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Practicum Evaluation: Developing Instrument of Scientific Attitudes in Biology

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Abstract

Practicum is an important part that is very closely related to biology. To test theory or find theory need practicum. The practicum can run smoothly and the results of activity practicum can be achieved with a maximum of one of them the factor is if the student's attitude is scientific. This study aims to develop an attitude instrument scientific on activities valid and reliable practicum. The method used in this research is Research and Development (R&D) with the ADDIE model. Stages include Analysis, Design, Development, Implementation, and Evaluation. The results of the study indicate that the scientific attitude instrument is feasible to use because the expert validation result is 86.88. The empirical validation results show that there are 38 valid statements because it is more than 0.3338 and the reliability is more than 0.6.

Keywords: Biology, Instrument, Practicum, Scientific Attitude

INTRODUCTION

Biology is a part of natural science that studies various problems of living things, from unicellular organisms to multicellular organisms (Harahap et al., 2020; Awaludin et al., 2024). Biology is also a field of science that teaches various learning experiences in understanding a concept and scientific process, including practical activities, namely observing, researching, and analyzing logically to produce facts and concepts (Harahap, 2020).

Practicum is an important part of the biology learning process because this activity can develop curiosity, activeness, creativity, and innovation in students.(Taşdemir & Gümüşok, 2023; Rini & Aldila, 2023). Practicum provides direct experience so that it is easier to understand. One of the educational facilities that functions as a support in the learning process in schools, especially those related to practical activities, is the biology laboratory. The biology laboratory has an important position (Watkins, 2020) because the learning process in the laboratory covers three domains at once, namely cognitive, affective, and psychomotor

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(Morselli & Marcelli, 2022; Mohzana et al., 2023; Errabo et al., 2024). Practical tasks must be completed correctly because practicum is a crucial component of the biology learning process.

This is in line with Harahap et al., (2022) and Visnjic Jevtic & Rogulj, (2022) practicum is a way of presenting lessons that allow students to experiment by experiencing and proving for themselves something that is being learned. Practicum is also a structured and scheduled activity that allows students to gain real experience in improving students understanding of theory (Nicho et al., 2024) so that students master certain skills related to a knowledge or a subject. In practicum activities, students' attitudes greatly influence the success of the practice.

Attitude usually leads to something or an object. There is no attitude without an object. *Attitude* is part of human behavior (Hogan & O'Flaherty, 2022) as a form of personality description that can be seen. Attitude is defined as the result of a person's positive or negative assessment of events, activities, ideas, objects or anything in the environment (Benson et al., 2020). Attitude is a person's general tendency that is influenced by the assessment and emotional feelings that a person has. Attitude arises from human needs and is an expression of a person's intellectual process (Christidou et al., 2021; Ayasrah et al., 2024). Attitude is something that is very much needed in interacting (El Masry & Alzaanin, 2021; Suryanto et al., 2023). Attitude is influenced by several factors such as education, intelligence, background, and experience so that the response formed in each individual to an object will be different.

Attitude has 3 components, namely cognitive components, affective components, and behavioral components. The cognitive component is an element of attitude that contains a person's beliefs, opinions, or knowledge of an object. The affective component is an element of attitude related to a person's emotions or feelings towards an object. The behavioral component is an element of attitude that describes actions that may arise from a person towards an object and these actions come from beliefs and emotions (Azwar, 2011).

Attitude toward science refers to the tendency of positive or negative attitudes toward science. Scientific attitude is a person's view or way of thinking by scientific methods so that a tendency to accept or reject arises (Tawil et al., 2024; AlAli & Al-Barakat, 2024). Attitude scientific is the desire someone to develop new knowledge and respond to a problem according to thinking scientifically (Inayah et al., 2020; Fadilah et al., 2024). Attitude scientific close to the concept of science and activities science that can strengthen positive as well as develop the ability of students to grow ability creative, independent, and responsible (Yuliasari & Agustin, 2024). Attitude scientific can be used to evaluate somebody to an object related to science to improve knowledge students (Sturgis et al., 2024) in answering, asking, discussing,

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and respecting others. Scientific attitudes that must be possessed and developed in science learning are curiosity, encouraging discoveries *(inventiveness)*, critical thinking, and having a stance (*persistence)* so as not to be afraid to express opinions (Gega, 1977).

