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Developing of Inquiry Based Learning Tools for Increasing Self-Efficacy and Student Learning Outcomes

Ni Ketut Rapi*, Ida Bagus Putu Mardana and Luh Putu Budi Yasmini

Department of Physics Education, Faculty of Mathematics and Sciences, Universitas Pendidikan Ganesha, Bali, Indonesia
**Corresponding author. Email: ketutrapi658@gmail.com*

ABSTRACT
This study is motivated by the fact that the implementation of the Physics curriculum in Senior High School has not been able to develop students' self-efficacy and to improve student learning outcomes. The main problem analysed in this study is whether the inquiry-based learning tools developed is valid and practice to improve students' self-efficacy and learning outcomes. Moreover, the aim of the study is to produce an adaptable and effective learning media for increasing students' self-efficacy and student learning outcomes. This study was used research and development design. In this study, the inquiry-based learning tools approach are modified into five steps, namely preliminary studies (need assessment), making prototypes of learning tools, validation, testing, and reporting. The subjects of this study are teachers and students of class X SMA in Singaraja. Data are collected by observation guidelines, interview guidelines, and questionnaires. The data were analyzed by using descriptive analysis approach. The result of this study shows that: (1) the inquiry-based learning tools physics produced is very valid. The average score of the validation of the learning tools (student book) is 3.42 with a valid category; and (2) the inquiry-based learning tools physics produced is very practical to be used in physics learning. The average score of the practicalities of three kinds of data are 3.7 for implementation of the inquiry-based learning tools physics witha very practical category, 3.6 for teacher's response with a very practical category, and 3.1 for students' responses with a practical category. The total practicality averagefor the three dimensions is 3.5 with a very practical category.

Keywords: *Physics learning, Knowledge, Learning outcomes*

1. INTRODUCTION

In the era of industrialization and globalizationwith the increasingly competitive competition, the factor of the mastery of science and technology plays a very important role. Mathematics and Natural Sciences education has the potential to play a strategic role in preparing human resources to face the era of industrialization and globalization. This potential can be accomplished if Mathematics and Natural Sciences education is able to produce students who are strong in Mathematics and Natural Sciences and succeed in fostering the ability to think logically, think critically, creatively, take initiative, self-efficacy, and be adaptive to change and development. According to Buchori (2001) [1] educating young people to become specialists in the social and humanities fields and leaving them blind to the world of science and technology is a big mistake. In a society that is flowed by the advanced of scientific and technology, humans who are blind to science will be confused, do not understand what is happening around them and also do not understand what is happening to them.

According to Faure et al (1982) [2] the idea of learning is not as a dream for the future but as a fact, internal reform and improvement of the education system that must be carried out continuously. Preliminary studies show that the expectation for the growth of creative and anticipatory nature of physics teachers in learning practices to maximize the role of students today is still not optimal. This seems to be happened from the lowest formal education to university level. It is claimed to be one of the

factors causing the low quality of physics learning processes and products. The quality of the physics learning process today can be seen from the regular learning activities, indicates that the choice of approaches, strategies, methods is less varied. The learning process tends to begin with orientation and presentation of information related to the concepts to be studied by students, giving sample questions, and followed by giving tests. Meanwhile, one of the products of Physics learning can be articulated from the acquisition of Physics Semester Final Examination scores which from a few years were still not in maximal score and the report cards in Physics are also relatively low.

Facts show that Indonesian's education system is in low quality. Based on the World Education Ranking published by the Organization of Economic Co-operation and Development (OECD) in 2016, Indonesia is ranked 62 out of a total of 70 countries in the world. The ranking is obtained from the results of the Program for International Student Assessment (PISA) test. The specifications show that the science test score obtained by Indonesia is 403 out of the total maximum science test score that should have been obtained of 640.When compared to other countries in Southeast Asia, Vietnam is in the 8th place with 526 points and Singapore is in the 1st place with a score of 556. This shows that the average science ability of Indonesian students is 153 points lower than Singapore. The data of the Program for International Student Assessment (PISA) in 2018 reveals that Indonesia is only able to be in the 10th lowest among all participating countries. PISA measures from the aspects of reading literacy, math skills, and science skills. In the aspect of scientific ability, Indonesia isrankedin the 70th out of 78 countries with an average score of 396 from a maximum average score of 590 (OECD, 2019). The Indonesia's backwardness indicates that the science learning achievement of Indonesian students is still very low.

If it is disclosed more deeply and the scope is narrowed down, the average score of the national exam (UN) in physics subjects in all state high schools in Singaraja City during the last three years has decreased significantly. This is shown by the average national examination scores in the 2015, 2016, and 2017 subjects of physics respectively for all public high schools in Singaraja City. The average scores are 85.70; 61.80; and 46.56 (Kemdikbud, 2017). This data further strengthens the low student achievement, especially in physics lessons.

