of rubrics.
Language	Clarity of language; appropriateness of language level
Evaluation aspects	Potential reliability; objectivity; practicality
Technical presentation	Systematicity and format; instructions for completion

Results and Discussion

The content validity of science process skills assessment instruments is determined using expert agreement. Expert agreement is used in determining content validity because test or non-test instruments have been proven to be accurate if experts believe that the instruments will measure the abilities to be measured (Sari et al., 2025). Aiken's validity index can be used to determine this expert agreement (Mansur et al., 2023). The Aiken index value (V index) is an index of assessors' agreement regarding the suitability of items with the indicators that need to be measured using these items (Nabil et al., 2022). From the content validity analysis of the science process skills assessment instruments for students in grades X, XI, and XII, the content validity values from six assessors using the Aiken formula were obtained, as shown in Tables 5, 6, and 7. Content validity ensures that the assessment instruments cover all aspects of science process skills indicators. In this study, four categories of answers were used to determine validity, namely not suitable (TL) with a score of 1, less suitable (KL) with a score of 2, quite suitable (CL) with a score of 3, suitable (L) with a score of 4, and very suitable (SL) with a score of 5.

Validation Test

In this validation test, the validation process of the science process skills assessment instrument was analysed using Aiken's formula. This analysis is important to ensure that the assessment instrument has high content validity or is valid, so that it meets the eligibility criteria for use as an assessment instrument in schools. The validation of the science process skills assessment instrument involved six validators, namely three lecturers and three teachers. This validation aims to ensure the depth of chemistry material coverage, the accuracy of chemistry concepts, and suitability with the curriculum. Constructive input and suggestions from validators were accommodated in the revision of the science process skills assessment instrument, resulting in a final draft with guaranteed quality and relevance.

Expert Learning Validation

In this validation, the aspects assessed were content suitability, instrument construction, language, learning aspects, and technical presentation. The results of this validation analysis are presented in Table 5. Based on the data in Table 5, the average V value obtained from the expert learning validation results is 0.71, so it can be concluded that this science process skills assessment instrument is valid and suitable for use. This indicates that the assessment instrument is valid in several aspects and indicators, one of which is in the learning aspect with its indicators, namely namely integration with the learning approach (contextual approach) and suitability for high school students or suitability for application at the high school level (Ramadani et al., 2017). Several suggestions for improvement from both validators have also been noted to enhance several aspects and indicators that were assessed. The instrument is considered valid because this science process skills assessment instrument is capable of measuring student's abilities (Nizary & Kholik, 2021).

Table 5. Results of Learning Expert Validation

Indicators Assessed	V Score	Conclusion
Relevance to Basic Competencies (KD) and learning objectives	0.75	Valid
Relevance of material/suitability of material with learning concepts	0.63	Valid
Coverage of basic science process skills aspects	0.75	Valid
Clarity of science process skills indicators	0.63	Valid
Appropriateness of question/task format	0.75	Valid
Appropriateness of scoring and assessment rubrics	0.75	Valid
Compliance with language rules	0.63	Valid
Clarity of statements/sentences	0.75	Valid
Integration with the learning approach (contextual approach)	0.75	Valid
Suitability for secondary school students/suitability for application at secondary school level	0.75	Valid
Clear instructions	0.75	Valid

Indicators Assessed	V Score	Conclusion
Format, neatness, and systematic organisation of the instrument	0.63	Valid
Average	0.71	Valid

Chemistry Expert Validation

In this validation, the aspects assessed were content appropriateness, chemical concept accuracy, instrument construction, language, and technical presentation. The results of this validation analysis are presented in Table 6.

Based on the data in Table 6, the average V value obtained from the validation results of chemical experts was 0.74, so it can be concluded that this science process skills assessment instrument is valid and suitable for use. The assessment instrument to be used must have valid criteria from expert validators so that it is ready for use by teachers and schools (Wibowo & Pratiwi, 2018). Several suggestions for improvement from both validators have also been noted to enhance several aspects and indicators assessed. In this assessment instrument, the indicator of clarity of chemical language is classified as highly valid with a score of 0.88. In chemistry, many concepts are expressed using chemical language, such as symbolic language. Symbolic language in chemistry not only includes symbols of elements and compounds, but also other concepts such as moles, molality, molarity, pressure, temperature, volume, chemical potential, and others. These symbols often appear together in equations (Andria & Hadiwinarto, 2023).