However, in reality still, there is problem low attitudes of scientific students. The gap occurs because the learning carried out by teachers is less varied and rarely done practical work through observations and experiments. This leads to a lack of desire knowledge, and attitude value data. One of the how to ensure the practical process is truly carried out by students and by established procedures determined is by providing an instrument for measuring the attitude of scientific students or can be checked one by one activity practical work that has been carried out, so that attitude scientific student will appear during the practicum process. Because of this, a tool for evaluating how well tasks are being carried out is required.

Assessment will be valid and reliable if the questions or instruments are constructed by considering real-life conditions (Dimmick et al., 2023; Rahmat & Abuzaraida, 2023; Harahap & Harahap, 2024). Assessment instruments in learning are an integral part of the assessment process which consists of tests and assessment systems (Rahmat & Abuzaraida, 2023; Dimmick et al., 2023). The quality of the assessment instruments will directly affect the accuracy of achieving results.

RESEARCH METHODS

The development of scientific attitude instruments in biology practicum activities is a type of Research and Development (R&D) research using the ADDIE development model in Figure 1. However, this research only reached the Develop stage.

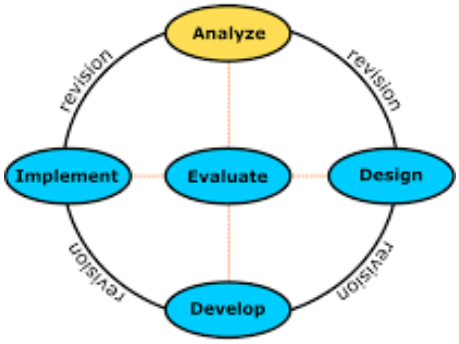

Figure 1. ADDIE development model

The population in this study were students of class X SMAN 2 Krakatau Steel Cilegon with a sample of 35 students. The following is an explanation of each stage:

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A. Analyze Stage

This stage consists of initial and final analysis, student analysis, task analysis, and material concept analysis.

B. Design Stage

This stage is the initial design such as making an outline, determining the indicators or dimensions to be measured namely curious, responsible, discipline, honest, and meticulous Dimyati and Mudjiono (2004) and developing a scientific attitude instrument in the form of *a checklist* and equipped with an assessment rubric.

Table 1. Scientific Attitude Instrument Grid

No.	Dimensions Scientific Attitude	Explanation	Question Number
1.	Curious Attitude	a. The enthusiastic attitude of students when carrying out practical work b. The attitude of daring to ask questions in students c. An interested attitude in seeking causal relationships from the results of experiments and discussions carried out by students	a. 4, *29, 40 b. 25, 28, 33 c. 34, 35, 36
2.	Responsible Attitude	a. Students prepare reports seriously b. Students carry out practical work by work procedures seriously c. Students feel satisfied if they can do the practicum as well as possible	a. 22, *24, 27 b. 13, 18, 31 c. *5, 9, 15
3.	Discipline Attitude	a. Students obey the rules in the laboratory b. Students carry out practical work by utilizing their time as effectively and efficiently as possible. c. Students submit reports on time	a. 16, 21, 37 b. 39, 41, 43 c. 12, 38, *44
4.	Honest Attitude	a. Students are not afraid to report to the teacher if they have made a mistake in carrying out the practicum b. Record data that corresponds to the observation results c. Do not copy the results of observations and reports of other students	a. *2, 7, 11 b. 1, 10, 19 c. 6, 8, *26
5.	Thorough Attitude	a. Students make observations using the appropriate senses according to their needs and collect relevant facts. b. Students can use practical tools and materials properly and correctly. c. Students carry out the experimental steps correctly	a. 23, 30, 45 b. 3, 17, 20 c. 14, 32, *42
Number of Question Items Used (valid)			**38**

Note: *No Valid

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C. Develop Stage

Instrument assessment by validators or experts and empirical validation on students are part of this stage. Here is the development.

