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# Development Of Physics Learning Devices Based On Student Learning Style

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**Abstract:** Teachers' understanding of the diversity of student learning styles in a classroom can improve the quality of learning. Therefore, research has been done and physics learning tools based on student learning style have been developed successfully. The aim of this study is to produce the valid of physics learning devices based on student learning style of temperature and heat material at X SMA. The device development method used Research and Development (R & D) method. The Steps of R & D methods start from identifying potentials and problems, collecting data, product design, design validation by the professor of research methodologies, design revisions and final product trials. The validation result of the learning device validity instrument is the source of the research data. The percentage of validation results of RPP, LKS, media, and test of learning result in sequence was 88.14%; 75.50%; 87.24%; and 89.09% The percentage of such validation results is categorized as very high with an average score of 83.99%. The average number indicates that the developed learning device is valid.

Keywords: Learning tool, learning style, R & D method

## 1. Introduction

Learning design needs to be done by a teacher so that learning becomes more effective and efficient. The design of learning can be made with the Assure model which is a model by utilizing technology and media in it. The design starts with analyzing students' interests, presenting material, involving students in practice with feedback, assessing understanding and providing relevant follow-up activities (Smaldino, 2012). The success of the student learning process is determined by a teacher who knows and understands the characteristics of students (Abdul Halim, 2012). Characteristics of students intended are learning styles. One factor of low learning outcomes is the way students want learning or learning styles (Bagus, 2010). There are three learning styles, namely visual, auditory, and kinesthetic (Nurjanah, 2009). Visual learning style centered on the eye means how to see. Auditory learning styles are centered on the senses of the ear by listening, while the kinesthetic learning style prioritizes activities usually noted.

Research results show that students who learn according to learning styles will achieve higher grades than students who learn in a way that is not in line with the learning style when doing the test (Nurjanah, 2009). Research also shows that if students are served according to the learning style, students' passion for learning and understanding of material can increase (Makbul Muksar, 2013). If the teacher's teaching strategy is the same as the student's learning style, then there is no difficult lesson (Chatib, 2014). Based on the results of interviews with several high school physics teachers in pekanbaru, teachers tend to do teaching activities without regard to

students' learning styles first. need a learning design that helps teachers organize an effective and interesting learning for students who have a variety of learning styles in one class.

Learning device design is one of the plans that must be prepared by the teacher to achieve learning objectives. Learning devices are a number of materials, media tools, instructions, and guidelines that will be used in the learning process (Rusmiati, 2007). Learning devices consist of; Syllabus, Learning Implementation Plans (RPP), Media, Student Activity Sheets (LKS), Learning Outcomes Tests.

This research is about the development of physics learning devices based on student learning styles. The purpose of this study was to produce a physics learning device based on students' learning styles on subject matter temperature and a valid heat of class X SMA. The expected benefit is that the development of this learning device is used as an alternative to improve student learning processes and outcomes in accordance with students' learning styles in physics learning.

## **2. Theory**

### **2.1. Development of learning tools based on learning styles**

Development of learning style-based learning tools is a series of processes or activities carried out to produce a learning tool by paying attention to learning styles. Learning device is a series of media / facilities used and prepared by teachers and students in the learning process in the classroom such as Learning Implementation Plans (RPP), Student Worksheets (LKS), Learning Media, and Learning Outcomes Tests.

### **2.2. Learning style**

Learning style is a way of thinking, processing and understanding a preferred information. Learning styles of students can be observed from the multiple intelligences they have and each student has their respective dominant intelligence (Makbul Muksar, 2013). Learning styles are divided into three, namely visual, auditory, and kinesthetic. Most people have access to all three learning styles namely visual, suditorial and kinesthetic, but almost everyone tends to one of the learning styles that act as filters for learning, processing and communication (Mike Hernacki, 2005). There is no one learning that is most effective, but every tendency of learning styles has their own effectiveness (Noneng, 2014)

#### **a) Visual learning style**

The strategy to facilitate the visual learning process is to use visual materials such as writing, pictures, diagrams and maps, use colors to mark important things, use visual multimedia such as computers and videos, direct students to try to illustrate their ideas in writing or picture.

#### **b) Auditory type**

This learning style will easily absorb information through all kinds of sounds and words, both created and heard. Someone who has this learning style has the characteristics of talking to oneself while working, likes to discuss and talk at length and are better at spelling hard than writing it (Deporter, 2014).

