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Scientific Attitude Assessment Instruments Using Self-Assessment in Project-Based Learning Development

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Abstract

Scientific attitude is very important in learning activities. In addition, one of the learning objectives stated that students must have character. Students must be able to solve problems scientifically to form a good character or attitude. Such learning can be realized by using contextual learning such as project-based learning, as well as using standard scientific attitude assessment instruments. However, this affective assessment has been less emphasized. Most educators prioritize cognitive aspects in their assessment activities. For this reason, it is necessary to develop a scientific attitude assessment using self & peer assessment in project-based learning. This research is a kind of R&D research that used the ADDIE development model. The purpose of this study is to analyze the validity of the instrument, the practicality of the instrument, and the effectiveness of the developed scientific attitude assessment instrument by using self & peer assessment in project-based learning. The sample used in this study was class VII A and B SMP N 04 Lambu Kibang totaling 48 students. The lesson taught was about environmental pollution. The results of the validity of the instrument analyzed using the CVR obtained 0.9. This means that the instrument validity was good. The results of the instrument's effectiveness can be seen from the scientific attitude that has excellent criteria. The assessment used in this study was only self-assessment because of the limited learning activities due to the COVID-19 pandemic. The first learning step is having a scientific attitude of critical thinking, responsibility, and care for the environment. The second is having curiosity, perseverance, and responsibility. The third is having curiosity, critical thinking, and being objective. In the fourth learning step, the scientific attitudes that have excellent criteria are the attitude of being curious, objective, and persevering. The fifth learning step is being disciplined, caring for the environment, and having a critical thinking attitude. The sixth is an attitude of curiosity, perseverance, and responsibility.

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INTRODUCTION

Attitude is the basis for students to appreciate the work of others and respect themselves. Scientific attitude is the ability that exists within students to take action in the form of a positive or negative attitude towards an object (Olatoye & Aderogba, 2012; Slameto, 2010). Scientific attitudes are extremely important in learning science because students must be able to learn through a series of scientific work experiences (Amri, 2014). Learning science in schools is not only a conceptual knowledge, but it also contains several things, such as products, processes, attitudes, environment, technology, and society (Harahap et al., 2017).

The purpose of learning science is to make students have good character through a scientific attitude that can be developed by maximizing the readiness of educators and students in employing contextual learning models (Uswatun, 2015). The project-based learning model is one of the learning models that can be employed in learning science (Tsani et al., 2016; Kurniawati et al., 2014). In addition to the project-based learning model, problem-based learning models can also be used to activate students in learning activities (Atikasari et al., 2012; Astuti et al., 2016; Hayanah et al., 2019)

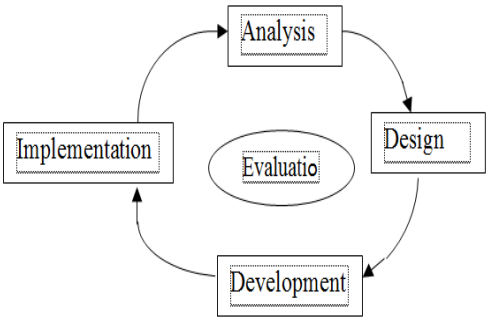
The characteristics of this learning model are group activities, student-centered, and contextual (Marianti et al., 2013). This learning model can be used to see the students' scientific attitudes. Scientific skills or scientific attitudes are important in a scientific investigation (Yani et al. 2017; Zeidan & Jayosi, 2015) In addition to using a contextual learning model, educators are also assigned with providing assessments in learning.

Assessment is an activity of collecting and processing information to measure the students' achievement Didik (Permendikbud No. 66 Tahun 2013). However, the assessment used must be following the applicable curriculum. The existence of an evaluation on the curriculum implementation is also useful for controlling the quality of the curriculum (Isnaeni & Kumaidi, 2015). A study shows that authentic assessment can foster problem-solving skills (Kinay & Bagcecy, 2016). To innitiate a scientific attitude, this problem-solving process must involve scientific methods and work.

Observations done in February 2020 at SMP 4 Lambu Kibang found that teachers assessing the affective aspects of students have not used standardized instruments. Self-assessment is one of the effective assessments that can be employed to assess students' scientific attitudes. Self-assessment is a type of assessment done by students themselves in the process of achieving learning activities (Novia, 2015; Sari, 2018). This assessment can raise students' self-confidence (Kunandar, 2014) because they are given the confidence to assess their abilities and attitudes so that teachers get information about their students' strengths and weaknesses. In conducting assessments, students must be honest and objective. A study found that this assessment was effective for assessing students' performance and attitudes (Hairida, 2019). Based on the previous discussion, it seems necessary to develop a scientific attitude assessment instrument using self-assessment in project-based learning.