1. Expert assessment

The experts/validators in the development of this instrument are Master of Biology Education and Master of Science lecturers who are experts in the field of scientific attitudes.

2. Instrument Development Test

Testing of instruments on students. Test results to determine the empirical validity and reliability of scientific attitude tests.

According to Dimyati and Mudjiono (2004), scientific attitude consists of several dimensions: curiosity, responsibility, discipline, honesty, and thoroughness. Scientific attitude in students is measured using an instrument in the form of a questionnaire with a Likert scale model. The way to fill in the Likert scale in the instrument has distinguished alternative answers for each statement item and respondents can choose one answer that suits their choice, starting from strongly agree to disagree strongly. Answers for each item that indicate a low scientific attitude will get a score of 1, while answers that demonstrate a high scientific attitude will get a score of 4.

RESULTS AND DISCUSSION

The results of this study are in the form of a student scientific attitude questionnaire instrument. The following are the results of development in each phase.

1. Analyze

First, an analysis was conducted in the form of an unstructured interview with a class X, teacher regarding learning activities including practicum activities. Through the interview, it can be concluded that the practicum has not been successful, or is not optimal, is less impressive, and there is a lack of scientific attitude from students in biology practicum activities. Often students have gone through practicum but do not know the benefits of the practicum. When asked to practice again at home, some students cannot or forget how to do it so it has an impact on the failure of the practicum results.

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2. Design

a. Creating an outline and determining indicators

Table 2. Instrument design and determination of scientific attitude indicators

No	Question	A	O	S	N
1	I am always enthusiastic to see the results of observations during the practicum				
2	Etc.				

Note: A=Always, O=Often, S=Seldom, or N=Never

b. Development of scientific attitude instruments

The scientific attitude instrument developed consisted of 45 positive and negative questions in *multiple-choice form.*

Example questions to measure scientific attitudes

Before starting the practicum, I first read the work methods that had to be carried out.

A = Always

O = Often

S = Seldom

N = Never

The answer that gets the highest points is "A=Always" because reading the practical work procedures first will make it easier for students to get the maximum practical results as expected.

Table 3. Instrument design and determination of scientific attitude indicators

Indicator	Question	Answer
Discipline Attitude	In carrying out Practicums must pay attention to and obey the rules laboratory.	*A= Always =1* *O=Often=2* *S= Seldom =3* *N=Never = 4*

3. Develop

a. Expert Score

The validators in this study were two Biology Education Master lecturers who were experts in the field of practical activities and laboratory use. Validation refers to indicators of

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curiosity, responsibility, discipline, honesty, and thoroughness. Validators I and II provided comments and suggestions on the concept, accuracy, and presentation of statements, and the suitability of scientific attitudes to statements. The instruments that have been prepared will be assessed by the validator, namely from 1 to 100. The aspects assessed include the completeness of the instrument, the suitability of the assessment technique, the suitability of the content, and the language. Then the average suitability of the instrument will be sought, as shown in Table 4.

Table 4. Expert validator scores

Component	Type of Questions	Validators	Eligibility Percentage	Total Average	Conclusion
Scientific Attitude	Checklist	Validator I	85.25	86.88	Worthy
		Validator II	88.50		

Based on Table 4, the developed instrument can be used to measure students' scientific attitudes because it reaches an average of 86.88, so it can be continued to the empirical validation stage.

b. Empirical Validation and Reliability Results

The validity process can be done by analyzing the data from the instrument trial, namely item validity using the correlation coefficient between item scores and the total score of each component. The validity test of the scientific attitude test was carried out using *Pearson product-moment.* Based on the results of the validity test calculation, the results showed that the valid questions were 38 out of 45 questions (Table 1) in the question number section. Invalid question numbers are marked with an asterisk (*).