Table 6. Results of Chemical Expert Validation

Indicators Assessed	V Score	Conclusion
Relevance to KD and learning objectives	0.75	Valid
Relevance of material/suitability of material to chemical concepts	0.75	Valid
Coverage of basic science process skills aspects	0.88	Very valid
Conceptual accuracy	0.63	Valid
Contextual appropriateness	0.75	Valid
Clarity of indicators	0.63	Valid
Appropriateness question/task format	0.75	Valid
Appropriateness of scoring and assessment rubrics	0.75	Valid
Clarity of chemical terminology	0.88	Very valid
Ease of understanding	0.63	Valid
Clear instructions	0.75	Valid
Format, neatness, and systematicity of the instrument	0.75	Valid
Average	0.74	Valid

Expert Validation (Measurement)

In this validation, the aspects assessed were content suitability, instrument construction, language, evaluation aspects, and technical presentation. The results of this validation analysis are presented in Table 7.

Table 7. Results of Expert Evaluation Validation (Measurement)

Indicators Assessed	V Score	Conclusion
Conformity of items with basic science process skills ndicators	0.75	Valid
Relevance to measurement objectives	0.88	Very valid
Sufficiency of item quantity	0.75	Valid
Clarity of indicators	0.88	Very valid
Clarity of item formulation	0.75	Valid
Appropriateness of assessment format and scale	0.75	Valid
Appropriateness of rubrics	0.75	Valid
Clarity of language	0.88	Very valid
Appropriateness of language level	0.75	Valid
Potential reliability	0.63	Valid
Objectivity	0.75	Valid
Practicality	0.88	Very valid
Systematicity and format	0.75	Valid
Instructions for completion	0.75	Valid
Average	0.78	Valid

Based on the data in Table 7, the average V value obtained from the expert evaluation (measurement) validation results was 0.78, so it can be concluded that this science process skills assessment instrument is valid

and suitable for use. All forms of learning tools validated by experts must be classified as valid (Utami et al., 2019). Several suggestions for improvement from both validators have also been noted to enhance several aspects and indicators assessed. In this assessment instrument, the practicality indicator falls into the category of highly valid with a V value of 0.875. This is because the assessment instrument developed is easy to understand. A summary of the validation results of the science process skills assessment instrument by the validators is presented in Table 8.

Table 8. Results of the Validation of the Science Process Skills Assessment Instrument

Type of Validation	Average V Value	Conclusion
Learning	0.71	Valid
Chemistry	0.74	Valid
Evaluation (Measurement)	0.78	Valid
Average	0.74	Valid

Based on Table 8, it can be concluded that overall, this science process skills assessment instrument is valid with an average V score obtained from expert validators in learning, chemistry, and evaluation (measurement) of 0.74. This high validity indicates that this process skills assessment instrument is feasible and ready to be used as an assessment instrument for students in grades X, XI, and XII in chemistry. This is in line with the views of experts who state that an instrument is considered valid if it is able to measure or assess what should be measured or assessed (Deni et al., 2025).

The results of the content validity analysis of the instrument show that most of the assessment items are in line with the science process skills (SPS) indicators relevant to chemistry learning in senior high school (Elvanisi et al., 2018). Science process skills are a set of scientific thinking and acting skills that enable students to understand concepts through direct experience (Andria & Hadiwinarto, 2023). Science process skills include basic skills such as observing, measuring, classifying, and integrated skills such as identifying variables, formulating hypotheses, designing research, and analysing data (Rizal et al., 2022). Therefore, the KPS assessment instrument must be able to capture these scientific processes representatively. KPS assessment instruments are considered valid if the items present the stages of observing, questioning, trying, reasoning, and communicating (Fadillah, 2017). High validity results on the majority of items indicate that the instrument meets curriculum requirements. A validated KPS instrument can improve the quality of chemistry practical assessments and guide students to achieve the Pancasila learner profile, especially in terms of critical and creative thinking (Primadianningsih et al., 2023).