#### **c) Kinesthetic type**

This learning style will easily absorb information through all kinds of movements and emotions, both created and remembered. One way to help students with a kinesthetic style is to make mind maps involving physical activity (Ariesta Kartika Sari, 2014)

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### 3. Methodology

The place of research was conducted at the Laboratory of Physics Education FKIP University of Riau from November 2014 to January 2015. The design of the study used Research and Development (R & D) method. Through this method, learning device research subjects such as Learning Implementation Plans (RPP), Student Worksheets (LKS), learning media, cognitive learning outcome tests, process skills learning outcome tests, and affective assessment sheets were developed according to the flow chart (figure 1). Test results The study was validated by the validator from the Lecturer of Physics Education Study Program FKIP University of Riau. The validation process is carried out by means of a validator assessing the physics learning device design that has been designed and developed as a whole and then completing a validation sheet prepared by the researcher.

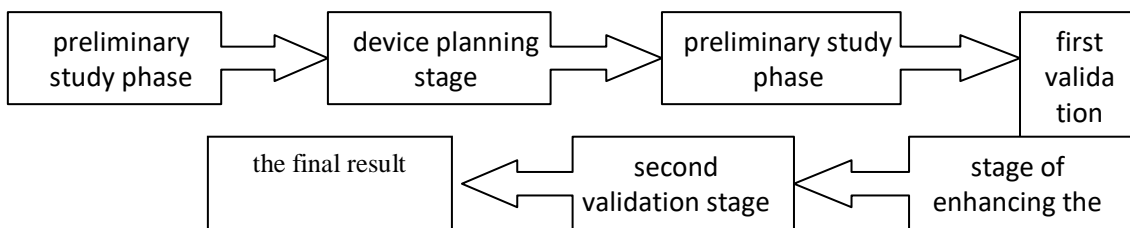


Figure 1. Flowchart of Physics Learning Device Development Design based on student learning styles

The data used in the study are the results of validation of the instrument validity of learning devices consisting of RPP, LKS, media, tests of cognitive, process, psychomotor and affective learning outcomes. The instrument developed to collect data is an instrument of validity of physics learning devices based on student learning styles including visual, audio, and kinesthetic learning styles. Each component of the learning device can be scored (by validator) 1-4 with the specified rubik. Data collection techniques are done by:

1. Providing assessment instruments and learning tools to validators to be assessed as the first stage of validation.
2. Collect the results of the first phase of validation data.
3. Providing assessment instruments and learning tools to validators to be assessed as second stage validation.
4. Collecting the results of the second stage of validation results.

Data analysis techniques using descriptive analysis, namely calculating the score validity of each indicator of the validity of the learning device. The validity of the learning device is determined by the score of the validation results by an expert lecturer. Analysis of validation results data is as follows:

- a) Calculate the validity of the RPP format and LKS format with the following conditions

$$validity\ index = \frac{value\ obtained}{maximum\ value} \times 100\%$$

Format validity categories (RPP / LKS) can be seen in table 1 (Sugiyono, 2010).

Table 1. Format Validity Categories (RPP / LKS)

Percentage	category
$78\% \leq x < 100\%$	high
$56\% \leq x < 78\%$	medium
$33\% \leq x < 56\%$	low

b) Calculating the validity of learning devices consisting of the contents of the RPP, learning media, content of LKS, and tests of cognitive learning outcomes using the following steps:

- 1) Determine the score for questionnaire answers using a Likert scale as in Table 2 (Sugiyono, 2010).

Table 2. Assessment Score Questionnaire

No	category	Score
1	Very suitable	4
2	Corresponding	3
3	Less appropriate	2
4	It is not in accordance with	1

- 2) Look for the average of each questionnaire indicator and the whole questionnaire
- 3) Determine the average indicator category based on Table 2. because the validation uses a Likert scale consisting of four classes, the determination of the class interval value for the average indicator category is

$$Ci = \frac{Range}{K}$$

Where :

Range: the highest and lowest score difference (4 - 1 = 3);

Ci: Class interval

K: number of classes desired (4 classes)

The criteria for drawing conclusions from this study are set as follows:

1. Each component of the assessment format for learning devices is declared valid if the validity is high in accordance with Table 1.
2. Each component of the assessment of the contents of the learning device is declared valid if each statement on the indicator gets a score of 3 and 4 of high or very high validity in accordance with Table 3 (Sugiyono, 2010).

