PILLAR OF PHYSICS EDUCATION
Vol. 17 (1), 2024, page.17-27
ISSN (Print) : 2337-9618
ISSN (Online) : 2684-8880

Validity and Reliability of the Student Perception Questionnaire Instrument regarding the Implementation of the Problem-Based Learning Model

Annisa Syukri Amalia[1], Desnita[1*], Festiyed[1], Amali Putra[1]

[1] *Department of Physics, Universitas Negeri Padang, Jl. Prof. Dr. Hamka Air Tawar Padang 25131, Indonesia*
Corresponding author. Email: desnita@fmipa.unp.ac.id

ABSTRACT

The implementation of the problem-based learning model needs to be known through information from students as subjects. This is so that teachers can build students' insight into teaching and learning activities. Measuring students' perceptions about the implementation of the problem-based learning model needs to be developed. In measuring student perceptions, a standardized measuring instrument in the form of a questionnaire is needed. The questionnaire covers several aspects, namely aspects of student learning activities, aspects of objectives, and aspects of benefits which were then developed into 54 statement items. Validity and reliability testing aims to ensure that the questionnaire instrument can be used properly during research. Instrument development consists of 4 stages, namely planning, construction, quantitative evaluation, and validation. The validity test uses product moment correlation, while the reliability test uses Croanbach's alpha. Instrument testing involved 56 respondents. From the test results, 54 items were declared valid, with a calculated correlation value above > 3,102, which means the criteria are valid. Meanwhile, for the reliability test on 54 items, the calculated Croanbach's alpha value was greater than the Cronbach's alpha table, amounting to 0,982 > 0,70, which means the criteria are reliable. Based on the results of validity and reliability tests, it was concluded that the instrument had met the feasibility of measuring student perceptions regarding the implementation of the problem-based learning model in physics learning.

Keywords :*Questionnaire; Student Perception; Problem-Based Learning Model*.

I. INTRODUCTION

Learning is a communication mechanism that occurs between students, teachers, learning media and learning resources. Learning is a way of gaining knowledge as support for improving the quality of student learning. Student perceptions can be used to perk up the quality of the learning activity process. Students will have a better learning quality if they have a positive perception of learning. Therefore, teachers must try to realize the implementation of the problem-based learning model in learning, so that students feel they have learned according to the stages in the problem-based learning model. This aims to ensure that students are able to participate in learning activities well.

Good learning activities are based on the curriculum. One of the curricula that has developed in accordance with the needs of students' current learning activities is the independent curriculum. The independent curriculum is a curriculum that consists of various kinds of intracurricular learning, where the content will be optimized so that students get time efficiency to master concepts and increase competence [1]. The learning model that can be used in independent curriculum-based physics learning is a learning model that is oriented towards high order thinking skills (HOTS), one of which is the problem-based learning model. The problem-based learning model can be used to develop advanced cognitive abilities in students, such as problem-solving abilities, communication skills, and various other thinking skills [2]. Therefore, the problem-based learning model can adapt to the procedures and learning outcomes that apply in driving schools that implement an independent curriculum.

The problem-based learning model is a learning model that is needed to face the challenges of modern life. Based on research results from Horak et al [3], that the problem-based learning model has a good impact on skills in modern life, such as the ability to review the results of information collection and the ability to analyze

Submitted: .2024-01-09 Accepted: 2024-03-08 Published: .2024-03-31

information. Therefore, the problem-based learning model can improve students' routines in understanding knowledge fluently and firmly. The problem-based learning model can increase students' activeness in scientific processes based on learning steps which are components of science learning, so that students also get facilities in developing high-level thinking skills and scientific thinking skills [4]. Based on that, students will be able to apply basic physics concept equations based on problem solutions using high-level thinking skills that have been trained from involvement in physics learning activities based on problem-based learning models.

The problem-based learning model has several characteristics, namely using problems to start learning activities, using problems that are real and random, using problems that require perspectives in various directions, and using problems that result in identifying learning needs in new fields [5]. Based on these characteristics, the problem-based learning model is a learning model that can accommodate students to be involved in problem solving activities. Apart from that, students will also gain new scientific insights discovered through the process of problem solving activities based on the steps of the problem-based learning model.

During learning activities based on the problem-based learning model, the learning design must be in accordance with students' problem solving performance. Teachers can provide facilities by holding activities that apply scientific knowledge to authentic phenomena, carrying out analysis and reasoning with peers, and formulating new ideas so that students have good problem solving abilities [6,7]. Based on that, students' problem solving abilities are very dependent on the teacher's attention to facilities in problem solving activities. Learning activities based on the problem-based learning model can be achieved if accompanied by good design from the teacher.

The problem-based learning model has several advantages. The advantages of the problem-based learning model are that it can challenge abilities accompanied by satisfaction in exploring the latest knowledge for students, directing students to transfer knowledge to real life applications, and directing students in developing the latest knowledge and taking responsibility for the knowledge gained [8]. Based on the advantages of the problem-based learning model, students' perceptions during physics learning activities based on the problem-based learning model need to be known. This is so that teachers can explore the potential of students' thinking abilities further. Therefore, student perceptions are closely related to the teacher's level of success in implementing learning activities based on the problem-based learning model, especially physics concepts.