Samudra et al (2014) [3] examined the problems faced by high school students in Singaraja City in learning physics originating from internal students' factors. The study shows that students did not like physics lessons and still considered physics as a difficult subject. The difficulty of students in learning physics is caused by several things, namely the density of physics material, memorizing, and counting, as well as learning physics in class that is not contextual.

The packaging of learning today is not in line with the nature of people learning and the nature of teaching according to the constructivist view. According to Suparno (1997) [4] teaching means asteacher participation with students in shaping knowledge, making meaning, seeking clarity, being critical, and providing justification. On the other hand, learning science (physics) which only emphasizes product aspects such as memorizing concepts, principles or formulas, does not provide opportunities for students to be actively involved in the science processes. Furthermore, Bybee (2002) [5] define learning asthe interaction of ideas and processes; new knowledge builds on prior knowledge (initial knowledge); learning increases when students find meaning, complex problems that have multiple solutions enhance learning, and learning increases when students engage in discussion of ideas and engage in processes.

It seems that a transformation of physics education is needed to be carried out, such from learning through memorization changed into learning to think. From superficial learning into a deep or complex learning. It induces from the orientation on the transfer of knowledge to the development of knowledge, skills and character". It becomes the task for all physics education experts in order to develop a physics education curriculum and assessment system that is directed at this new direction, and to disseminate knowledge about methods and techniques of physics learning that are effective for that purpose. Many factors influence student learning outcomes apart from the learning applied by the teacher.

According to Anderson and Krathwohl (2001) [6] learning outcomes in the cognitive domain include two dimensions, namely, the dimensions of knowledge and dimensions of cognitive processes which can be classified in the educational taxonomic framework. Anderson and Krathwohl define four types of knowledge, namely factual, conceptual, procedural, and metacognitive. Factual knowledge is knowledge about parts that are separate and have their own characteristics. Conceptual knowledge is knowledge about forms of knowledge that are more complex and organized. This type of knowledge includes knowledge of classifications, principles and generalizations, and theories. Procedural knowledge is knowledge about how to do something. This includes knowledge of skills, techniques and methods, as well as criteria to justify. Metacognitive knowledge consists of knowledge of cognition in general, awareness of knowledge of one's own cognition. This type of knowledge includes knowledge of strategies, knowledge of cognitive procedures, contextual and conditional knowledge and self-knowledge.

Brar (2018) [7] states that there are a number of factors that can affect student academic achievement, including: individuals, home and school environment, as well as self-concept, self-confidence, motivation, interests, and anxiety. In line with Brar, according to Kolo et al (2017) [8], students' academic performance in class is influenced by many psychosocial factors such as motivation, attitudes, interactions, academic self-efficacy, family, stress, etc. Aktan (2019) [9] claims that self-efficacy and motivation have a big impact on students' academic success. Further, Bandura (1995) [10] defines that self-efficacy is an individual's assessment of his ability to organize and implement action to achieve the goals. Students who have

high self-efficacy tend to have a high ability to organize themselves to do more effort and feel less pressured by environmental conditions. This shows that the tendency of students to perform tasks that give them high competitiveness and achievement. The student's belief that he or she can achieve academic goals can be a major determinant of a person's interest in doing assignments or achieving goals. The learning tools used by the teacher in learning greatly influence the learning process, self-confidence, and student learning outcomes.

Based on the research background above, the problems to be answered through this research can be formulated as follows. (1) What is the validity of inquiry-based physics learning tools? (2) What is the practical level of inquiry-based physics learning tools? The general objective of this study is to develop inquiry-based learning tools to improve high school students' self-efficacy and learning outcomes. The specific objectives of this research in each year are as follows.

1) Through literature study, to examine the characteristics of Self-efficacy and student learning outcomes and their indicators, examine inquiry-based learning steps to improve Self-efficacy and learning outcomes in Physics and assess the assessment system and procedures for assessing Self-efficacy and students' learning outcomes.
2) Through a preliminary study, to explore user opinions about self-efficacy and students' learning outcomes of physics, development of learning preparation, implementation of learning, and utilization of facilities / environment.
3) Through a panel group discussion, to analyze literature studies and field surveys obtained from activities 1 and 2.
4) Through laboratory work, to design a draft prototype for inquiry-based Physics learning tools that have been produced in point 3.
5) Through expert validation and panel group discussion, to test the correctness of concepts, suitability of prototypes or draft learning tools.
6) Through a limited test to determine the practicality and effectiveness of the learning device being developed.
7) Through a panel group discussion, to conduct an assessment of the results achieved in testing the effectiveness of learning tools, so that the obtained learning tools are trully in accordance with the needs of students and teachers in Senior Hight School.
8) Through laboratory work to improve the results of the activities in points 6 and 7 above, so as to produce inquiry-based learning tools that are valid and practical.