In addition to being valid, a measuring instrument used in research must also be reliable. Reliability can also be called consistency or how much trust is in the measuring instrument. The implications of how much trust is in the measuring instrument can be seen if several measurements are carried out on the same group of subjects, relatively the same results will be obtained as long as the aspects of the object being measured have not changed. The reliability test of scientific attitudes was carried out using the *Cronbach alpha formula wi*th the help of the SPSS program. Based on the results of the reliability test, it was obtained that $r_{count} > r_{table,}$ namely 0.881 > 0.05, which means that the scientific attitude instrument that has been developed is reliable. The complete results of the validity and reliability calculations can be

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seen in (Appendix 1 and Appendix 2). The following are the results of the instruments developed.

Table 5. Instruments Developed

No.	Statement	Attitude			
		A	O	S	N
1.	The reported experimental data must be by the results of the practicum, even if some do not correspond to the hypothesis.				
2.	There is no need to report to the teacher if you forget/skip one of the work procedures.				
3.	The use of tools from one experiment to the next does not need to be cleaned first, because it will not affect the results of the experiment.				
4.	I am always enthusiastic about seeing the results of observations during practical work.				
5.	I do not feel satisfied if the practicum hours end before I have completed all the practicum activities.				
6.	When I have not finished all the practicums, I will borrow the results of other groups and record them as observation data.				
7.	If during the practicum you break laboratory equipment, you must report it to the teacher.				
8.	When the experimental data is lost and a friend's data is found, the data is taken and used to make a report rather than not collecting it.				
9.	I feel insecure if the results of my observations are different from the results of other friends' observations.				
10.	Writing experimental data must be by the results of your observations, even if they differ from 198those of some other groups.				
11.	Admit mistakes if intentionally or unintentionally you don't bring practical materials.				
12.	If I forget to submit the report on the deadline, I ask for dispensation from the teacher so that I can submit it at another time.				
13.	The practicum was carried out seriously according to work procedures to obtain good results/data.				
14.	Before the practicum, I always read first the work method that must be carried out.				
15.	I trust my group members to complete all the practical activities.				
16.	When carrying out practical work, you must pay attention to and obey laboratory regulations.				
17.	Practitioners can use the practical materials freely until the experimental results are by the hypothesis.				
18.	The use of practical materials must be by needs.				

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19.	Report only the available data, because the laboratory practicum is only an exercise.				
20.	I always measure the practical materials that will be used first.				
21.	By obeying laboratory regulations, practitioners will work safely.				
22.	Processing the results of the practical work according to my abilities, because I am not a researcher.				
23.	Since there was still time left, it was used to repeat the experiment whose results were somewhat questionable.				
24.	In completing the report I did it according to the knowledge I had.				
25.	Ask the teacher if there are things in the practical activities that you don't understand.				
26.	In making my practical report, I always work together with my group members.				
27.	Include images based on the results of practical work and images based on literature.				
28.	If you experience difficulties in practicing, you don't need to ask the teacher, because all the work methods are listed on the work activity sheet.				
29.	Before carrying out the practicum, I read the theories related to the practicum being carried out.				
30.	If the data obtained is different from the theory, then there is no need to find out what the cause is, the important thing is that the practicum has been carried out by work procedures.				
31.	When carrying out practical work, work procedures must be followed so that relevant facts are obtained.				
32.	Students are not required to carry out the experimental steps according to the procedure, students can carry out experiments according to their wishes so that students can freely explore.				
33.	In processing data from practical work that is different from the theory, you have to ask the teacher a lot of questions.				
34.	I always compare the results of my observations with the results of other people's observations and analyze them.				
35.	If the data obtained is different from the theory, I will find out what is the cause.				
36.	I collected as many theories as possible to use in discussing the results of the practicum.				
37.	Laboratory regulations make practitioners feel less free so they cannot explore further.				
38.	I am determined to complete the lab report even though there are many other assignments.				

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39.	When carrying out the practicum, I did it quickly, so that I had time to rest.				
40.	Observations were carried out seriously and seriously so that many relevant facts were collected.				
41.	Being late for a practical event at school is not an issue because the practical is completed in groups.				
42.	If the data obtained is different from the theory, repeat the practicum until the expected data is obtained.				
43.	When practicing, it is done quickly so that the remaining time can be used for studying, because the next hour there is another lesson.				
44.	I will work on the lab report if other friends have worked on the lab report.				
45.	I always observe every change in shape/color/quantity of the object of observation when conducting experiments.				