The problem-based learning model has great benefits in building student character, so it is necessary to know the level of application of the problem-based learning model in physics learning. For this reason, it is necessary to obtain information from students as learning subjects in order to be able to trace the level of teacher preparation in applying the steps of the problem-based learning model in physics learning. The process of implementing the problem-based learning model consists of activities to initiate students into problems, mobilize students to learn, guide personal and organizational investigations, create and demonstrate work results, and review and review problem-solving activities [5]. Based on these stages, it is necessary to develop measuring tools that can further determine student perceptions regarding the implementation of the problem-based learning model.

It is important to know more about student perceptions. Perception can be considered as a tool for evaluating learning activities in order to improve teaching quality and optimize concepts in accordance with the current curriculum [9]. Based on that, student perceptions are an evaluation tool that can determine the implementation of the problem-based learning model in learning activities. This is because students are subjects who know more about the things that happen during the learning activities held by the teacher.

Students' perceptions about learning can be used as material for learning reflection to improve subsequent learning. Student perceptions are closely related to teaching and learning, namely as an instrument for teachers to take into consideration in improving subsequent learning activities [10]. Therefore, with an instrument regarding student perceptions regarding the implementation of the problem-based learning model, teachers can evaluate subsequent learning activities to be more structured. By evaluating learning activities from teachers, students can experience learning activities that are much better than before.

The benefaction of students' perceptions towards the implementation of physics learning activities, especially the problem-based learning model, has a benefaction in building students' insight into teaching and learning activities. This is based on the results of research by Sari [11] which shows that students have a positive perception of learning implemented using the problem-based learning model, where when studying Physics, students are able to understand the material and solve problems skillfully in an ongoing manner. Apart from that, the results of research from Pusparini, et al [12] that there is a positive and significant correlation in the middle of intrinsic motivation and students' perceptions of physics lessons with the physics learning achievement of class. Based on these two research results, it can be proven that students' perceptions have benefits in the form of an influence on success in implementing the problem-based learning model.

In reality, implementing learning activities based on the problem-based learning model in schools cannot necessarily be implemented optimally. Students who have problems when carrying out learning activities can be observed through their behavior during the learning process [13]. Apart from that, there are still students who have a low perception of physics lessons. Students who have the perception that physics lessons are difficult and uninteresting can result in low learning outcomes [14]. Therefore, it is important to know students' perceptions about the implementation of the problem-based learning model through measurement instruments.

Measuring students' perceptions about the implementation of the problem-based learning model needs to be developed. Through measuring student perceptions, teachers can detect the level of effectiveness and efficiency of learning activities applied to students [15]. Based on this, if the learning activities implemented are not taking place optimally, the teacher can evaluate improvements to subsequent learning activities. Therefore, an instrument for measuring student perceptions is needed which of course must be guaranteed through the testing stage. Instrument testing is carried out to maintain the validity and reliability of the instrument [16]. Through this testing, the instrument can be used to optimally measure student perceptions.

In measuring student perceptions, reliable measuring instruments based on real evidence are needed. This is useful in order to prove the accuracy of the data that will be obtained in the field. The instrument to be measured is a questionnaire. The questionnaire that will be developed discusses perceptions of learning activities, perceptions of goals, and perceptions of benefits within the scope of applying the problem-based learning model. A questionnaire is a data collection technique whose action consists of distributing a set of statements listed on paper for immediate response by respondents [17]. The requirements for measuring instruments that meet good standards are that they must meet the requirements for validity and reliability. The basis of good research data is to obtain it from instruments that have met validity and reliability tests, so that researchers obtain valid data in future research [18]. Therefore, validity and reliability testing is needed so that the questionnaire instrument can be used properly during research.

A variety of previous studies have tackled students' perceptions of physics learning activities implemented using the problem-based learning model. However, there is still minimal research that discusses student questionnaire instruments regarding physics learning activities implemented using the problem-based learning model. Therefore, this research aims to develop an instrument regarding student perceptions regarding the implementation of the problem-based learning model in physics learning that is acceptable for use as a measuring tool. The feasibility of the instrument is measured from the validity and reliability of which data is collected through instrument testing.

II. METHOD

Research Methods

The research uses development research in order to compile a questionnaire on student perceptions regarding the implementation of the problem-based learning model in physics learning that meets validity and reliability. According to Creswell [19], the research instrument development stages consist of four stages, namely planning, construction, quantitative evaluation, and validation.

