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Development of Learning Tools Based on *Contextual Teaching and Learning* (CTL) on The Material of Balance and Rotation Dynamics For Class XI SMA

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ABSTRACT

The learning tool based on *contextual teaching and learning* (CTL) on the material of balance and rotation dynamics for class 10 high school is a learning tool in the form of RPP, LKPD and Cognitive Learning Outcomes Test. This research aims to develop learning tools as well as determine the validity of these learning tools. It is hoped that the learning tools developed will make it easier for teachers to convey material on equilibrium and rotational dynamics, make it easier for students to understand material on equilibrium and rotational dynamics, and can improve high school physics learning in schools. The development research model used is the 4D development model (Define, Design, Development and Disseminate). The research carried out only reached the development stage. The instrument used in this research was a validation sheet which was filled in by 3 validators. The learning device validation results obtained were valid with an Aiken's validity index of 0.84 in the very high category for lesson plans, an Aiken's validity index of 0.84 in the very high category for LKPD and an Aiken's validity index of 0.85 in the very high category for learning outcomes tests. Therefore, the learning tools developed are suitable for use as learning tools in schools. This learning tool is recommended for teachers. Other research related to implementation and development via Android applications is still needed.

Keywords: *Development, Learning Media, Contextual Teaching and Learning* (CTL)

1 Introduction

Education according to Republic of Indonesia Law No. 20 of 2003 is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the necessary skills. himself, society, nation and state (Samukti, 2019:1). Education is an integral part of development. The education process cannot be separated from the development process itself. Development is directed and aims to develop quality human resources (Hamalik, 2003:1.

In the 2013 Minister of Education and Culture Regulation Number 65, it is stated that the learning process in educational units is carried out in an interactive, inspiring, fun, challenging manner, motivating students to participate actively, and providing sufficient space for initiative, creativity and independence in accordance with their talents, interests, and physical and psychological development of students. So that through these learning activities, students are facilitated by the teacher to be actively involved in developing their potential. With the experience possessed by teachers, students can carry out activities that make it possible to develop their potential into competencies specified in the curriculum (Puput & Djamilah, 2018: 64).

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Indonesia has made several curriculum changes to suit current developments. The curriculum currently used is the 2013 curriculum which requires students to learn actively, independently, discover their own concepts and carry out competency-based learning. One of the subjects in the 2013 curriculum is physics at high school. Physics learning is seen as a process to develop abilities in concepts, principles and laws of physics so that in the learning process you must consider active and efficient learning strategies or methods. On the other hand, in the implementation of physics learning, generally the teacher-centered lecture method is still used, physics concepts are in rote form so that physics learning is less meaningful (Anggraini, 2018:2).

One of the difficulties that students often experience in studying physics is analyzing the relationship between one concept and other interrelated concepts. For example, in equilibrium and rotational dynamics. The concept of rotational dynamics and equilibrium of rigid bodies which requires a high level of analysis and accuracy of a simple event. In solving the problem, the concept of rotational dynamics and equilibrium of a rigid body must link the concept of force in Newon's law, the concept of kinematics of motion, and the concept of circular motion. Determining the formula is not necessarily easy to memorize, but requires an understanding of how forces work in a system that causes an object to stay still or move, as well as what factors influence whether an object rotates or not. Because of this connection, students often feel that there are too many formulas, it is difficult to memorize them, it makes their heads dizzy and so on, so that students' interest or interest in physics subjects becomes less or even not interested at all. This causes students to become lazy and affects student learning outcomes. (Apriani et al, 2016:1).

Another problem that is often found in learning is the inappropriate use of learning tools, including: teaching materials, syllabus, lesson plans, modules, worksheets and so on. There are several parts of learning tools that are often focused on, namely teaching materials, lesson plans, and student activity sheets (LKS). Several types of learning tools can be used in various subjects, because the form can be adjusted to suit needs, for example in physics subjects (Yunita et al, 2012: 18.

Learning that can develop students' social and cognitive skills, namely learning based on CTL (Contextual Teaching and Learning). According to Nurdin et al. (2013), CTL-based learning resources are good enough to improve the quality of physics learning. The CTL approach has the advantage of providing direct experience so that learning is more effective and meaningful (Fadhli & Yoenanto, 2021: 1-11).