METHODS

This is an R&D (Research & Development) research conducted from January to February 2021. The research subjects were students of class VII A and B of SMPN 4 Lambu Kibang totaling 48 students. This research followed the ADDIE development model. The following is the ADDIE development cycle that will be used in the research:



Picture 1. ADDIE development model

1. Analysis

This is where the innitial observation were done. The observation step was conducting interview sessions with teachers and the students in class VII in SMP N 4 Lambu Kibang. The researchers also conducted a literature study within this step.

2. Design

The purpose of this step was to design the scientific attitude assessment instrument using self-assessment in project-based learning. This stage was

designing initial product, conducting expert validation and try-out, and also making some revisions.

3. Development

This stage is where the researchers developed the results of the expert's validation. The purpose was to produce a draft of a scientific attitude assessment instrument using self-assessment on a project-based learning model according to the criteria.

4. Implementation

This stage is the product try-out stage carried out on students of SMP N 04 Kibang Budi Jaya class VII A, odd study group, totaling 16 students, while extensive testing was carried out in other study group of class VII A, VII B that contained 48 students.

5. Evaluation

This stage is the instrument analysis stage which was carried out at the end of each stage from analysis or evaluation, design, to the development stage.

RESULTS AND DISCUSSION

Instrument validity

The result of this study is Scientific Attitude Assessment Instruments Using Self-Assessment in Project-Based Learning Development This instrument is an instrument that has been validated by experts. It was validated by five expert validators, and the validation results will be calculated using CVR analysis. The results of validation by experts are presented in the table below:

Table 1. Instrument Validation Result

No.	Validator	Score from Experts	Criteria
1	(Validator 1)	1.00	Very Good
2	(Validator 2)	0.84	Very Good
3	(Validator 3)	1.00	Very Good
4	(Validator 4)	0.93	Very Good
5	(Validator 5)	0.98	Very Good
6	CVR result	0.9	Very Good

The instrument validated by the expert validator is the developed scientific attitude assessment instrument with a self-assessment that has been adapted to each project-based learning step. The results of expert validation were analyzed using CVR analysis to determine the validity of the developed instrument. The number of CVRs obtained was 0.9. This value indicates that the instrument has very good/appropriate criteria or is valid (Lawshe, 1975).

Self-assessment is an instrument used to assess scientific attitudes done by students themselves. This assessment involves students directly. Therefore, this can create a sense of responsibility towards learning in the classroom. According to Sutrisno (2012), self-assessment can develop students' sense of responsibility towards learning activities and processes, so students can have an attitude and character in them.

The product of this research is a scientific attitude assessment instrument using a self-assessment consisting of an instrument grid, an assessment questionnaire, and scoring instructions that students will use. The experts validating this instrument were lecturers and teachers of science subjects. The validation results will be used as a reference for improving and refining the instrument before being tried on students of class VII A and B.

Data in Table 1 shows that the developed instrument has met the construct, content, and language validity. It presents that the analysis using CVR obtains 0.9. This means the instrument is considered feasible. This is in line with the statement of Sugiono (2015) who states that the validators are assigned with a decision that whether the instrument can be used without improvement, need improvement, and need complete reorganization.

Instruments that previously obtained "very good/appropriate" criteria with several notes for improvement. The improvement notes included the first validator who suggested that during a pandemic, eliminating the point of cooperation is important and suggested a self-assessment instrument to be used. In addition, the second validator believes that it is better to provide information on the scores. Besides, the third and

fourth validators both argue that there is a need to reduce time in conducting scientific attitude assessment questionnaires. The fifth validator declares it is a need for image variations in learning steps to raise problems in learning activities.

Suggestions from the validators were then used by researchers to improve and refine the developed instruments. It includes (1) the use of self-assessment only to assess students' scientific attitudes; (2) The addition of a description of scores to make it easier for students to calculate the scores; (3) The implementation of scientific attitudes assessment was done for 10 minutes on each learning step; (4) The addition of pictures about environmental pollution problems to lead students to solve the problem formulation. After the instrument is valid, the researchers administer try-out to class VII A and B. Expert validator 1 gave a score of 1.00, the second validator gave the score of 0.84, the third validator gave the score of 1.00, the fourth validator gave the score of 0.93, and the validator 5th gave the score of 0.98. The above score was calculated using CVR and then resulted in 0.9. It means that the score was very good/appropriate.