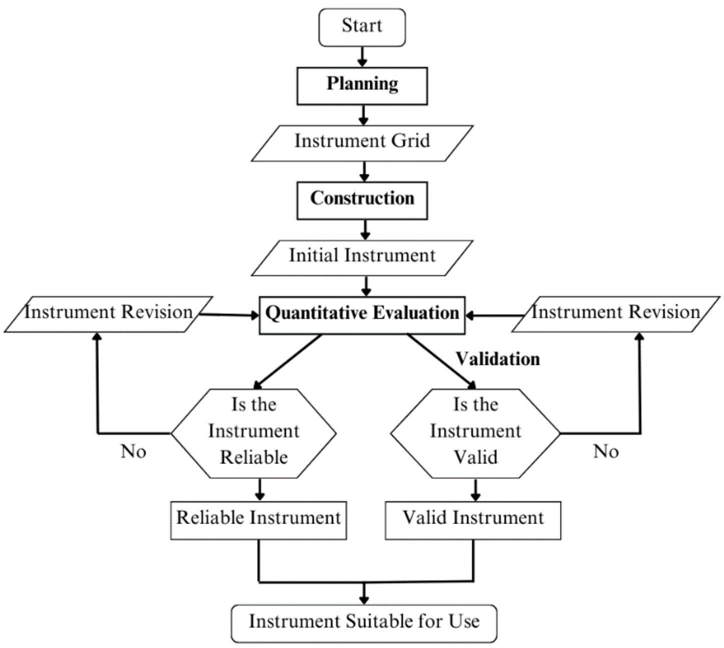

Fig 1. Stages of instrument development

The first stage (planning) in making this questionnaire instrument consists of (1) determining the purpose of the questionnaire, (2) determining the research subjects, namely students, (3) determining the tests that will be carried out, (4) determining the variables for the research, (5) composing questionnaire instrument grid. At this planning stage, researchers have created a questionnaire instrument grid for student perceptions regarding the implementation of the problem-based learning model in physics learning. Then the second stage (construction) is compiling the questionnaire instrument based on the grid that was designed in the previous stage. The result of this construction is the initial questionnaire instrument. The third stage (quantitative evaluation) is testing the questionnaire instrument on class XI students studying Physics at Padang Public Senior High School 14 in the odd semester of the 2023/2024 academic year. From the test results, its reliability can be determined. The fourth stage (validation) is determining the validity decision. Questionnaire items can be used if the questionnaire items are valid. Meanwhile, questionnaire items cannot be used (aborted) if the questionnaire instrument items are invalid. Based on these 4 research stages, it is hoped that the questionnaire will be valid and reliable so that it can be used to analyze student perceptions regarding the implementation of the problem-based learning model in high school physics learning.

Population and Sample

The population used to test this questionnaire instrument was class XI students studying Physics at Padang Public Senior High School 14. The population of students in class XI who study Physics is 56 people. The sampling technique uses census or total sampling, where all members of the population are used as research samples, namely 56 people.

Data Collection Technique

Data collection was carried out through testing questionnaire instruments. This research was carried out by compiling a list of statements that would be used to test the questionnaire instrument. The questionnaire sheet was prepared based on the previous explanation. The questionnaire instrument that has been prepared consists of an introduction, namely an initial explanation of the questionnaire, then respondent data, then instructions for filling out the questionnaire, on the next sheet, namely a student learning activity questionnaire at the problem-based learning model stage which consists of 36 statements used to measure perceptions of learning activities. students regarding the implementation of the problem-based learning model, a questionnaire on the objectives of the problem-based learning model which consists of 10 statements which are used to measure students' perception of objectives regarding the implementation of the problem-based learning model, and a questionnaire on the benefits of the problem-based learning model which consists of 8 statements which used to measure students' perceived benefits regarding the implementation of the problem-based learning model. Each statement on this questionnaire sheet uses a Likert scale, and this scale is used to determine the parameters of actions, arguments and perceptions based on events that occurred in the sample studied.

Data Analysis Technique

Validity Test

Validity can determine the extent to which a measuring instrument measures what it is intended to measure [20]. Testing the validity of the instrument uses a type of construction validity testing, where the instrument to be tested is first consulted with an expert, then continues with testing the instrument by distributing questionnaires to the sample. In analyzing the validity of this instrument, we use the product moment correlation formula based on Yusrizal, et al [20], namely:

$$\boldsymbol{r_{xy}} = \frac{\boldsymbol{n\sum XY - (\sum X)(\sum Y)}}{\sqrt{(\boldsymbol{n\sum X^2 - (\sum X)^2})(\boldsymbol{n\sum Y^2 - (\sum Y)^2})}} \quad (1)$$

Information:

$\boldsymbol{r_{xy}}$ = correlation coefficient of variables X and Y

$\sum \boldsymbol{X}$ = total score for each item

$\sum \boldsymbol{Y}$ = total score

$\boldsymbol{n}$ = number of trial respondents

$\sum X\boldsymbol{Y}$ = the sum of the products of X and Y

The condition of the test is that an item is declared invalid if the calculated $\boldsymbol{r_{xy}} < \boldsymbol{r_{table}}$ at a significance level of 0.01. Validity test using product moment correlation through manual calculations assisted by Microsoft Excel.

