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Analysis of Assessment Instrument Needs to Measure Students Critical Thinking Skills and Self-Efficacy in Physics Learning

Tri Lestari[1*], Undang Rosidin[1], I Wayan Distrik[1], Chandra Ertikanto[1], Kartini Herlina[1]

[1] Master of Physics Education, Faculty of Teacher Training and Education, University of Lampung, Lampung, Indonesia.

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Corresponding Author:
Tri Lestari
lestaritari1505@gmail.com

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Abstract: This research is a preliminary study that aims to determine the needs of teachers and students in the learning process, especially in the material of particle motion dynamics. The research method chosen was a survey, which was conducted on 20 physics teachers and 30 high school students in the MIPA field in Lampung Province using Google Form. The collected data were then curated and analyzed to identify and address educational needs. The results of the data analysis showed a demand for assessment instruments that can measure critical thinking skills and self-efficacy in physics learning. According to the survey, 45% of teachers never assess critical thinking skills and 60% of teachers never assess self-efficacy. Teachers do not apply because of the lack of examples or instruments owned to assess critical thinking skills and self-efficacy. Teachers also do not have assessment instruments that are easy, practical, and appropriate during the learning process. Physics learning assessment at school has not optimized critical thinking skills well, so critical thinking skills are still low, and self-efficacy is still an obstacle. Therefore, the development of assessment instruments to measure critical thinking skills and student self-efficacy in physics learning is very important.

Keywords: Assessment; Critical thinking; Instruments; Self-efficacy

Introduction

Character education is education that is closely related to a person's morals and attitudes. Character is related to a person's morals that are inherent in him as an individual being. The values contained in character are positive values for something good, not bad. Instilling character in students through education cannot be separated from our own national culture and in this case, integration is needed between three educational environments, namely family, school, and society. 21st Century Skills not only develop students' attitudes or character, knowledge, and skills alone. However, this needs to be balanced with students' ability to use technology wisely. Students are required to be able to think critically and complexly. Therefore, to achieve these goals, students are expected to be active and creative in participating in learning. In addition, teachers are also required to be able to create a pleasant learning atmosphere and encourage students to be able to achieve 21st Century skills (Angga et al., 2022). The independent learning curriculum is very relevant to the needs of students and the demands of 21st century education (Daga, 2021).

Assessment is important in the teaching and learning process, because without assessment it will be very difficult to measure the level of success. Educational evaluation is a systematic process in measuring the level of progress achieved by students, both in terms of objective norms and group norms and determining whether students are making satisfactory progress towards achieving the expected teaching goals. So that a way to evaluate it is obtained. This method is by adjusting the object of educational assessment (Halimah et al., 2022). A good assessment is an assessment that can reflect all the abilities that will be

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assessed both in terms of cognitive, affective, psychomotor (Saputri et al., 2018; Sumarni et al., 2018).

Critical thinking is a way of thinking that is meaningful and has reasons and goals in deciding/concluding a problem (Doang et al., 2022). Fitriana et al. (2019) stated that critical thinking skills are thinking skills that involve cognitive processes and invite students to think reflectively about their problems. Critical thinking is one of the thinking skills in high-level thinking skills and is a 21st century learning goal (Redhana, 2019). Critical thinking skills are very important for individuals to master in order to succeed in facing the challenges of life and career problems in the era of science and technology that continues to change rapidly (Sari et al., 2020). Critical thinking skills are very important and must be possessed by students. Students who have high critical thinking skills will tend to be able to analyze information to find the truth. With high critical thinking skills, students will be able to solve problems and be confident in their success in learning (Allanta et al., 2021).

Individuals who are able to think critically are individuals who can conclude what they know and know how to use that information to solve problems and find relevant information to support them in solving problems. Therefore, critical thinking skills are one of the basic skills in solving problems. Indicators of students having critical thinking skills are being able to analyze/identify information and problems, being able to formulate ideas, being able to create strategies to solve problems, being able to evaluate, being able to conclude. Students' critical thinking skills must be honed and trained in the classroom. Teachers can provide various stimuli so that students have critical thinking skills. In learning, the model used by the teacher influences the abilities and skills of students (Setiawan et al., 2022).