Instrument Effectiveness

After the try-out process, the data from the scientific attitudes assessment using self-assessment in project-based learning in grades VII A and VII B were obtained. Learning was carried out with small groups considering the current COVID-19 pandemic. The researchers conducted the try-out sessions in the even group of class VII A, odd, and even group of VII B. The data below is scientific attitude data that obtained 'very good' criteria on each project-based learning step in the three study groups.

Table 2. Effectiveness Of Scientific Attitude

No.	Learning step	Scientific attitudes	%		
			Even Group of VII A	Odd Group of VIIB	Even Group of VII B
1	Start With Essential Question	Critical thinking	0.8	0.8	0.8
		Responsibility	0.9	0.8	0.8
		Caring for the environment	0.9	0.8	0.9
2	Design a plan for the project	Curiosity	0.9	0.9	0.9
		Perseverance	0.9	0.9	0.8
		Responsibility	1	0.8	0.9
3	Create a schedule	Curiosity	0.9	0.9	0.9
		Objective	0.8	0.8	0.9
		Responsibility	0.9	0.8	0.9
4	Monitor The Students And Progress The Project	Curiosity	0.9	0.9	0.9
		Objective	1	1	0.9
		Perseverance	1	1	0.9
5	Asses The Outcome	Discipline	1	1	0.8
		Caring for the environment	1	0.8	0.8
		Critical thinking	0.9	0.8	0.9
6	Evaluate The Experience	Curiosity	0.9	0.8	0.9
		Responsibility	0.9	0.8	0.9

There are aspects of a scientific attitude of critical thinking, responsibility, and environmental care in the first learning step. The first step is formulating problems after the teacher presents problems about environmental pollution. A critical attitude appears in this step is when students express their opinions or ideas to formulate questions from the problems presented. This learning step requires students to have critical thinking skills by analyzing the problems presented by the teacher so that students acquire question formulation skills. This is in line with Yani (2017) who argues that project-based learning models can improve students' scientific attitudes.

The attitude of being responsible appears in the first step. The teacher invites students to analyze the problems presented, then students will write the questions formulated using what, where, why,

when, and who (Wh-questions). Students are responsible for solving their questions, and the teachers are serving as student mentors. According to Muldalara (2012), during the learning process, the teachers are assigned to guide students, while students are fully responsible for the tasks given by the teacher. The students acquired an attitude of caring for the environment in this step because of the students' experience and their ability to compare the polluted environment and the unpolluted environment. It is in line with Anwar (2011) stating that students' scientific attitudes can be formed from student experiences and during the learning activities at school.

The second learning step is to make a project plan. The attitudes that arise include curiosity, perseverance, and responsibility. The teacher assigns students to provide solutions in the form of poster designs to prevent environmental pollution. Students' curiosity arises because of the students' enthusiastic attitude in solving problems through posters. The students can make poster designs from various literature to add ideas in making poster designs that they will make. The results were in the form of poster designs for preventing environmental pollution as well as messages or appeals about environmental pollution. Yunita (2012) states that students' scientific attitudes can be seen, by the acquisition of curiosity about the concept of learning.

The attitude of perseverance arises because in designing posters students must be diligent and accurate in completing the designs. This attitude will prevent students from making mistakes in designing posters. Scientific attitudes will appear during learning activities. Yuliani (2012) states that scientific attitudes will appear when the learning process takes place.

The attitude of responsibility appears because students have a sense of responsibility in designing posters about environmental pollution. This attitude needs to be instilled since the attitude of responsibility in students is one of the scientific attitudes that need to be instilled (Sardinah, 2012).

In the third learning step, students and teachers will discuss the schedule for completing the posters that students made. The scientific attitude that emerges was an attitude of responsibility, curiosity, and perseverance. The attitude of responsibility arises because students were required to collect posters within an agreed time. In this case, the teacher instilled an attitude of responsibility that students must have. According to Sanjaya (2006), teachers have the opportunity to instill good attitudes to students through habituating and giving examples.