Reliability Test

A measurement instrument can be called reliable if the instrument shows consistent measurement results in a study. The instrument reliability testing technique used is internal consistency. Internal consistency is carried out by testing the instrument once and analyzing it using certain techniques to predict the reliability of the instrument [17]. Then, to analyze the reliability of this instrument, use the Croanbach's alpha test formula based on Yusrizal, et al [20], namely:

$$\boldsymbol{\alpha = \frac{k}{k-1}\left(1 - \frac{\sum \sigma_b^2}{\sigma_t^2}\right)} \qquad (2)$$

Information:

$\boldsymbol{k}$ = number of items

$\sum \boldsymbol{\sigma_b^2}$ = number of item variants

$\boldsymbol{\sigma_t^2}$ = variance of the total score

The instrument is declared reliable if the Croanbach alpha coefficient is more than 0,70 ($\boldsymbol{\alpha > 0,70}$). While the Croanbach alpha coefficient is less than 0,70 ($\boldsymbol{\alpha < 0,70}$), it is necessary to revise or eliminate question items with low correlation. Croanbach's alpha reliability test was done using manual calculations assisted by Microsoft Excel.

III. RESULTS AND DISCUSSION

Results

The research results are presented based on the research stages. The first stage is planning, where the results are in the form of determining the objectives of the instrument, determining the objectives of the instrument, determining the research subject, determining the type of test that will be tested on the questionnaire, determining the variables for the research, and compiling a questionnaire grid. The aim of this questionnaire was to determine the perceived benefits, perceived goals and perceptions of students' learning activities regarding the implementation of the problem-based learning model. The subjects of this research were class XI students studying physics at Padang Public Senior High School 14. The variables discussed in this questionnaire are student learning activities at the problem-based learning model stage, the objectives of the problem-based learning model, and the benefits of the problem-based learning model. Based on that, the researchers compiled a questionnaire grid on student perceptions regarding the implementation of the problem-based learning model in the table 1. following:

Table 1. Student Perception Instrument Grid regarding the Implementation of the Problem-Based Learning Model

Number	Aspect	Information
1	Student learning activities at the problem-based learning model stage	Statements for numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36
2	The purpose of the problem-based learning model	Statements for numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
3	Benefits of the problem-based learning model	Statements for numbers 1, 2, 3, 4, 5, 6, 7, 8

The questionnaire grid was continued with the construction stage, where the questionnaire grid was developed into a questionnaire on student perceptions regarding the implementation of the problem-based learning model in physics learning. The questionnaire consists of (1) questionnaire title, (2) respondent data, (3) instructions for filling out the questionnaire, and (4) questionnaire sheet. Then the scoring guidelines for each statement on the questionnaire sheet use the Likert scale response options, namely a value of 1 means strongly disagree, a value of 2 means disagree, a value of 3 means agree, and a value of 4 means strongly agree. Questionnaire scoring guidelines are based on table 2.

Table 2. Example of Instrument Scoring Guidelines

Number	Aspect	Number	Statement	Rating			
				1	2	3	4
1	Student learning activities at the problem-based learning model stage	1 …etc.	I listened carefully to the learning outcomes announced by the teacher at the beginning of the learning activity.				
2	The purpose of the problem-based learning model	1 …etc.	I feel more skilled at scientific investigations in groups.				
3	Benefits of the problem-based learning model	1 …etc.	I am able to construct my thoughts in thinking skills and problem-solving skills independently.				

The questionnaire that has been prepared is continued with the quantitative evaluation stage. Researchers tested the questionnaire on 56 class XI students studying physics at Padang Public Senior High School 14 in the odd semester of the 2023/2024 academic year. The validation stage consists of testing the validity of the questionnaire items. The validity test was carried out on 56 class XI students studying physics at Padang Public Senior High School 14 . After testing the questionnaire on students, it was continued by testing the validity of the questionnaire using the product moment correlation formula at a significance level of 0,01 through manual calculations assisted by Microsoft Excel. The results of the questionnaire instrument test are displayed in table 3.

Table 3. Validity Test of Statement Items for Each Aspect

Aspect	Item	r count	r table	Information
perceptions of student learning activities	S11	0,766	0,3102	Valid
	S12	0,691	0,3102	Valid
	S13	0,632	0,3102	Valid
	S14	0,817	0,3102	Valid
	S15	0,724	0,3102	Valid
	S16	0,552	0,3102	Valid
	S17	0,729	0,3102	Valid
	S18	0,661	0,3102	Valid
	S19	0,751	0,3102	Valid
	S110	0,7	0,3102	Valid
	S21	0,745	0,3102	Valid
	S22	0,79	0,3102	Valid
	S23	0,719	0,3102	Valid
	S24	0,671	0,3102	Valid
	S25	0,787	0,3102	Valid
	S26	0,733	0,3102	Valid
	S27	0,85	0,3102	Valid
	S28	0,85	0,3102	Valid
	S29	0,742	0,3102	Valid
	S210	0,683	0,3102	Valid
	S31	0,738	0,3102	Valid