In this overall context, scientific process skills are not merely laboratory competencies, but the foundation of chemistry learning centred on the scientific process (Ramlawati et al., 2025). Various recent research findings show that the development of valid KPS assessment instruments is not only relevant, but also very necessary to improve the quality of learning (Hapisah et al., 2025). Good instruments help students experience the scientific thinking process systematically, strengthen their understanding of chemistry concepts, and shape the scientific character needed in the future (Luque et al., 2018). Thus, KPS becomes an important link between concepts, practices, and science literacy, and is one of the key aspects in producing graduates who are able to think and act scientifically both inside and outside the classroom.

Conclusion

The instrument for assessing the science process skills of senior high school students in grades X, XI and XII is classified as valid with an average V score of 0.74, which means that the assessment instrument is ready and suitable for use by teachers and schools. The assessment instrument meets the criteria for content validity and can be used to assess students' skills in the chemistry learning process at school. In a broader scientific context, these findings indicate that well-designed assessment tools can support the development and evaluation of scientific process skills as an integral part of chemistry education (Sari et al., 2025). Therefore, valid assessment tools have the potential to contribute to improving assessment practices and supporting student-centred learning in chemistry subjects in secondary schools. However, this study was limited to expert validation and did not involve field implementation with students or teachers. As a result, this tool may still require refinement in certain aspects and indicators to improve its practicality and effectiveness in a real classroom environment. Therefore, further research is recommended to conduct extensive field tests, evaluate the practicality and reliability of this tool in various school contexts, and possibly expand the indicators to cover a wider range of scientific process skills. Such studies will help optimise this tool for continuous improvement and maximise its contribution to the field of chemistry education.

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Author Contributions

F.K., M.T., and D.Y.A.F.: preparation of the initial draft, namely the science process skills assessment instrument,

results, discussion of methodology, analysis, conclusions; R., L., and G.J.P.H., G.B.M., P.O.L., F.E., and M.A.U.L: Participation in the validation process.

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Conflict of Interest
The authors declare no conflicts of interest.

References

Alfian, M. A., Parno, Wisodo, H., & Khamis, N. (2024). The Influence of the 9E Learning Cycle with A STEM Approach on Students' Science Process Skills in Static Fluid Topics. *Jurnal Penelitian Pendidikan IPA, 10*(11), 9012–9019. https://doi.org/10.29303/jppipa.v10i11.8916.

Aliyah, H., Saputro, S., & Sarwanto. (2025). Implementation of Problem Based Learning-Science Technology Engineering Art and Mathematics Module to Improve Students' Science Process Skills. *Jurnal Penelitian Pendidikan IPA, 11*(7), 378–386. https://doi.org/10.29303/jppipa.v11i7.11879.

Andria, M., & Hadiwinarto. (2023). Development and Validation of a Two-Tier Multiple Choice Instrument to Assess Students' Science Process Skills in Acid- Base Chemistry. *ISEJ Indonesian Science Education Journal, 4*(1), 11–18. https://doi.org/10.62159/isej.v4i1.141.

Astalini, Kurniawan, D. A., Darmaji, Ikhlas, M., Kuswanto, Perdana, R., Anggraini, L., & Putra, I. (2020). Attitude and Self-confidence Students in Learning Natural Sciences: Rural and Urban Junior High School. *Universal Journal of Educational Research, 8*(6), 2569–2577. https://doi.org/10.13189/ujer.2020.080640.

Astuti, R. T. (2020). Relevansi Kegiatan Praktikum dengan Teori dan Pemahaman Mahasiswa pada Mata Kuliah Kimia Dasar Lanjut. *Orbital: Jurnal Pendidikan Kimia, 4*(1), 16–30. https://doi.org/10.19109/ojpk.v4i1.4336.