The attitude of curiosity is very good because students were given the freedom to complete the poster according to the agreed schedule. They can refer to various existing literature, both from books and from the internet. Indirectly this learning step will make students' curiosity attitude develop, like what Arifin (2012) has stated that indirectly the scientific attitude possessed by students will be applied and developed in them. Meanwhile, the attitude of perseverance appears when students arrange their schedules. They need to be diligent and thorough so that learning activities run regularly, effectively, and efficiently so they can solve problems systematically. According to Astawa (2015), the attitude that emerges from students comes from the urge to behave towards a learning activity that is carried out systematically.

Activities in the fourth step were monitoring students' assignments. The attitudes that arise are curiosity, objectivity, and perseverance. The attitude of curiosity emerged because during this activity the teacher would check from each student's project and ask about the posters they made, and confirm the concepts they do not understand. Project-based learning reinforces students to be active in learning activities and the teacher acts as mentor and director. They confirm some concepts that the students do not understand. This is in accordance with Kartono (2011) who states that in scientific attitude assessment activities, the students' position is only limited to users. The teacher directly provides an assessment based on information provided by students through a questionnaire given by the teacher.

An objective attitude arises when the teacher monitors and facilitates activities and mentors students, but it is the students who are in charge of completing the posters they design themselves. In accordance with Trianto (2009) who states that learning will be better if students are actively involved together with teachers and other friends directly in learning activities. While the attitude of perseverance appears when students complete the

poster and actively discuss with the teacher in aligning the learning concept.

The fifth learning step is discipline, environmental care, and critical thinking. Discipline arises because, in this step, students collect and present posters on time. The next attitude is caring for the environment. This attitude appears when students make posters, they express ideas about pollution so that an attitude of caring for the environment appears. This is in accordance with Krismiyanti (2019) who states that an attitude of caring for the environment is an attitude of preventive actions against damage to the environment and the natural surroundings, as well as efforts to repair environmental damage.

The step of testing the results also raises a critical thinking attitude indirectly, when students present their posters, they will think about describing the tasks they have completed. Posters completed by students came from various existing literature, so students can solve problems through making posters. Novera (2019) states that strong scientific evidence can be derived from books or modules provided by the teacher.

The last step is evaluating. The scientific attitude that emerges is the attitude of curiosity and responsibility. The attitude of curiosity arises after students made conclusions on the learning process they were doing through various existing literature. Yunita (2012) states that the level of scientific attitude can be seen from a high curiosity attitude towards an object to solve problems during learning activities.

The next scientific attitude is responsibility. Students acquired an attitude of responsibility to understand the concept and complete the conclusions they make. They were also responsible for correcting the wrong concept during the confirmation step done together with the teacher. This attitude is an attitude that the teacher needs instill in students. According to Sardinah (2012), scientific attitudes in students can be instilled and developed.

CONCLUSION

Based on the results and discussion, the following conclusions can be drawn:

1. The scientific attitude assessment instrument using self-assessment on the project-based learning model developed and calculated using CVR obtained 0.9. This value indicates that the instrument is valid.
2. The scientific attitude assessment instrument using self-assessment in a project-based learning model developed is able to measure the students' scientific attitude in each project-based learning model step. Scientific attitudes that have very good criteria include critical thinking, responsibility, environmental care, curiosity , perseverance, objective and discipline.

REFERENCES

Anwar, H. (2009). Penilaian Sikap Ilmiah dalam Pembelajaran Sains. Universitas Negeri Gorontalo. 103-114.

Astawa, Widya I M., Sadia, W., &Suastra, W. (2015). Pengaruh Model Pembelajaran Berbasis Proyek Terhadap Sikap Ilmiah Dan Konsep Diri Siswa Smp.*e- Journal Program Pascasarjana Universitas Pendidikan Ganesha Program Studi Pendidikan IPA*. Volume 5

Astuti, A., Sumadi., & Isnaeni, W. (2016). Pengaruh Model Pembelajaran *Problem Based Learning* Berbantuan *Tv-News* Terhadap Kemampuan Analisis Siswa Pada Materi Bahan Kimia Kehidupan. *Unnes Journal Of Biology Education.* Vol 5, No2

Atikasari, C., Isnaeni, W., & Budi, A. P. (2012). Pengaruh Pendekatan *Problem-Based Learning* Dalam Materi Pencemaran Lingkungan Terhadap Kemampuan Analisis, *Unnes Journal Of Biology Education.* Vol 1, No3

Hairida, R. (2019). The Development Of Students' Performance Assessment Through Self-Assessment Technique.*Unnes Science Education Journal* 8 (1)