The application of CTL in learning must be supported by appropriate learning tools. Learning tools play an important role in the success and smoothness of the teaching and learning process. Learning tools are materials that a teacher will use in the learning process so that learning can run more effectively and meaningfully. Quality learning certainly requires a learning device that can help students understand and master the subject matter well.

2 Research Methodology

The type of research used in this research is research and development (R&D). The development model in this research uses a 4D model. The 4D model proposed by Thiaagrajan, Dorothy S. Semmel and Melvyn I (1974) consists of four stages including define, design, develop and disseminate. In this research, the 4-D model was only carried out in three stages, namely defining, designing and developing. The implementation of this development research was only carried out at the development stage or the development stage which was validated by the validation team, namely 3 Physics Education Lecturers at FKIP Riau University.

The development procedure in this research can be seen as in Figure 1.

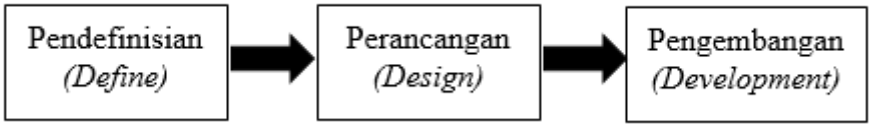

Figure 1. Development Procedure

In this research, only research was carried out up to stage 3, namely development. The definition stage is carried out through literature study and simple questions and answers with high school physics teachers, students and fellow Physics Education Alumni. At this stage, several development analyzes are carried out, namely initial analysis, student analysis, task analysis, concept analysis and learning objective analysis.

The type of data used in this development research is a quantitative description taken from the assessment of the expert validation team. Data obtained from the results of this product development are used as a basis for determining the feasibility and attractiveness of the learning tools using the Contextual Teaching and Learning (CTL) approach that have been produced. The data sources in this research were obtained from validator assessments in the form of numbers, and suggestions outlined in the learning tool validity questionnaire. The data analysis technique used in this research is descriptive analysis, which aims to describe the data that has been collected from the assessment of the learning implementation plan validation sheet (RPP), student worksheets (LKPD), and Test Instrument Assessment Sheets by a team of experts. The validation sheet was converted using a Likert Scale with 5 alternative answers to obtain quantitative data.

3 Results and Discussion

The development research carried out in this research was to develop learning tools in the form of Learning Implementation Plans (RPP), Student Worksheets (LKPD), and Physics Learning Outcomes Tests on rotational dynamics and equilibrium of rigid bodies based on approaches (CTL) for class XI high school students. . Researchers use a 4D development model which consists of 4 stages, namely the define (definition), design (planning), development (development) and dissemination (distribution) stages. However, this research was only carried out until the development stage. At the define stage, initial analysis, concept analysis, task analysis and specification of learning objectives are carried out. At the design stage, test standards are prepared, media analysis, format analysis and initial design of learning tools. Meanwhile, at the development stage, validation is carried out by expert experts.

The results of the validation process are described as follows:

1. Validation RPP

   Based on criticism and suggestions from the validator in the validation process I, improvements were made according to the input. The results of data analysis using the Aiken's V formula are presented in Table 3.

Table 3.1 Validation Result RPP

No	Assesment Aspect	$\sum s$	V	Validation Criteria
Format RPP				
1	The complete RPP identity includes School Name, Subject Name, Class, Semester, Main Material, Study Material and Time Allocation.	12	1	Very High
2	Complete RPP components include KI, KD, GPA, Learning Objectives, Material	11	0.92	Very High