The development of inquiry-based learning tools that is oriented to self-efficacy and learning outcomes, and that is developed in this study can provide a very valuable contribution in supporting development, especially in the development and improvement of the quality of physics learning in senior high school. The research product in the form of learning tools can overcome the problem of the absence ofadaptable learning tools and can be effective for increasing self-efficacy and student learning outcomes.

2. METHODS

This study used research and development approach [11] which was modified into five important steps, namely need assessment, designing prototypes or learning media draft, validation, testing, and dissemination. The subjects of this research were those who were involved in obtaining valid, practical, and effective learning media. Subjects in the development of this learning media included: 2 physics lecturers and 1 physics teacher as content experts; 2 physics lecturers and 3 physics teachers as validators; 37 students (class X MIPA 4 SMA Negeri 4 Singaraja in academic year 2020/2021); 1 teacher as an observer; and 1 teacher as a user. The objects in this development research were: inquiry-based learning media (student book). The data obtained in this study consisted of qualitative data and quantitative data. The collected data were analyzed descriptively and quantitatively. The learning tools that was developed must meet the quality of good learning media, which include: validity and practicality.

3. RESULTS AND DISCUSSION

The product of this study was physics learning media in the form of student book for odd semester grade X senior high school which was designed in a valid and practical inquiry-based learning model setting.

a. Validity

The validation test of the learning tools was carried out by asking 2 physics lecturers and 3 physics teachers as validators. The results of the validators' assessment of the learning media are presented in Table 1.

Based on the results of the validation in Table 1, it was found that the average score of the learning tools was 3.42 in the valid category. Thus, the learning tools developed are suitable for use in classroom setting, but before being used, the learning tools must be revised based on the validators' feedback.

b. Practicality

The practicality of learning tools was assessed based on three things, namely: 1) the implementation of the learning Tools, 2) the teacher's response to the learning Tools, and 3) the students' responses to the student book. The implementation of the learning tools was assessed using an observation sheet. The aspects observed in the application of the learning tools were presented in Table 2. The observation was done by one physics teacher for 7 meetings.

The average score for all meetings is 3.7 with the category of very practical so that it meets the expected practicality level. Mean while, the teacher's response to the learning tools was assessed using a questionnaire. The result is presented in Table 3.

In Table 3, it can be seen that the average score of the teacher response to the learning tools is 3.6 with the category of very practical which met the expected practicality level.

Students' responses to the learning tools were gathered using a questionnaire. The results are presented in Table 4. It can be seen that the average score of students' responses on the learning tools was 3.1 with the category of very practical which met the expected level of practicality.

Table 1 Assessment Results on Learning Tools by the Validators

No	Aspects Assessed	Assessment Result	
		Mean score	**Criteria**
I	**Content**		
	1. Systematics of book writing presentation/format	3.7	Very Valid
	2. essential material/task	3.7	Very Valid
	3. The problem raised is in accordance with the level of student cognition	3.7	Very Valid
	4. Each activity presented has a clear purpose	3.0	Valid
	5. The activities presented grow students' curiosity	3.3	Valid
	6. The book is presented with pictures and illustrations	3.3	Valid
	7. Learning activities are in accordance with physics learning with inquiry-based learning model setting	3.0	Valid
II	**Language**		Valid
	8. The use of language is in accordance with standard Indonesian Language.	3.3	Valid
	9. The language used is in accordance with the level of cognitive development of students.	3.7	Very Valid
	10. The language used is communicative and easy to understand.	3.7	Very Valid
	11. The instructions and directions are clear.	3.3	Valid
	12. The expected answer criteria are clear.	3.3	Valid
	Average Score	**3.42**	**Valid**

Table 2 Aspects Observed on the Implementation of the Learning Tools

No	Aspects Observed
1	The student book can be used well by students during learning activities
2	The student book can make it easier for students to learn
3	The students do not experience difficulties in carrying out the activities described in the student book
4	The student book can assist teachers in carrying out learning activities
5	The student book helps students with structured assignments
6	The sentences used in the student book are clear and easy to understand