Daud, M. (2018). Efektivitas Pembelajaran Keterampilan Proses Sains (KPS) pada Pokok Bahasan Termokimia dalam Meningkatkan Kemampuan Siswa di SMA Negeri 1 Krueng Barona Jaya Kabupaten Aceh Besar Dinas Pendidikan Aceh. *Lantanida Journal, 6*(1), 90–102. https://doi.org/10.22373/lj.v6i1.3157.

Deni, W., Rizal, F., Ambiyar, & Sukardi. (2025). Development of E-Modules for Students' Soft Skills in Facing the World of Work in English Subjects English Subject at SMKN. *Jurnal Penelitian Pendidikan IPA, 11*(4), 265–273. https://doi.org/10.29303/jppipa.v11i4.8653.

Elvanisi, A., Hidayat, S., & Fadillah, E. N. (2018). Analisis Keterampilan Proses Sains Siswa Sekolah Menengah Atas. *Jurnal Inovasi Pendidikan IPA, 4*(20), 245–252. https://doi.org/10.21831/jipi.v4i2.21426.

Fadillah, E. N. (2017). Pengembangan Instrumen Penilaian untuk Mengukur Keterampilan Proses Sains Siswa SMA. *Didaktika Biologi: Jurnal Penelitian Pendidikan Biologi, 1*(2), 123–134. https://doi.org/10.32502/dikbio.v1i2.

Fatwini, Astawan, I. G., & Bayu, G. W. (2025). Development of Experimental Digital Comics to Stimulate Kindergarteners' Science Process Skills. J*urnal Penelitian Pendidikan IPA, 11*(7), 540–552. https://doi.org/10.29303/jppipa.v11i7.11696.

Firanti, F. F., Andromeda, Alizar, & Kurniawati, D. (2025). Validity and Practicality of Reaction Rate Module Based on Problem Based Learning Integrated Socio-Scientific Issues for Phase F. *Jurnal Penelitian Pendidikan IPA, 11*(3), 115–123. https://doi.org/10.29303/jppipa.v11i3.10432.

Haniah, F., Annisa, M., & Kartini. (2018). Pengembangan Instrumen Tes Berbasis Keterampilan Proses Sains pada Materi Benda dan Sifatnya Kelas V DN 010 Tarakan. *Widyagogik, 6*(1), 29–46. https://doi.org/10.21107/widyagogik.v6i1.4560.

Hapisah, Yuniarti, Rahmawati, E., & Suhrawardi. (2025). Development of Media Modules for Pregnant Teenage Mothers using the ADDIE Model (Analyze, Design, Develop, Implement, and Evaluate). *Jurnal Penelitian Pendidikan IPA, 11*(10), 295–304. https://doi.org/10.29303/jppipa.v11i10.12868.

Hardiyani, S., Roshayanti, F., Nuroso, H., & Hayat, M. S. (2025). Analysis of Science Process Skills of Junior High School Students on The Concept of Elements , Compounds , and Mixtures Based on Education for Sustainable Development. Jurnal Penelitian Pendidikan IPA, 11(3), 660–664. https://doi.org/10.29303/jppipa.v11i3.10352.

Hindriana, A. F., & Nur, S. H. (2020). Pengembangan LKS Praktikum Berbasis KPS (Keterampilan Proses Sains) untuk Meningkatkan Penguasaan Konsepdan Sikap Ilmiah Siswa. *EDUBIOLOGICA Jurnal Penelitian Ilmu dan Pendidikan Biologi, 8*(67), 11–26. https://doi.org/10.22219/jpbi.vxiy.xxyy.

Idris, N., Talib, O., & Razali, F. (2022). Strategies in Mastering Science Process Skills in Science Experiments: A Systematic Literature Review. *Jurnal Pendidikan IPA Indonesia, 11*(1), 155–170. https://doi.org/10.15294/jpii.v11i1.32969.

Jaya, T. D., Tukan, M. B., & Komisia, F. (2022). Penerapan Pendekatan Inkuiri Terbimbing untuk Melatih Keterampilan Proses Sains Siswa Materi Larutan

Penyangga. *Educativo: Jurnal Pendidikan, 1*(2), 359–366. https://doi.org/10.56248/educativo.v1i2.44

Kriswantoro, Kartowagiran, B., & Rohaeti, E. (2021). A Critical Thinking Assessment Model Integrated with Science Process Skills on Chemistry for Senior High School. *European Journal of Educational Research, 10*(1), 285–298. https://doi.org/10.12973/eu-jer.10.1.285.