	Descriptions, Learning Approaches/Models and Methods, Media/Tools/Resources, Learning Activities and Learning Assessment.			
Formulation of Indicators and Learning Objectives				
3	Achievement Indicators are formulated in accordance with KI/KD	10	0.83	Very High
4	Achievement Indicators according to the lesson material	10	0.83	Very High
5	Learning Objectives in accordance with Achievement Indicators	9	0.75	High
6	Learning objectives are in accordance with the learning material	9	0.75	High
Learning materials				
7	The lesson material is in accordance with KD	9	0.75	High
8	The lesson material is in accordance with the learning objectives	9	0.75	High
9	Learning material is presented sequentially	10	0.83	Very Hihg
Tools, Media and Learning Resources				
10	Tools, media and learning resources in accordance with learning objectives	10	0.83	Very High
11	Tools, media and learning resources in accordance with the CTL approach	10	0.83	Very High
Learning Activities				
12	Learning activities include 3 stages, namely preliminary activities, core activities and closing activities.	12	1	Very High
13	Learning activities include components of the CTL approach.	10	0.83	Very High
14	The activity steps are in accordance with the stages of the CTL approach	10	0.83	Very High
Assessment of Learning Outcomes				
15	Technical assessment of learning outcomes in accordance with learning indicators	10	0.83	Very High
16	The assessment instrument items are in accordance with the learning objectives	10	0.83	Very High
17	The existence of instruments, answer keys, and clear scoring rubrics	10	0.83	Very High
Average			0.84	Very High

From the data in Table 3, it shows that all indicators in the RPP Validation are valid with a validity index ranging from 0.75 to 1 and have an average Aiken's validity index of 0.84 in the very high category.

2. Validation LKPD

Table 3.2 LKPD validation results

No	Assesment Aspect	$\sum s$	V	Validation Criteria
Format				
1	The cover design is made in such a way with an attractive color combination	11	0.92	Very High
2	The layout of the image illustrations with the text is appropriate	10	0.83	Very High
3	The use of type and letters is appropriate	10	0.83	Very High
4	The overall appearance design of the LKPD is attractive	10	0.83	Very High
Fill				
5	The material in the LKPD is in accordance with the KI/KD	9	0.75	High
6	Presentation of material is based on the components of the CTL approach	9	0.75	High
7	The material chosen is essential material	10	0.83	Very High
8	The material presented in the LKPD provides students with direct experience	10	0.83	Very High
9	The LKPD presented helps students discover the concept of learning material	10	0.83	Very High
10	The presentation of material in the LKPD is in accordance with the correct concept	10	0.83	Very High
Language				
11	LKPD uses language that is in accordance with EYD	10	0.83	Very High
12	The language used is communicative in accordance with the students' level of communication	10	0.83	Very High
13	The sentences used are simple and clear	10	0.83	Very High
	Average		0.84	Very High

From the data in Table 3.2, it shows that all indicators in the LKPD Validation are valid with a validity index ranging from 0.75 to 0.92 and have an average Aiken's validity index of 0.84 in the very high category.

3. Validation Test

Table 3.3 Validation results of cognitive learning outcomes tests

No	Assesment Aspect	$\sum s$	V	Validation Criteria
Materials				
1	The questions correspond to the KD achieved	10	0.83	Very High
2	The questions correspond to the indicators	11	0.92	Very High
3	The questions correspond to the material being taught	10	0.83	Very High
Construction				
4	There are clear instructions for answering questions	10	0.83	Very High
5	The questions are formulated clearly	10	0.83	Very High
6	The answer to the question does not depend on the previous question	11	0.92	Very High
Language				
7	Use of language in accordance with EYD	10	0.83	Very High
8	The language used is communicative	10	0.83	Very High
9	The use of sentences is clear and easy to understand	10	0.83	Very High
	Average		0.85	Very High

From the data in Table 4.6, it shows that all indicators in Validation II of the learning outcomes test are valid with a validity index ranging from 0.83 to 0.92 and have an average Aiken's validity index of 0.85 in the very high category.

4 Conclusion

The conclusions of this research are:

1. Based on the research results, a learning tool based on contextual teaching and learning has been produced on the material of balance and rotation dynamics for class XI SMA which meets the elements of validity and is suitable for use in learning.
2. Based on the validator assessment and data analysis that has been carried out, the learning tools consisting of Learning Implementation Plans (RPP), Student Worksheets (LKPD), and Learning Results Tests are declared valid with RPP validation results of 0.84 in the very high category, results of the LKPD validation obtained was 0.83 in the high category, and the results of the learning outcomes test validation were 0.85 in the high category.

Thus, learning tools based on contextual teaching and learning on equilibrium and rotational dynamics are declared valid and suitable for use as learning tools for class XI students in high school.

5 Acknowledgement

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