	S32	0,745	0,3102	Valid
	S33	0,798	0,3102	Valid
	S34	0,841	0,3102	Valid
	S35	0,785	0,3102	Valid
	S41	0,537	0,3102	Valid
	S42	0,838	0,3102	Valid
	S51	0,643	0,3102	Valid
	S52	0,754	0,3102	Valid
	S53	0,703	0,3102	Valid
	S54	0,832	0,3102	Valid
	S55	0,717	0,3102	Valid
	S56	0,816	0,3102	Valid
	S57	0,599	0,3102	Valid
	S58	0,744	0,3102	Valid
	S59	0,843	0,3102	Valid
Perception of students' goals in learning	TS1	0,708	0,3102	Valid
	TS2	0,659	0,3102	Valid
	TS3	0,828	0,3102	Valid
	TS4	0,722	0,3102	Valid
	TS5	0,792	0,3102	Valid
	TS6	0,794	0,3102	Valid
	TS7	0,923	0,3102	Valid
	TS8	0,882	0,3102	Valid
	TS9	0,872	0,3102	Valid
	TS10	0,766	0,3102	Valid
Perception of students' benefits in learning	MS1	0,835	0,3102	Valid
	MS2	0,603	0,3102	Valid
	MS3	0,786	0,3102	Valid
	MS4	0,844	0,3102	Valid
	MS5	0,894	0,3102	Valid
	MS6	0,833	0,3102	Valid
	MS7	0,885	0,3102	Valid
	MS8	0,841	0,3102	Valid

Based on the results of the validity test in Table 3 with the perception aspect of student learning activities, it shows that 36 statements meet the valid criteria because each item has a correlation value above 0,3102. Therefore, all statements regarding aspects of students' perceptions of learning activities can be used as a measurement of students' perceptions of learning activities regarding the implementation of the problem-based learning model in physics learning. Meanwhile, the aspect of students' perception of goals in learning shows that the 10 statements meet the valid criteria because each item has a correlation value above 0,3102. Therefore, all statements regarding aspects of students' perception of goals in learning can be used as a measurement of students' perceptions of learning goals regarding the implementation of the problem-based learning model in physics learning. Then the results of the validity test with the aspect of students' perceived benefits in learning show that 8 statements meet the valid criteria because each item has a correlation value above 0,3102. Therefore, 54 valid statements were continued with reliability testing.

Test the reliability of the questionnaire instrument using Croanbach's alpha at a significance level of 1% through manual calculations assisted by Microsoft Excel. The results of the Croanbach's alpha test for each aspect are in table 4.

Table 4. Instrument Reliability Test Results

Number	**Aspect**	**Number of items**	**Sum of all items**	***Croanbach's Alpha***
1	Perception of student learning activities at the problem-based learning model stage	36	54	0,982

2	Perception of students' goals in problem-based learning model learning	10
3	Perception of students' benefits in problem-based learning model learning	8

The reliability test was carried out by combining the number of valid items in the aspects of students' perceptions of learning activities, perceptions of students' goals, and perceptions of students' benefits in learning, totaling 54 items. The reliability test on the number of all items resulted in a Croanbach's alpha value of 0,982 > 0,70, it can be concluded that the statements in all aspects are reliable or consistent. Therefore, this questionnaire can be trusted as a data collector to examine student perceptions regarding the implementation of the problem-based learning model in physics learning.

Discussion

This questionnaire grid consists of three aspects, namely perceptions of student learning activities, perceptions of goals, and perceptions of benefits. First, perceptions of learning activities, which discusses students' perceptions about the implementation of physics learning based on the stages of the problem-based learning model. In stage I - student orientation to problems, the indicators discussed are student learning activities related to stage I, such as paying attention to learning objectives at the beginning of learning activities, recording tools, materials, learning resources, noting problem topics, paying attention to problem situations in problem solving activities, etc. In stage II - organizing students to learn, the indicators discussed include following directions from the teacher by joining small groups, interacting with other students in small groups, explaining learning tasks, and so on. In stage III - guiding individual and group investigations, the indicators discussed are collecting information related to problem solving activities, conducting experiments to obtain problem solving information, getting guidance and support from teachers during problem investigation activities, and so on. In stage IV - developing and presenting the results of the work, the indicators discussed are planning the work with group members according to the teacher's direction and developing the work according to the teacher's instructions. In stage V - analyzing and evaluating the problem-solving process, the indicators discussed are presenting the results of work in groups according to the teacher's direction, providing responses to presentations of the work of other student groups, evaluating learning outcomes according to the teacher's direction, and so on.

Based on the description above, the level of implementation of the problem-based learning model in physics learning can be determined by knowing students' perceptions based on their learning activities facilitated by the teacher. This is supported by the research results of Sulardi et al [21], that teachers must guide students at each stage of the problem-based learning model, especially at stage III - guiding individual and group investigations, because at this stage teachers must provide more intensive time facilities. to students to guide them to formulate problems, develop hypotheses, carry out experiments, analyze and draw conclusions. Based on this, the implementation of the problem-based learning model in physics learning is largely determined by how students perceive themselves while participating in learning activities facilitated by the teacher. Apart from providing time facilities intensively, teachers must also facilitate efficient time so that each stage of the problem-based learning model in physics learning is carried out well. This is in accordance with the results of research by Kurnia et al [22] who suggested using pictures to streamline learning time as a solution to the weaknesses of the problem-based learning model. Therefore, students will have a good perception of learning activities based on the teacher's facilities so that the stages of the problem-based learning model in physics learning are implemented.