CONCLUSION

Based on the results of the study, it can be concluded that the scientific attitude instrument in the form of *a checklist* that has been developed is appropriate for measuring students' scientific attitudes. There are 38 valid and reliable statements. The developed instrument is expected to help teachers in directing students to be more concerned, and more concentrated on biology practicum activities so that practicum activities are more optimal, memorable, and useful.

REFERENCES

AlAli, R., & Al-Barakat, A. (2024). Young children's attitudes toward science learning in early learning grades. *Asian Education and Development Studies*, *13*(4), 340–355. https://doi.org/10.1108/AEDS-02-2024-0036

Awaludin, J., Kurniati, T. H., Ristanto, R. H., & Komala, R. (2024). How environmental literacy research works in biology learning? A literature review. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, *10*(1), 131–142. https://doi.org/10.22219/jpbi.v10i1.31291

Ayasrah, F. T. M., Alarabi, K., Al Mansouri, M., Fattah, H. A. A., & Al-Said, K. (2024). Enhancing secondary school students' attitudes toward physics by using computer simulations. *International Journal of Data and Network Science*, *8*(1), 369–380. https://doi.org/10.5267/j.ijdns.2023.9.017

Azwar, S. (2011). *Sikap Manusia: Teori dan Pengukurannya.* Yogyakarta: Pustaka Pelajar.

Benson, O., Nwagbo, C. R., Ugwuanyi, C. S., & Okeke, C. I. O. (2020). Students' Perception of Teachers' Pedagogical Skills and its Influence on their Attitude towards Science, Implication for Science, Technology and Engineering Careers. *International Journal of Mechanical and Production Engineering Research and Development*, *10*(3), 14701–14714. https://doi.org/10.24247/ijmperdjun20201397

Christidou, D., Papavlasopoulou, S., & Giannakos, M. (2021). Using the lens of science capital to capture and explore children's attitudes toward science in an informal making-based space. *Information and Learning Science*, *12*(5–6), 317–340. https://doi.org/10.1108/ILS-09-2020-0210

Dimmick, A. A., Callahan, J. L., & Cox, R. J. (2023). Further Validation of Competency Assessment: The Practicum Evaluation Form. *Training and Education in Professional Psychology*, *17*(3), 269–276. https://doi.org/10.1037/tep0000416

Dimyati dan Mudjiono. (2004). *Belajar dan Pembelajaran*. Jakarta : Proyek Pembinaan dan Peningkatan Mutu Kependidikan, Dirjen Dikti Depdikbud.

El Masry, T., & Alzaanin, E. I. (2021). The impact of the intrapersonal, interpersonal and ecological factors on pre-service second language teachers' identity construction. *Saudi Journal of Language Studies*, *1*(1), 50–66. https://doi.org/10.1108/sjls-03-2021-0007

Errabo, D. D., Paguio, A. J., & Enriquez, P. A. (2024). Epistemic fluency in virtual laboratories as flipped classroom's innovative learning delivery. *Journal of Research in Innovative Teaching and Learning*, *17*(2), 256–281. https://doi.org/10.1108/JRIT-03-2024-0052

Fadilah, S. I., Surakusuma, W., & Sanjaya, Y. (2024). Pengaruh Kegiatan Merancang Alat Sederhana Dalam Praktikum Terhadap Penguasaan Konsep dan Sikap Ilmiah pada Materi Sistem Pernafasan SMA. *Oryza (Jurnal Pendidikan Biologi)*, *13*(1), 7–17. https://doi.org/10.33627/oz.v13i1.1729

Gega, P.C. (1977). *Science in Elementary Education*. California: John Willey & Sons Inc.

Harahap, L. J. (2020). *Pengaruh Model Pembelajaran Cooperative Integrated Reading, Composition and Guided Inquiry (CirGi) terhadap Keterampilan Berpikir Kritis dan Penguasaan Konsep Ekosistem*. Universitas Negeri Jakarta.