Table 3. Validity Categories

Average score	Percentage	Category
$3,25 \leq x < 4$	$81,25\% \leq x < 100\%$	Very high
$2,50 \leq x < 3,25$	$62,5\% \leq x < 81,25\%$	High
$1,75 \leq x < 2,50$	$43,75\% \leq x < 62,5\%$	Low
$1,00 \leq x < 1,75$	$25\% \leq x < 43,75\%$	Very low

**4. Result and Discussion**

The results of the assessment of physics learning devices based on student learning styles can be seen in table 4 below:

Table 4. Results of Assessment of Physical Science Learning Devices Based on Student Learning Styles

No	Assessment Indicator	Average	Assessment of Learning Devices	Category
1	RPP	84,14 %		ST
2	LKS	75,50 %		T
3	Instructional Media	87,24 %		ST
4	Learning Outcomes Test	89,09 %		ST
	Average	83,99 %		ST

ST = very high; T = high

Based on table 4, learning devices are declared valid with a very high average category and declared feasible to be used as a learning tool in schools and have accommodated learning styles.

The results of the validation of the RPP format in this study can be seen in the following table 5:

Table 5. Results of validation of RPP format

No	Assessment Indicator	Component Validity (%)				
		V-1	category	V-2	category	
1	Format	Identify	93,22%	T	100%	T
		Matrix format	100%	T	100%	T
		average	96,96%	T	100%	T
2	content	Principle of development	3,13	T	3,46	ST
		Component substance	2,95	T	3,33	ST
		Average	3,04	T	3,39	ST
		Percentage	75,00%	ST	84,14	ST

Description: V-1 = validation 1; V-2 = validation 2; T = high; ST = Very High

Based on table 5. there is an improvement in the validity score of RPP format from validity-1 to validity-2. The average value for the validity of the two RPP formats is 100% in the high category, which means that the RPP format is valid. The validity of the content of RPP based on student learning styles has increased from validation-1 to validation-2. In the second validity the average value for the content validity of RPP is 3.39 with a very high category which means that all items are in the very high category. This means that the validity of the RPP content is valid and has accommodated all three student learning styles, namely visual, audio, and kinesthetic learning styles.

Based on data analysis, the results of the LKS 1, LKS II, LKS III and LKS IV format validation are shown in table 6.

Table 6. LKS format validation results

No	Assessment indicator	LKS I		LKS II		LKS III		LKS IV	
		VK (%)	K	VK (%)	K	VK (%)	K	VK (%)	K
1	title	100	T	100	T	100	T	100	T
2	Set goals	100	T	100	T	100	T	100	T
3	Work steps	100	T	100	T	100	T	100	T
4	question	100	T	100	T	100	T	100	T
	average	100	T	100	T	100	T	100	T

Description: VK = Component Validity; K = Category; T = high

Based on table 6, it can be seen that the validity of LKS 1, 2, 3 and 4 formats on validation-1 is 100%. This indicates that all LKS components are declared valid by the validator.

The validation results of the contents of LKS I, LKS II, LKS III, and LKS IV can be seen in table 7. below:

Table 7. Results of validation of LKS contents

No	Assesment indicator	LKS I				LKS II				LKS III				LKS IV			
		V1	K	V2	K	V1	K	V2	K	V1	K	V2	K	V1	K	V2	K
1	Didactic terms	2,75	T	3,29	ST	2,53	T	3,29	ST	2,66	T	3,29	S	2,43	R	3,29	S
2	Construction requirements	3,00	T	3,22	T	2,66	T	3,22	T	2,44	T	3,22	T	2,44	R	3,22	T
3	Technical requirements	2,33	R	3,08	T	2,83	T	3,08	T	2,55	T	3,08	T	2,55	T	3,08	T
	average	3	T	3,08	T	2,74	T	3,19	T	2,55	T	3,19	T	2,55	R	3,19	T
	Percentage (%)	65,09	T	75,50	T	67,64	T	75,50	T	65,69	T	75,50	T	65,69	R	75,50	T

Description: V-1 = validation 1; V-2 = validation 2; K = category; T = high; ST = Very high

Based on table 7. it can be seen that there is an improvement in the validity score of LKS 1 contents from validation-1 to validation-2. The average value of the 2-component LKS validity is 3.08 which means that all the requirements of the LKS component are valid and the LKS has accommodated students' learning styles which consist of visual, audio and kinesthetic