Second, students' perceptions of goals, which discusses students' perceptions of goals in carrying out physics learning activities based on the problem-based learning model. The indicators discussed in this aspect of goal perception are mastery of the meaning of multidisciplinary knowledge, mastery of process skills and heuristic discipline, learning to improve problem solving abilities, learning collaborative skills, learning skills related to real life, improving cognitive abilities, increasing motivation, increasing understanding of concepts, improve skills in application, and develop a lifelong learning attitude. Students' perceived goals are known so that teachers can follow up on how far students are prepared to play a role in physics learning activities based on the problem-based learning model. This agrees with Ningsih [23], that teachers need to observe student activities during learning activities, namely student readiness in carrying out learning activities and student activities in learning (interaction with teachers and other students). Therefore, students' perceptions of goals are related to the extent to which the problem-based learning model is implemented in physics learning.

Third, students' perceived benefits, which discusses students' perceived benefits in carrying out physics learning activities based on the problem-based learning model. The indicators discussed in this aspect of perceived benefits are accommodating students in developing thinking skills and problem-solving skills, studying the role of adults in becoming independent learners, making it easier to remember and increasing understanding of teaching material, increasing focus on knowledge, encouraging level thinking. high level, build soft skills, build learning skills, and motivate students to learn. Students' perceived benefits are known so that teachers can monitor whether learning objectives have been achieved or not. If the teacher is able to provide students with an understanding of the material, students' problem-solving abilities related to learning objectives will be achieved as a result of their learning [24]. Therefore, students' perceived benefits are based on the design of learning activities that are in accordance with the teacher's learning objectives.

To determine students' perceptions of learning activities, students' perceptions of goals, and students' perceptions of benefits regarding the implementation of the problem-based learning model, an instrument in the form of a questionnaire is needed. The aim of compiling this questionnaire is to determine the level of achievement in learning outcomes using the problem-based learning model. Measuring instruments in research (especially survey research) must be tested through validity and reliability tests. The results of this research contribute to producing a valid and reliable questionnaire to analyze student perceptions regarding the implementation of the problem-based learning model in physics learning.

Testing the validity of the questionnaire uses construct validity. Construct validity can be seen using the product moment correlation formula at a significance level of 0,01, where the results are interpreted in table 3. In table 3, the validity test of the statement items regarding the perception aspect of student learning activities shows 36 valid statements. Meanwhile, in the aspect of students' perception of goals in the problem-based learning model, 10 statement items are valid. Then in the aspect of the benefits of the problem-based learning model, 8 statements were declared valid. Therefore, the 54 items that are categorized as valid will be continued with reliability testing.

To test the reliability of the questionnaire, internal consistency is used, namely testing the instrument once and analyzing it using the Croanbach's alpha formula. All 54 valid items were tested for reliability. The results of the reliability testing are interpreted in table 4, where the results show a Croanbach's alpha value above 0,70, namely 0,982. This means that the student perception questionnaire instrument regarding the implementation of the problem-based learning model in physics learning is valid and reliable. Instruments that are valid and reliable will show consistent results when tested on different times and on different subjects [25]. Therefore, the student perception questionnaire instrument can be used in physics learning activities.

Through a questionnaire instrument on student perceptions regarding the implementation of a valid and reliable problem-based learning model, teachers can improve students' problem-solving abilities. However, students' problem-solving abilities depend greatly on various circumstances. This is supported by Tan, et al [26], that in improving problem solving skills effectively, there are big challenges when viewed from the students' diverse academic backgrounds. In addition, Rodzalan, et al [27] stated that the thing that influences students' increased perception in solving problems in detail is the facility of learning activities that analyze and synthesize the meaning of knowledge. Therefore, measuring student perceptions needs to be accompanied by careful preparation of learning activities from teachers on a regular basis.

In measuring student perceptions accompanied by this questionnaire instrument, the level of student perception is enormously influenced by the role of the teacher during learning activities based on the problem-based learning model. The presentation of non-structured problems and activities to identify gaps between student knowledge and the teacher's problem-solving knowledge can influence the level of student perception in learning activities based on the problem-based learning model [28]. Apart from that, according to Cáceres-Jensen, et al [29], the method applied in learning activities is based on the problem-based learning model, namely a mixture of students' scientific interests and attitudes. Therefore, through the application of a questionnaire instrument on student perceptions regarding the implementation of the problem-based learning model, teachers can find out students' needs and interests in solving problems.

With the existence of a questionnaire instrument on student perceptions regarding the implementation of the problem-based learning model in physics learning, learning activities held by teachers can improve learning outcomes. This is also in line with the research results of Wismath, et al [30] that student perceptions in problem solving can result in the achievement of learning outcomes, which are related to students' concepts, strategies, logic and openness in analyzing information. Based on this, student perceptions need to be followed up after being measured through a questionnaire instrument.

The theoretically important role of this research is that it can expand literature references regarding instrument making, especially questionnaires regarding student perceptions regarding the implementation of the problem-based learning model in physics learning. Meanwhile, practically, the questionnaire discussed in this research can provide an evaluation of learning activities carried out by teachers based on student perceptions so that learning outcomes can be achieved in the future. Therefore, the student perception questionnaire regarding the implementation of the problem-based learning model that has been prepared can be applied to physics learning activities.