Harahap, L. J., & Harahap, L. J. (2024). Development of an Instrument for Measuring Intention to ACT and Healthy Eating Behavior of Students. *Jurnal of Health Science*, *17*(1), 45–54. https://doi.org/https://doi.org/10.33086/jhs.v17.i01.4547 45

Harahap, L. J., Komala, R., & Ristanto, R. H. (2020). Studying Ecosystem in Senior High School : The Utilization of CirGi Learning Model to Enhance Mastery of Biological Concepts. *IRJE (Indonesian Research Journal in Education)*, *4*(2), 515–529.

Harahap, L. J., Siregar, R. A., & Marpaung, D. R. A. K. M. (2022). Analisis Pelaksanaan Praktikum dan Kelengkapan Sarana Prasarana Laboratorium Biologi di SMA Negeri Kota Padangsdimpuan. *Bioedunis Journal*, *1*(1), 9–16. https://doi.org/10.24952/bioedunis.v1i1.5358

Hogan, D., & O'Flaherty, J. (2022). Exploring the nature and culture of science as an academic discipline: implications for the integration of education for sustainable development. *International Journal of Sustainability in Higher Education*, *23*(8), 120–147. https://doi.org/10.1108/IJSHE-06-2021-0236

Inayah, A. D. Y., Sigit, D. V., Ristanto, R. H., & Miarsyah, M. (2020). Virtual laboratory of protists: Learning media to enhance scientific attitudes. *JPBIO (Jurnal Pendidikan Biologi)*, *13*(2), 183–200. https://doi.org/https://doi.org/10.31932/jpbio.v5i2.874

Mohzana, M., Murcahyanto, H., Fahrurrozi, M., & Supriadi, Y. N. (2023). Optimization of Management of Laboratory Facilities in the Process of Learning Science at High School. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 8226–8234. https://doi.org/10.29303/jppipa.v9i10.5249

Morselli, D., & Marcelli, A. M. (2022). The role of qualitative research in Change Laboratory interventions. *Journal of Workplace Learning*, *34*(2), 215–228. https://doi.org/10.1108/JWL-08-2020-0140

Nicho, M., Fakhry, H., Bataineh, E., & Girija, S. (2024). A Strategic Evaluation of Educational Continuity for Accessibility During Uncertainty in an Educational Practicum. *International Journal of Information and Communication Technology Education*, *20*(1), 1–31. https://doi.org/10.4018/IJICTE.342111

Rahmat, A. R., & Abuzaraida, M. A. (2023). Developing An Online Practicum Evaluation Management System. *Journal of Digital System Development*, *1*(2), 24–37. https://doi.org/https://doi.org/10.32890/jdsd2023.1.3

Rini, E. F. S., & Aldila, F. T. (2023). Practicum Activity: Analysis of Science Process Skills and Students' Critical Thinking Skills. *Integrated Science Education Journal*, *4*(2), 54–61. https://doi.org/10.37251/isej.v4i2.322

Sturgis, P., Brunton-Smith, I., Allum, N., & Fuglsang, S. (2024). Testing the cultural-invariance hypothesis: A global analysis of the relationship between scientific knowledge and attitudes to science. *PLoS ONE*, *19*(2), 1–12. https://doi.org/10.1371/journal.pone.0296860

Sugiyono. (2013). *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif, dan R&D)*. Bandung: Alfabeta.

Suryanto, A., Saliman, S., & Sudrajat, S. (2023). Weakness of Character Education in Indonesian Teenager. *Jurnal Penelitian Pendidikan IPA*, *9*(1), 3869–3874. https://doi.org/10.29303/jppipa.v9i5.3721

Taşdemir, H., & Gümüşok, F. (2023). Self-Evaluation as a Form of Reflective Practice in the Practicum. *Dil Eğitimi ve Araştırmaları Dergisi*, *9*(2), 515–534. https://doi.org/10.31464/jlere.1252480