Kriswantoro, Wulandari, L., Sainuddin, S., & J, S. A. (2025). Penilaian Keterampilan Proses Sains pada Praktikum Mahasiswa di Laboratorium Kimia. *Experiment: Journal of Science Education, 5*(1), 45–53. https://doi.org/10.18860/experiment.v5i1.32730

Luque, G. T., Garcia, A. I. F., Manrique, D. C., Egido, J. M. G., & Toro, E. O. (2018). Design and Validation of an Observational Instrument for the Technical-Tactical Actions in Singles Tennis. *Frontiers in Psychology, 9*, 1–10. https://doi.org/10.3389/fpsyg.2018.02418.

Mansur, F. A., Arsyad, & Manaf, A. (2023). Analysis of The Aiken Index to Measure The Content Validity of The Wolio Language and Culture Preservation Model Instrument. *ELS Journal on Interdisciplinary Studies in Humanities, 6*(3), 567–573. https://doi.org/10.34050/elsjish.v5i3.22230.

Nabil, N. R. A., Wulandari, I., Yamtinah, S., Ariani, S. R. D., & Ulfa, M. (2022). Analisis Indeks Aiken untuk Mengetahui Validitas Isi Instrumen Asesmen Kompetensi Minimum Berbasis Konteks Sains Kimia. *Paedagogia, 25*(2), 184–191. https://doi.org/10.20961/paedagogia.v25i2.64566.

Nizary, M. A., & Kholik, A. N. (2021). Validitas Instrumen Assesmen (Analisis Validitas Isi dan Konstruk Instrumen Asesmen Buku Pelajaran Al Quran Hadis Kelas 6 Madrasah Ibtidaiyah Materi Surat Ad Dhuha Bab VI). *Jurnal Contemplate: Jurnal Pendidikan Bahasa Arab, 2*(01), 21–42. https://doi.org/10.53649/contemplate.v2i01.49.

Nurjanah, S., Istiyono, E., Widihastuti, W., Iqbal, M., & Kamal, S. (2023). The Application of Aiken 's V Method for Evaluating the Content Validity of Instruments that Measure the Implementation of Formative Assessments. *Journal of Research and Educational Research, 12*(2). https://doi.org/10.15294/jere.v12i2.76451.

Primadianningsih, C., Sumarni, W., & Sudarmin. (2023). Systematic Literature Review: Analysis of Ethno-STEM and Student's Chemistry Literacy Profile in 21st Century. *Jurnal Penelitian Pendidikan IPA, 9*(2), 650–659. https://doi.org/10.29303/jppipa.v9i2.2559.

Rahmah, S., & Festiyed. (2025). The Validity of Online Assessment Instruments for Measuring Higher Order Thinking Skills of High School Students in Physics Subject. *Jurnal Penelitian Pendidikan IPA, 11*(2), 92–98. https://doi.org/10.29303/jppipa.v11i2.4993.

Ramadani, M., Supahar, S., & Rosana, D. (2017). Validity of Evaluation Instrument on The Implementation of Performance Assessment to Measure Science Process Skills. *Jurnal Inovasi Pendidikan IPA, 3*(2), 180–188. https://doi.org/10.21831/jipi.v3i2.15534.

Ramlawati, Sari, N. I., Kusumawati, R., Yesin, M., Ilmi, N., & Arsyad, A. A. (2025). The Effect of Differentiated Science Inquiry Learning Model Based on Teaching At the Right Level on Students' Critical Thinking and Science Process Skills. *Jurnal Pendidikan IPA Indonesia, 14*(1), 1–16. https://doi.org/10.15294/jpii.v14i1.19479.