This research has the advantage of preparing instruments that are planned according to the stages stated in the research method. The questionnaire was prepared based on results from literature from several sources and opinions from experts who master research fields related to this research. Then try out the questionnaire on class. Meanwhile, the weakness of this research is that there are still limited questionnaires that can measure students' perceptions about the implementation of the problem-based learning model. Apart from that, currently there is still a lack of research that develops valid and reliable instruments for measuring perceptions of other learning models.

IV. CONCLUSION

Based on the questionnaire instrument trial on a sample of 56 students in grade XI studying physics, the validity test results show that 54 statements meet the validity criteria, with each valid item having a calculated correlation value above the table correlation value, namely > 0,3102. Meanwhile, in the reliability test, all 54 statements meet the criteria for reliability or consistency, with the calculated Croanbach's alpha value exceeding the table Croanbach's alpha value, which is 0,982 > 0,70. It can be concluded that all statements in the three aspects are reliable or consistent. The results of the validity and reliability tests of the questionnaire instrument have proven that the questionnaire instrument on student perceptions regarding the implementation of the problem-based learning model meets the criteria for validity and reliability in measuring measuring student perceptions regarding the implementation of the problem-based learning model in physics learning.

ACKNOWLEDGMENT

I would like to thank Prof. Dr. Desnita, M. Si. as my supervisor who has played a role in providing direction and suggestions for the writing of this article.

REFERENCES

[1] U. C. Barlian, S. Solekah, and P. Rahayu, "Implementasi Kurikulum Merdeka dalam Meningkatkan Mutu Pendidikan," *JOEL J. Educ. Lang. Res.*, vol. 1, 2022, doi: https://doi.org/10.53625/joel.v1i12.3015.

[2] R. F. Mustofa and Y. R. Hidayah, "The Effect of Problem-Based Learning on Lateral Thinking Skills.," *Int. J. Instr.*, vol. 13, no. 1, pp. 463–474, Jan. 2020, doi: 10.29333/iji.2020.13130a.

[3] A. K. Horak and G. R. Galluzzo, "Gifted Middle School Students' Achievement and Perceptions of Science Classroom Quality During Problem-Based Learning," *J. Adv. Acad.*, 2017, doi: 10.1177/1932202X16683424.

[4] M. Y. Soleh, S. Santosa, and M. Indrowati, "Studi Komparasi Penerapan Model Pembelajaran Problem Based Learning dan Inkuiri Terbimbing terhadap Keterampilan Proses Sains Siswa Kelas X SMA Negeri 3 Boyolali Tahun Pelajaran 2013/2014," *Bio-Pedagogi*, vol. 3, no. 2, p. 1, 2014, doi: 10.20961/bio-pedagogi.v3i2.5328.

[5] Nurdyansyah and E. F. Fahyuni, *Inovasi Model Sesuai Kurikulum 2013*. 2016.

[6] C. M. Hung, G. J. Hwang, and I. Huang, "A project-based digital storytelling approach for improving students' learning motivation, problem-solving competence and learning achievement," *Educ. Technol. Soc.*, 2012.

[7] X. Gu, S. Chen, W. Zhu, and L. Lin, "An intervention framework designed to develop the collaborative problem-solving skills of primary school students," *Educ. Technol. Res. Dev.*, 2015, doi: 10.1007/s11423-014-9365-2.

[8] H. Ade and S. Hasan, *Model & Pendekatan Pembelajaran Inovatif (Teori dan Aplikasi)*. 2017. [Online]. Available: http://repository.unkhair.ac.id/99/

[9] C. Carvalho *et al.*, "Student perceptions of secondary science teachers' practices following curricular change," *J. Turkish Sci. Educ.*, vol. 8, no. 1, pp. 29–41, 2011.

[10] E. Ampadu, "Students ' Perceptions of their Teachers ' Teaching of Mathematics : The Case of Ghana," *Int. Online J. Educ. Sci.*, vol. 4, no. 2, pp. 351–358, 2012.

[11] I. D. P. Sari, "Respon Siswa Terhadap Pembelajaran Fisika Menggunakan Model Pembelajaran PBL (Problem Based Learning) di SMAN 2 Tanjung Jabung Timur," *Snitt*, vol. P, no. 45, pp. 1–6, 2021.

[12] K. D. C. Pusparini, K. Suma, and I. Suswandi, "Hubungan Motivasi Intrinsik, Persepsi Siswa, Motivasi Intrinsik dan Persepsi Siswa terhadap Pelajaran Fisika dan Prestasi Belajar Fisika Siswa Kelas X MIPA SMA," *J. Pendidik. Fis. Undiksha*, vol. 10, no. 1, p. 12, 2020, doi: 10.23887/jjpf.v10i1.26719.

[13] I. Susanti, Sholikhan, and N. Ain, "Penerapan Model Pembelajaran Problem Based Learning Untuk

Meningkatkan Motivasi Belajar Dan Prestasi Belajar Siswa Kelas Viii Smpn Satap Matawai Iwi," *Rainstek J. Terap. Sains dan Teknol.*, vol. 3, no. 1, pp. 6–12, 2021, doi: 10.21067/jtst.v3i1.5289.