Improving students' critical thinking skills is important to do. Therefore, reviewing the supporting aspects is one way that can be done. The supporting aspects of critical thinking skills in question are personality factors. Sholihatin et al. (2019) explained that self-efficacy is a belief that a person or individual has about their ability to carry out actions or tasks to achieve desired goals. Studies show that self-efficacy has a positive relationship with students' critical thinking and systematic communication skills, meaning that the better the student's self-efficacy, the better their critical thinking and communication skills (Hendriana et al., 2019; Nuraeni et al., 2019). Self-efficacy also influences students' choice of activities. Students with low self-efficacy in learning will avoid their learning tasks, especially new and challenging tasks. Meanwhile, students with high self-efficacy will face the learning task with great desire. Students' critical thinking and visual representation skills need to be measured with the right measuring tools, one of which is a test (Nurulhasni et al., 2023).

Good self-efficacy will foster a positive attitude towards the way of thinking, succeeding and being able to solve problems (Heryani et al., 2023). Ningsih et al. (2020) stated that if critical thinking skills are high, it will foster self-confidence and belief in high learning success or give rise to student self-efficacy. Good self-efficacy will foster a positive attitude towards the way of thinking, succeeding and being able to solve problems. Student self-efficacy is formed from the experience of success in individuals. Due to the lack of activeness in learning, many students are not sure about learning success and it will be difficult to increase self-efficacy (Allanta et al., 2021).

Based on the results of the questionnaire analysis of the needs of high school/vocational high school teachers in Lampung province, it was revealed that 45% of teachers had never conducted critical thinking skills assessments and 60% of teachers had never conducted self-efficacy assessments. Teachers do not use or do not apply several assessments for several reasons, one of which is the lack of examples or instruments available to assess critical thinking skills and self-efficacy. Because teachers also do not have easy, practical, and appropriate assessment instruments during the learning process. Physics learning assessments in schools have not optimized critical thinking skills properly, so critical thinking skills are still relatively low, and self-efficacy is still an obstacle. This is caused by various circumstances, including students who are less confident in their talents, dislike of the subject, and failure to understand the ideas conveyed during learning. This has a major impact on the learning outcomes obtained, and the character embedded in students will be far from what is expected. Some students who have confidence in success in the learning process, the rest are many students who are silent and only pay attention. Self-efficacy also affects students' choice of activities. Students with low self-efficacy in learning will avoid their learning tasks, especially new and challenging tasks. While students with high self-efficacy will face the learning task with great desire.

This is also supported by previous research which states that: 53% of teachers have not yet revised the assessment instruments properly at the SMA/MA level (Haryati, 2018); the 21st century skills measurement instruments available in schools are still very limited so that an assessment is needed that can improve critical thinking skills in students (Mahmudah et al., 2024); attitude assessment instruments are rarely carried out during the learning process, because teachers only focus on cognitive aspects compared to affective and

psychomotor aspects (Adawiah et al., 2023), in addition, there is no attitude assessment instrument available so that teachers only make observations in assessing their attitudes (Kurniawati et al., 2021).

Physics learning involves the active participation of students, both physically and mentally, and focuses on students based on their everyday experiences. Physics emphasizes direct skills in seeking and acting to scientifically explore and understand the natural world. Students have meaningful learning experiences during the learning process, allowing them to develop physics learning values (Marlina et al., 2022). One of the factors for success in learning is the role of instructional media as a medium for delivering learning content and information to learners. This is closely related to the role of an educator. To overcome misperceptions in communication, a tool called media is needed in the learning process (Rompegading et al., 2022). In achieving high-quality learning assessments, technology plays an important role. With the rapid development of technology, the internet has become familiar to us. Internet technology can be modified to enhance students' interest (Ananda et al., 2023).

This research is important because it develops an integrated assessment instrument to measure students' critical thinking skills and self-efficacy in physics learning, both of which are essential 21st century competencies. This instrument is designed to be contextually relevant, valid, and reliable, so that it can help teachers evaluate learning holistically and provide appropriate interventions to improve the quality of education. This research also answers the need for a measurement tool that is able to support the implementation of Merdeka Curriculum with a focus on developing student competencies comprehensively.

Method

This study is a preliminary study with the aim of determining the needs of teachers and students in the learning process, especially in the context of physics subjects related to particle motion dynamics. The research method chosen was a survey conducted on 20 physics teachers and 30 high school students in mathematics and natural sciences in Lampung Province, using Google Forms. The results of the data analysis showed a demand for assessment instruments that can measure critical thinking skills and self -efficacy in physics learning. According to the survey, 45% of teachers have never conducted a critical thinking skills assessment and 60% of teachers have never conducted a self-efficacy assessment. The questionnaire consisted of 15 questions for teachers and students. This questionnaire includes questions about personal background information, learning processes and assessments, assessments of students' critical thinking skills, self-efficacy assessments, and instrument development needs. In addition, this questionnaire aims to align learning objectives with particle motion dynamics material. Each aspect contains open-ended questions that allow for diverse perspectives from respondents. The questionnaire was randomly distributed to high school physics teachers and high school students majoring in Mathematics and Natural Sciences over a period of time. The collected data is then curated and analyzed to identify and meet educational needs.