Tawil, M., Rusli, M. A., Bakkara, H., & Jatmiko, B. (2024). Alternative Virtual Lab-Based Practical Learning Model to Improve Scientific Attitude and Science Process Skills. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *10*(1), 47–59. https://doi.org/10.21009/1.10105

Visnjic Jevtic, A., & Rogulj, E. (2022). "Should we get support or just guidelines?" (self) assessment on mentoring of early childhood education students. *International Journal of Mentoring and Coaching in Education*, *11*(3), 262–273. https://doi.org/10.1108/IJMCE-03-2021-0048

Watkins, A. (2020). The Leadership Laboratory: A leadership practice field involving peer mentors in a first-year, project-based class. *Journal of Leadership Education*, *19*(4), 99–115. https://doi.org/10.12806/v19/i4/r8

Yuliasari, R. I., & Agustin, H. Y. (2024). The Effect of Peer Teaching Method Assisted By E-Module Media on Students' Concept Understanding and Scientific Attitude. *Educatum: Scientific Journal of Education*, *2*(1), 18–23. https://doi.org/10.59165/educatum.v2i1.59

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Appendix 1. Validity of the Scientific Attitude Instrument

The decision rule used is as follows:

If r count > r table means it is valid

If r count < r table means it is invalid

No. Butir	r hitung	r tabel	Kesimpulan
1	3.9775	0.3338	Valid
2	-0.5700	0.3338	Tidak Valid
3	3.1247	0.3338	Valid
4	1.4148	0.3338	Valid
5	-2.3175	0.3338	Tidak Valid
6	2.6766	0.3338	Valid
7	4.8594	0.3338	Valid
8	3.3594	0.3338	Valid
9	2.8433	0.3338	Valid
10	3.5788	0.3338	Valid
11	-0.8224	0.3338	Tidak Valid
12	1.1687	0.3338	Valid
13	5.1659	0.3338	Valid
14	2.6105	0.3338	Valid
15	0.8384	0.3338	Valid
16	4.4837	0.3338	Valid
17	1.0275	0.3338	Valid
18	5.5957	0.3338	Valid
19	2.0641	0.3338	Valid
20	1.2138	0.3338	Valid
21	3.3690	0.3338	Valid
22	1.5012	0.3338	Valid

No. Butir	r hitung	r tabel	Kesimpulan
23	3.2034	0.3338	Valid
24	-4.3099	0.3338	Tidak Valid
25	4.7973	0.3338	Valid
26	-2.5448	0.3338	Tidak Valid
27	0.7599	0.3338	Valid
28	4.7947	0.3338	Valid
29	0.1580	0.3338	Tidak Valid
30	2.6033	0.3338	Valid
31	5.5962	0.3338	Valid
32	1.3441	0.3338	Valid
33	1.2228	0.3338	Valid
34	1.4025	0.3338	Valid
35	4.4232	0.3338	Valid
36	6.1691	0.3338	Valid
37	1.7587	0.3338	Valid
38	4.3667	0.3338	Valid
39	2.4765	0.3338	Valid
40	4.5613	0.3338	Valid
41	4.5974	0.3338	Valid
42	-1.9519	0.3338	Tidak Valid
43	1.9693	0.3338	Valid
44	2.0128	0.3338	Valid
45	3.3613	0.3338	Valid

Conclusion

Based on the results of the scientific attitude instrument calculations, it was concluded that of the 45 questions tested, 38 were declared valid, while 7 were declared invalid.

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Appendix 2. Calculation of the Reliability of the Scientific Attitude Instrument

Reliability Statistics

Cronbach's Alpha	N of Items
.881	38

The reliability of the instrument is measured using the Cronbach Alpha formula using SPSS 21. Then the r value obtained is interpreted through the table below:

r value (Sugiyono, 2011)

Reliability Coefficient	Reliability Level
0.00 – 0.20	Very Low
0.21 – 0.40	Low
0.41 – 0.60	Currently
0.61 – 0.80	Tall
0.81 – 1.00	Very high

Based on the calculation results, the r value is known to be 0.881 for the scientific attitude instrument, meaning that the scientific attitude instrument has very high reliability.