Hayanah, Dkk, (2019). Pengembangan Model *Problem Based Learning* Berbasis Strategi *Scaffolding* Pada Pembelajaran Menentukan Ide Pokok,*Esj (Elementary School Journal)* Volume 9 No. 2

Isnaeni, W. & Kumaidi**.** **(**2015) .Evaluasi Implementasi Pkp Dalam Pembelajaran Biologi Di SMAN Kota Semarang

Menggunakan Pendekatan Mixed-Method . *Jurnal Penelitian dan Evaluasi Pendidikan* Volume 19, (109-121)

Kemendikbud. (2013). *Peneraparan Pendekatan Scientific Approach dalam*

Pembelajaran (PPT). Jakarta: Kemendikbud. *Salinan Lampiran Peraturan Menteri Pendidikan Dan Kebudayaan Republik Indonesia Nomor 66*

Kinay, İ. & Birsen, B. (2016). The Investigation of the Effects of Authentic Assessment Approach on Prospective Teachers' Problem-Solving Skills. *International Education Studies*; Vol. 9 No. 8

Krismiyanti , Marianti, A., & Hartono. (2019). Practise Science Process Skills And Sprout Up Environmentally Caring Attitudes Through Worksheet Base On School Gardens, Journal Of Innovative Science Education,Vol 8 (3) 2019 : 279 – 289

Kunandar. (2014). *Penilaian Autentik Penilaian Hasil Belajar Peserta DidikBerdasarkan Kurikulum 2013.* Jakarta: PT Raja Grafindo Persada.

Kurniawati, A., Santoso, K., & Isnaeni, W. (2014). Pengaruh Guided Inquiry Berbasis Proyek Terhadap Aktivitas Dan Hasil Belajar. *Unnes Journal of Biology Education*. Volume 3, Nomor 1

Marianti, A., Christijanti, W., & Isnaeni, W. (2013). Pembelajaran Berbasis Projek Dengan Pendekatan Jelajah Alam Sekitar Sebagai Model Perkuliahan Fisiologi Hewan. Biologi Fmipa Universitas Negeri Semarang

Novera, D., Indriyanti, D. R., & Marianti, A. (2019). The Development of Ecosystem Module Based on Science Literacy in Senior High School, *Journal of Innovative Science Education,* vol 8 (3) 2019: 271 – 278

Novia, R. Y., Hairida, Hadi, L.(2015). Analisis Keterampilan Proses Sains Melalui Self Assesment Dan Peer Assesment Dikelas XI IPA SMA. Artikel penelitian. Program Studi Pendidikan Kimia FKIP Untan

Olatoye, R.A & Adegobra, A.A. (2012). Harnessing The Power Of Emotional Int Elligence, Scientific Literacy And Problem Solving Skills For Successful Living. *Pacific journal of science and technology*. Vol 13 (1)

Trianto. (2012). *Model Pembelajaran Terpadu.* Jakarta Bumi Aksara

Tsani, U. L., Marianti, A., &Utami, N. R.(2016). Efektifitas Model Pembelajaran Berbasis Proyek Dengan Metode Galerry Walk Pada Pembelajaran Materi Sel Di SMA. *Unnes Journal of Biology Education*. Volume 5, Nomor 1

Uswatun, D. A.& Rohaeti, E. (2015). Perangkat Pembelajaran Ipa Berbasis Inkuiri Untuk Meningkatkan *Critical Thinking Skills* Dan *Scientific Attitude* Siswa.*Jurnal Inovasi Pendidikan IPA*.Volume 1 – Nomor 2

Yani, A., Haerunnisa., &Rahim, S. (2017). Analisis Aktivitas Dan Sikap Ilmiah Mahasiswamelalui Model Pembelajaran Project Based Learning (PJBL) Pada Perkuliahan Biologi Air Tawar Stkip Puangrimaggalatung Sengkang Sul-Sel . *Prosiding Seminar Nasional Iii Tahun 2017*

Yunianta,, Hasti, T.N., Rochmad., & Rusilowati, A.(2012). Kemampuan Berpikir Kreatif Siswa Pada Implementasi Project Based Learning Dengan Peer and Self Assesment Untuk Materi Segiempat Kelas VII SMPN RSBI 1 Juwana di kabupaten Pati. Tesis. Semarang: program pascasarjana UNNES

Zeidan, A. H.&Jayosi, M. R. (2015). Science Process Skills and Attitudes toward Science among Palestinian Secondary School Students.World Journal of Education, 5(1).