Validation results of cognitive skills tests and process skills as in table 8. below:

Table 8. Results of validation of process skills and cognitive skills

No	Assessment indicator	Cognitive skills				Process skills			
		V1	category	V2	category	V1	category	V2	category
1	Compliance with test questions with	2,66	T	3,33	ST	3,00	T	3,00	T
2	learning objectives	3,00	T	3,33	ST	2,66	T	3,33	ST

No	Assessment indicator	Cognitive skills				Process skills			
		V1	category	V2	category	V1	category	V2	category
3	Suitability of test questions with trained skills	2,33	R	3,00	T	3,00	T	3,00	T
4	The sentence used is clear and easy to understand by students	2,33	R	3,00	T	2,00	R	3,33	ST
5	The use of images is clear and easy to understand by students	2,33	R	3,33	ST	2,00	R	3,00	T
6	Illustrations or drawings made according to the purpose of the test provided	3,00	T	3,67	ST	2,00	R	3,00	T
7	The intent and purpose of the problem is well explained	2,66	T	4,00	ST	2,30	R	3,00	T
8	Between questions are not interrelated The language used is communicative, straightforward, and unambiguous (double meaning)					2,66	T	4,00	ST
	Average	2,62	T	3,38	ST	2,24	R	3,21	ST
	Percentage	65,48	T	84,50	ST	71,14	R	80,19	ST

From table 8, it can be seen that the validity of cognitive skills tests and process skills has increased from validation-1 to validation-2. Cognitive skills tests are categorized as very high with a validity of 3.38, and the process skills test is categorized as very high with a validity of 3.21. Both of these skills test results are valid.

The results of the validation of the psychomotor skills test in the study can be seen in the following table 9:

**Table 9. Results of validation of psychomotor skills tests**

No.	Assessment indicator	V-1	category	V-2	category
1	Suitability of question indicators with learning indicators	3.33	ST	4.00	ST
2	Suitability of text with trained skills	2.66	T	3.00	T
3	The assessment rubric corresponds to the test given	3.33	ST	4.00	ST
	average	3.10	T	3.67	ST
	Percentage	77.66%	T	91,7%	ST

Based on table 9. it can be seen that the validity of psychomotor skills tests is valid with a percentage of 91.7%.

Results of validation The Affective Assessment Sheet conducted in this study can be seen in table 10. below:

**Table 10. Results of validation of the Affective Assessment Sheet**

No.	Assessment indicator	V-1	category	V-2	category
1	Suitability of question indicators with learning indicators	3.00	T	4.00	ST
2	The assessment rubric corresponds to the test given	3.00	T	4.00	ST
	average	3.00	T	4.00	ST
	Percentage	75 %	T	100%	ST

Based on table 10. it can be seen that the validity of affective assessment sheets has increased from validity-1 to validity-2, and is declared valid with a very high category

The results of media validation with the assessment indicators in this study can be seen in table 11.

**Table 11. Results of media validation**

No	Assessment indicator	V-1	Component validity (%)		
			category	V-2	category
1	Planning aspects	3.96	ST	4.22	ST
2	Pedagogical aspects	4.20	ST	4.50	ST
3	Content aspect	4,07	ST	4.33	ST
4	Design aspects	4.00	ST	4.40	ST



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average	4.05	ST	4.36	ST
Percentage	81.15 %	ST	87.24 %	ST

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V-1 = validation 1; V-2 = validation 2; ST = very high

Based on table 11. it can be seen that there is a percentage increase from validation-1 to validation-2 from 81.15% to 87.24%. Validation of learning media is said to be valid in a very high category and has accommodated student learning styles consisting of visual, audio, and kinesthetic learning styles.

Based on the results of the validation data and the improvement of the device, the final result is that all components of the learning device are developed in the subject matter of temperature and heat based on student learning styles have a high or very high validity index. This means that the learning device is valid and is suitable for use as a learning tool in schools.

## 5. Conclusion

Learning tools that have been developed in this study include lesson plans, student worksheets, media, cognitive skills tests, process skills tests, psychomotor skills tests, and affective skills tests. Based on data and data analysis, it can be concluded that all components of learning devices developed in the subject matter of temperature and heat based on student learning styles have a high or very high validity index. This means that the learning device is valid and is suitable for use as a learning tool in schools.

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