[14] A. Arif, "Hubungan Persepsi Siswa Pada Mata Pelajaran Dengan Prestasi Belajar Fisika Di Sman 4 Banda Aceh," *J. Ilm. Mhs. Pendidik. Fis.*, vol. 1, no. 3, pp. 1–6, 2016, [Online]. Available: http://www.jim.unsyiah.ac.id/pendidikan-fisika/article/view/216%0Ahttps://kelembagaan.ristekdikti.go.id/wp-content/uploads/2016/08/UU_no_20_th_2003.pdf

[15] H. M. Siregar, "Pengembangan Instrumen Angket Persepsi Mahasiswa Pendidikan Matematika Terhadap Pembelajaran Daring," *AKSIOMA J. Progr. Stud. Pendidik. Mat.*, vol. 11, no. 2, p. 971, 2022, doi: 10.24127/ajpm.v11i2.4702.

[16] F. Yudup, "Uji Validitas Dan Reliabilitas Instrumen Penelitian Kuantitatif," *J. Tarb. J. Ilm. Kependidikan*, vol. 7, no. 1, pp. 17–23, 2018.

[17] Prof. Dr. Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: Penerbit Alfabeta, 2019.

[18] S. K. Dewi and A. Sudaryanto, "Validitas dan Reliabilitas Kuesioner Pengetahuan , Sikap dan Perilaku Pencegahan Demam Berdarah," *Semin. Nas. Keperawatan Univ. Muhammadiyah Surakarta 2020*, pp. 73–79, 2020.

[19] J. W. Creswell, *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*, vol. 4. 2012. [Online]. Available: https://drive.google.com/file/d/1d5ZzlgJuCrwAyLpdBeK5dhKMZTpE2HNb/view

[20] Yusrizal and Rahmati, *Pengembangan Instrumen Afektif & Kuesioner*. 2022. [Online]. Available: https://www.google.co.id/books/edition/Pengembangan_Instrumen_Afektif_Kuesioner/Y0uVEAAAQBAJ?hl=id&gbpv=0

[21] S. Sulardi, M. Nur, and W. Widodo, "Pengembangan Perangkat Pembelajaran Fisika Model Problem Based Learning (Pbl) Untuk Melatih Keterampilan Berpikir Kritis Siswa," *JPPS (Jurnal Penelit. Pendidik. Sains)*, vol. 5, no. 1, p. 802, 2017, doi: 10.26740/jpps.v5n1.p802-810.

[22] U. Kurnia, Hamdi, and Nurhayati, "Efektivitas Pengggunaan Gambar Pada Brosur Dalam Model Pembelajaran Problem Based Learning Untuk Meningkatkan Hasil Belajar Fisika Kelas XI SMAN 5 Padang," *Pillar Phys. Educ.*, vol. 6, pp. 105–112, 2015.

[23] S. I. P. Ningsih, "Penerapan Model Pembelajaran PBL Terintegrasi STEM untuk Meningkatkan Aktivitas dan Hasil Belajar Peserta Didik di Kelas XII IPA 5 SMAN 7 Padang," *Pillar Phys. Educ.*, vol. 13, no. 3, pp. 443–450, 2020.

[24] V. Prillasari, S. Murtini, and S. Andriyati, "Peningkatan Kemampuan Memecahkan Masalah melalui Penerapan Model Pembelajaran Problem Based Learning Pada Materi Hidrosfer Siswa SMA Labschool Unesa 1," vol. 7, pp. 18774–18782, 2023.

[25] R. Al Hakim, I. Mustika, and W. Yuliani, "Validitas Dan Reliabilitas Angket Motivasi Berprestasi," *FOKUS (Kajian Bimbing. Konseling dalam Pendidikan)*, vol. 4, no. 4, p. 263, 2021, doi: 10.22460/fokus.v4i4.7249.

[26] D. Y. Tan and C. W. Cheah, "Developing a gamified AI-enabled online learning application to improve students' perception of university physics," *Comput. Educ. Artif. Intell.*, vol. 2, 2021, doi: 10.1016/j.caeai.2021.100032.

[27] S. A. Rodzalan and M. M. Saat, "The Perception of Critical Thinking and Problem Solving Skill among Malaysian Undergraduate Students," *Procedia - Soc. Behav. Sci.*, vol. 172, pp. 725–732, 2015, doi: 10.1016/j.sbspro.2015.01.425.

[28] D. A. Chávez, V. M. Gamiz-Sanchez, and A. C. Vargas, "Problem-Based Learning: Effects on Academic Performance and Perceptions of Engineering Students in Computer Sciences," *J. Technol. Sci. Educ.*, vol. 10, no. 2, pp. 306–328, 2020, doi: 10.3926/jotse.969.

[29] L. Cáceres-Jensen *et al.*, "Learning reaction kinetics through sustainable chemistry of herbicides: A case study of preservice chemistry teachers' perceptions of problem-based technology enhanced learning," *J. Chem. Educ.*, vol. 98, no. 5, pp. 1571–1582, 2021, doi: 10.1021/acs.jchemed.0c00557.

[30] S. Wismath, D. Orr, and M. Zhong, "Student Perception of Problem Solving Skills," *Transform. Dialogues Teach. Learn. J.*, vol. 7, no. 3, pp. 1–17, 2014.