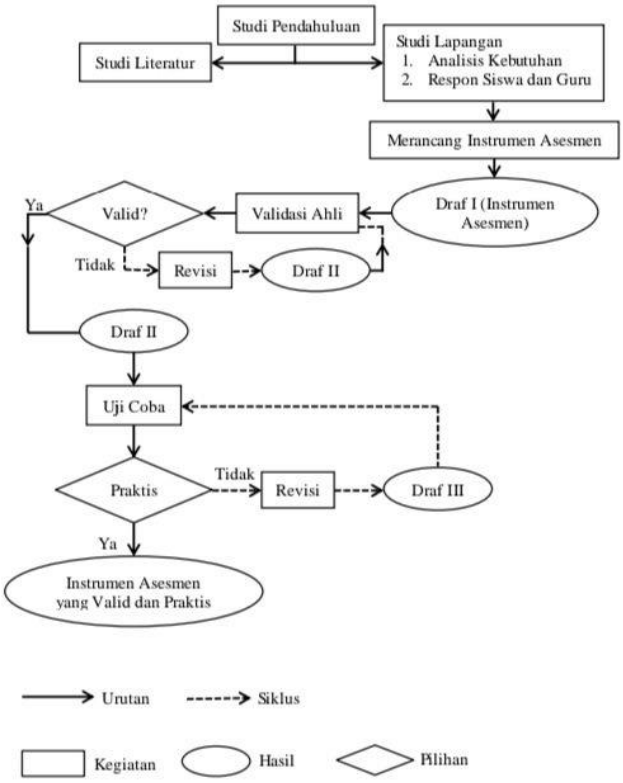

Figure 1. Research Flow

Result and Discussion

This preliminary study is a descriptive study that aims to determine the needs of teachers and students regarding assessment instruments to measure critical thinking skills and self-efficacy in physics learning. The study was conducted by providing questionnaires to teachers and students. This preliminary study presents an investigation into the needs and perceptions of assessment instruments to measure students' critical thinking skills and self-efficacy in physics learning for 20 physics teachers and 30 high school students in mathematics and natural sciences in Lampung Province, using Google Forms. The analysis we conducted aims to determine the needs of teachers and students by looking

at the number of questionnaires that have been filled out. Information collected from the questionnaire, related to the use of assessment instruments to measure students' critical thinking skills in learning, is presented in the diagram below.

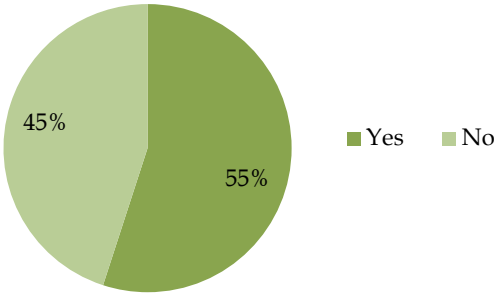

Figure 2. Diagram of the use of assessment instruments to measure critical thinking skills in the learning process collected from the teacher questionnaire

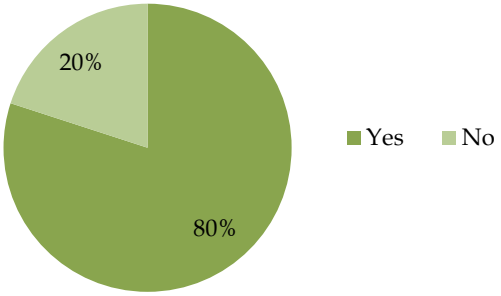

Figure 3. Diagram of the use of assessment instruments to measure critical thinking skills in the learning process collected from student questionnaires

Figure 2 shows that 45% of teachers do not use assessment instruments to measure students' critical thinking skills in physics learning. Similarly, Figure 3 students revealed that 80% of teachers do not use assessment instruments to measure critical thinking skills in physics learning.