Table 3 Teacher Response on Learning Tools

No	Statements	Score
1	The general appearance of the student books is attractive	3
2	The material / content of the student book is in accordance with Core Competence / Basic Competence	4
3	The material presented in the student book is neatly arranged so that it is easy in teaching students	4
4	The student book makes it very easy to implement learning	4
5	The student books can develop students' curiosity	3
6	The student book can help teachers guide students during learning activities	4
7	The student book can help students interact with teachers and other students	3
8	The materials in the student book are in accordance with the level of student development	3
9	The pictures in the student book help students understand	4
10	The materials in the student book can be understood by students	3
11	The materials in the student book support the achievement of learning objectives	4
12	Practicum instructions in the student book can be done by students	3
13	The student book can make students work together	4
14	With this book, the learning atmosphere becomes more comfortable and enjoyable	3
15	The language used in the student book is in accordance with standard Indonesian Language	4
16	The language used in the student book is communicative and easy to understand	4
	Average Score	**3.6**

Table 4 Students' Responses on the Learning Tools

No	**Statement**	**Assessment Result**	
		Mean Score	**Category**
1	I am very happy to learn using this book.	3.2	Practical
2	The appearance of this book is very interesting.	3.2	Practical
3	The contents of this book are interesting to read.	3.0	Practical
4	The questions in this book are close to everyday life.	3.0	Practical
5	The questions in this book are easy for me to imagine.	3.0	Practical
6	The presentation of the materials in this book is neatly arranged so that it is easy for me to understand.	3.1	Practical
7	The tasks in this book are clear.	3.1	Practical
8	Through this book I quickly understood the material provided.	2.9	Practical
9	In this book I was taught to find concepts with fun and easy to understand.	3.1	Practical
10	This book does not burden me with studying.	3.0	Practical
11	This book can help me in interacting with the teacher and with other students	2.9	Practical
12	Through this book I can solve the problem given either individually or in groups.	3.1	Practical
13	The problems in this book motivate me to find the answers.	3.0	Practical
14	With this book I freely express my opinion in answering the questions given	2.9	Practical
15	This book can make me comfortable in learning.	3.0	Practical
16	The writing in this book makes me easy to read.	3.2	Practical
17	The sentences used in this book make me easy to understand.	3.1	Practical
18	The figures and tables in this make me easy to understand.	3.1	Practical
19	With this book it is easy for me to understand the benefits of the materials I learn.	3.1	Practical
20	With this book, I will remember what I study longer.	3.0	Practical
	Average Score	**3.1**	Practical

Tabel 5 Summary of Analysis of the Practicality of the Learning Tools

No	Assessment	Result	
		Average Score	**Category**
1	Learning media Implementation	3.7	Very practical
2	Teacher response	3.6	Very practical
3	Students' responses	3.1	Practical
Average Score		**3.5**	**Very Practical**

Summary of the practicality of learning tools based on the following three things: 1) the implementation of learning media, 2) teacher responses to learning tools, and 3) student responses to student books, are presented in Table 5. Based on the summary analysis of the practicality test of learning tools as presented in the table, obtained a mean value of the overall practicality test assessment of 3.5 with the very practical category.

The average practicality score for learning tools implementation was 3.7 with the category of very practical, the teacher response was 3.6 with very practical category, and the students' responses was 3.1 with practical category. The average score of the overall practicality test for learning tools was 3.5 with the category of very practical. The practicality value of learning tools from meeting 1 to meeting 7 seemed to have increased. This happened because at the initial meeting there was still many students who were not familiar with the learning tools, so they had to make adjustments. At the final meeting, it seemed that students were very comfortable learning with the inquiry-based learning tools, this was because the concepts being learned were found by students themselves.

This book was developed based on the recent curriculum (called Curriculum 2013 / K13) applied in the school where the learning tools was implemented, so that the materials being tested were easily accepted by the students. This inquiry-based learning tools provided the widest possible opportunity for students to understand concepts based on what they experience in their lives, so this learning tools was practical to be applied in classroom setting.

Students' motivation in learning greatly determine the success of a learning process. The more motivated students are in learning, the better the learning process will be. Thus, quality learning process will produce good learning outcomes. Motivation to learn can be increased by applying learning tools that are in accordance with the materials and students' characteristics. If a learning media is able to be relevant with what students usually face and see, the learning tools will be able to develop students' motivation to learn, thus the quality of the learning process will be good. The quality of the learning process is one indicator of the level of practicality of a learning tools. A learning tools with very practical qualification will provide a good quality of learning process [12].

4. CONCLUSION

Based on the results and discussion, it can be concluded that:

1. Through this development research, a valid inquiry-based physics learning was developed, with the average score of the validation of the learning tools (student book) is 3.42.
2. Through this development research, the physics inquiry-based learning tools was produced which was very practical to use in physics learning. The practicality average score for the implementation of the learning tools was 3.7 with very practical category, the teacher response was 3.6 with the very practical category, and the students' responses was 3.1 with practical category. The total practicality average for the three dimensions was 3.5 with the very practical category.

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