Rehiara, R. E. (2025). The Effectiveness of the Probalusan Model on Improving Knowledge and Process Skills in Science Learning for Junior High Schools in Jayapura City. *Jurnal Penelitian Pendidikan IPA, 11*(6), 306–313. https://doi.org/10.29303/jppipa.v11i6.11348.

Rizal, S., Putra, A. K., Suharto, Y., & Wirahayu, Y. A. (2022). Creative Thinking and Process Science Skill: Self-Organized Learning Environment on Watershed Conservation Material. *Jurnal Pendidikan IPA Indonesia, 11*(4), 578–587. https://doi.org/10.15294/jpii.v11i4.39571.

Rusmansyah, Hamid, A., Saadi, P., Aufa, M. N., & Laliyo, L. A. R. (2025). Validity of Wetland-Based Chemistry Teaching E-Module with SCCrT Model Assisted with Liveworksheet to Improve Students' 6c Skills. *Jurnal Penelitian Pendidikan IPA, 11*(2), 108–114. https://doi.org/10.29303/jppipa.v11i2.9017

Salosso, S. W., Nurlaili, & Kusumawarnadi, R. (2018). Analisis Keterampilan Proses Sains Siswa SMA melalui Penerapan Model Pembelajaran Learning Cycle 5e pada Pokok Bahasan Larutan Asam dan Basa. *Bivalen: Chemical Studies Journal, 1*(1), 45–50. https://doi.org/10.30872/bcsj.v1i1.280

Sari, E. P. K., Muntholib, & Nihayah, U. H. (2025). Development of a Science Process Skills (SPS) Test for Assessing Environmental Chemistry Concept : Salt Hydrolysis in Grade XI. *Journal of Environment and Sustainability Education, 3*(3), 350–359. https://doi.org/10.62672/joease.v3i3.117

Supahar, Rosana, D., Ramadani, M., & Dewi, D. K. (2017). The Instrument for Assessing the Performance of Science Process Skills Based on Nature of Science (NOS). *Jurnal Cakrawala Pendidikan, 36*(3), 435–445. https://doi.org/10.21831/cp.v36i3.14731

Utami, Festiyed, Ilahi, D. P., Ratih, A., Lazulva, & Yenti, E. (2024). Analisis Indeks Aiken untuk Mengetahui

Validitas Isi Instrumen Scientific Habits Of Mind. *Journal of Research and Education Chemistry, 6*(1), 59–67. https://doi.org/10.25299/jrec.2024.vol6(1).17430

Utami, S. D., Efendi, I., Dewi, I. N., Ramdani, A., & Rohyani, I. S. (2019). Validitas Perangkat Pembelajaran Etnoekologi Masyarakat Suku Sasak Kawasan Taman Nasional Gunung Rinjani. *Jurnal Penelitian Pendidikan IPA, 5*(2), 240–247. https://doi.org/10.29303/jppipa.v5i2.291.

Wibowo, E., & Pratiwi, D. D. (2018). Pengembangan Bahan Ajar Menggunakan Aplikasi Kvisoft Flipbook Maker Materi Himpunan Pendidikan. *Desimal: Jurnal Matematika, 1*(2), 147–156. https://doi.org/10.24042/djm.v1i2.2279.

Yanti, S. R., & Fuadiyah, S. (2025). Validitas Instrumen Tes Keterampilan Proses Sains pada Materi Sistem Pernapasan Kelas XI SMA/MA. *Jerkin: Jurnal Pengabdian Masyarakat dan Riset Pendidikan, 3*(4), 4590–4597. https://doi.org/10.31004/jerkin.v3i3.

Yosa, I., Arsyad, M., & Palloan, P. (2025). Development of Scientific Literacy E-module in Science (Physics) Subject to Improve Students' Science Process Skills. *Jurnal Penelitian Pendidikan IPA, 11*(6), 947–956. https://doi.org/10.29303/jppipa.v11i6.11895

Yusup, F. (2018). Uji Validitas dan Reliabiltas Instrumen Penelitian Kuantitatif. *Jurnal Tarbiyah: Jurnal Ilmiah Kependidikan, 7*(1), 17–23. https://doi.org/10.18592/tarbiyah.v7i1.2100.