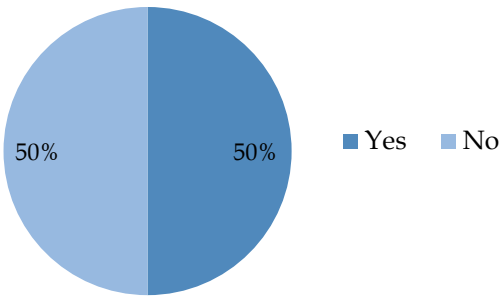

Figure 4. Diagram of the use of assessment instruments to measure self-efficacy skills in the learning process collected from the teacher questionnaire

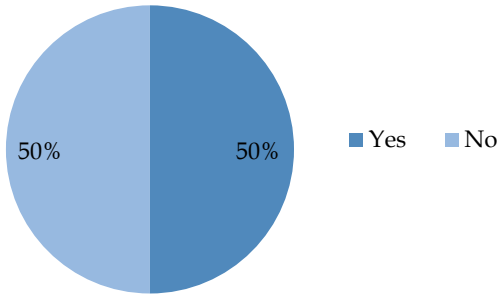

Figure 5. Diagram of the use of assessment instruments to measure self-efficacy skills in the learning process collected from student questionnaires

Figure 4 shows that 50% of teachers do not use assessment instruments to measure students' self-efficacy skills in physics learning. Likewise, Figure 5 students revealed that 90% of teachers do not use assessment instruments to measure self-efficacy skills in physics learning. Information collected from the questionnaire, related to the use of the problem-based learning model in physics learning on particle motion dynamics material is presented in the diagram below.

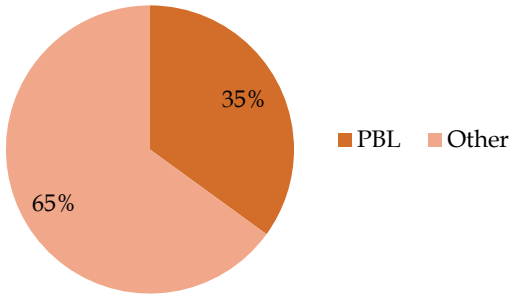

Figure 6. Diagram of the use of the problem based learning model on the material on particle motion dynamics from the teacher questionnaire.

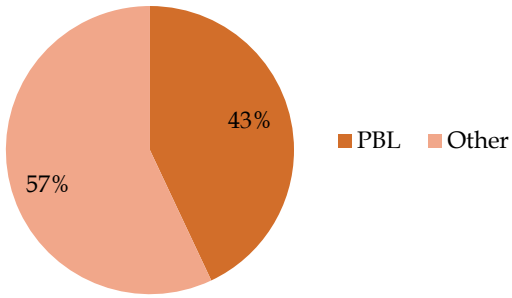

Figure 7. Diagram of the use of the problem based learning model on the material on particle motion dynamics from the student questionnaire.

Figure 6 states that 35% of teachers do not use the problem-based learning model in physics learning, especially the material on particle motion dynamics. Likewise, in Figure 7, students stated that only 57% of

teachers use the problem-based learning model in physics learning. The low use of the problem-based learning model is caused by limited school facilities such as internet networks and inadequate assessment instruments for use by teachers. In addition, this is also caused by the challenge of creating assessment instruments to measure students' critical thinking skills and self-efficacy in physics learning that is interesting and can actively involve students in the learning process.

This is also supported by previous research which states that: 53% of teachers have not yet revised the assessment instruments properly at the SMA/MA level (Haryati, 2018); the 21st century skills measurement instruments available in schools are still very limited so that an assessment is needed that can improve critical thinking skills in students (Mahmudah et al., 2024); attitude assessment instruments are rarely carried out during the learning process, because teachers only focus on cognitive aspects compared to affective and psychomotor aspects (Adawiah et al., 2023), in addition, there is no attitude assessment instrument available so that teachers only make observations in assessing their attitudes (Kurniawati et al., 2021).

Conclusion

Survey results show that 45% of teachers never assess critical thinking skills and 60% never assess self-efficacy, mostly due to the lack of easy, practical, and appropriate assessment instruments. Assessment in physics learning at school has not optimized critical thinking skills, so this ability is still low, while student self-efficacy is also an obstacle. Factors such as lack of confidence, dislike of physics, and difficulty understanding the material have a negative impact on learning outcomes and student character. Students with low self-efficacy tend to avoid challenging tasks, while students with high self-efficacy are more motivated. Therefore, the development of assessment instruments that can measure students' critical thinking skills and self-efficacy is an important step to improve the quality of physics learning.

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Author Contributions
Conceptualization, T. L.; methodology, T. L.; validation, C. E. and K. H.; formal analysis, U. R.; investigation, I. W. D.; resources, T.L.; data curation, T. L.: writing—original draft preparation, T. L.; writing—review and editing, T. L.: visualization, U. R. and I. W. D. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest
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