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Developing Learning Physics Multimedia Based on Local Wisdom of PALI District to Improve Student Learning Outcomes and Motivation

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ABSTRACT
The purpose of this research is to develop a multimedia learning physics based on local wisdom in PALI Regency that is valid, practical, and has a potential effect on learning outcomes and students' learning motivation. The development research uses the Rowntree model which has three stages including the planning stage, the development stage, and the evaluation stage. The evaluation stage using Tessmer's formative evaluation includes self-evaluation, expert review, one to one evaluation, small groups and field tests. This research was conducted in class X MIPA 3 consisting of 25 students. The research instruments used are walkthroughs, questionnaires and tests. Expert validation results show that the developed multimedia is very valid with an average score of 3.70. The results of the practicality questionnaire show that the product developed is very practical by obtaining a one-to-one evaluation percentage of 81.3% and a small group percentage of 85.4%. Multimedia effectiveness in terms of N-gain with an average N-gain of 0.68 in the medium category. The results of the learning motivation questionnaire showed that's average value of 34 where students have moderate learning motivation. Thus, it can be concluded that multimedia learning physics based on local wisdom in PALI Regency can be valid and practical as well as effective in improving student learning outcomes, work and energy, and increasing student motivation.

INTRODUCTION

At this time where technology has developed rapidly which makes the learning process is expected to adapt to the current trend of technological development. Innovations that can be made by teachers to improve teaching skills to develop knowledge and skills using various media [1]. Learning media is a means used by teachers to deliver learning materials in the form of physical and non-physical [2] [3]. Therefore, learning media is the most important part in learning because it helps students understand concepts conveyed quickly and attracts students to learn [4].

The development of science and technology has a positive impact on the development of learning media [5]. Therefore, research on the use of instructional media is widely carried out [6] [7] [8] such as e-books, e-LKPD, videos, or simulations. Learning media presents material in various formats such as text, images, audio, visual, or hyperlinks. The use of multimedia in learning influences the achievement of more effective and efficient learning outcomes [9]. Utilization of learning media provides direct experience to students thereby increasing student learning activities. Thus multimedia can help students understand the material presented [10].

Physics is a science that studies natural phenomena that occur in the universe around students. This phenomenon is observed both naturally and using treatment to see the changes that occur. Observable changes are data that can be analyzed so that generalizations are obtained as new knowledge. Therefore, physics material is a collection of phenomena in students' daily lives.

Phenomenon-based physics learning presents contextual problems that must be solved by students. Contextual presentation of problems requires media so that the phenomena presented can be accepted by students [11]. Physics learning consists of concrete concepts and abstract concepts. Abstract concepts are more difficult for students to understand than concrete concepts. The use of instructional media aims to present abstract concepts to be more concrete so that they are more easily understood by students. Learning media can also present processes that are difficult to observe, even dangerous experiments that require great caution, such as core reactions, which can be observed easily using learning videos. The development of science and technology has an impact on the development of learning simulations so that the learning process is more interactive.

Work and energy are essential physics materials for students. The concepts of work and energy are introduced to students from elementary school. The results of the analysis of work and energy material at both the tertiary level and high school level, the work and energy material begins with an illustration of a rope tied to a block being pulled by someone who forms a certain angle. This phenomenon was often encountered by students when they saw a carpenter pulling wood using a rope tied to the wood. When the rope is pulled, the position of the rope is not parallel to the beam but forms an angle with the plane. Even though students often see this phenomenon, students do not realize why the position of the rope tilts when the block is pulled.

Based on the results of this analysis it can be seen that the material studied by students at school is not integrated with the phenomena experienced by students in everyday life. This is supported by the results of observations of the physics learning process in schools only focusing on formulas and routine questions. Physics learning like that only trains students to solve problems using formulas without understanding the meaning of solving the resulting problems.

Phenomena of physics that students often encounter in everyday life are in the form of habits or customs in an area. Habits or customs of an area that are uniquely owned by a particular area are the local wisdom of that area that needs to be preserved by the younger generation through education [12]. The physics learning process that relates subject matter to the local wisdom of an area can attract students' interest because they can directly feel the relationship between the material and the real world [13]. Local wisdom can also be supported by providing real descriptions to students and examples of clear local wisdom materials and pictures that attract students' attention. Utilizing local wisdom content can help students learn Physics efficiently and effectively [14]. Teaching materials that integrate local wisdom can make students interested in the material presented [15].

Based on the data obtained through interviews at SMA Negeri 1 Talang Ubi it is known that the results of the Mid Semester Examination (UTS) for class X in Physics learning with an average score of 40 are below the Minimum Completeness Criteria (KKM) score of 67. One of the reasons is lack of students' understanding of work and energy material and not optimal in participating in the learning process.

Learning outcomes are changes in students' habit patterns including cognitive, emotional, and psychomotor aspects after participating in the learning process [16]. Learning multimedia has the potential to improve student learning outcomes and make learning interesting and not boring [17]. Motivation influences student learning outcomes [18]. Learning motivation is the desire of students who can encourage students to carry out a learning activity [19]. Great learning motivation makes students enthusiastic in participating in the learning process so that it gives enthusiasm to get maximum results.

Based on the description above, it is necessary to update Physics learning media which can make Physics learning more interesting so that it motivates students to learn which in turn improves student learning outcomes. Development of multimedia learning based on local wisdom So a research was conducted entitled "Development of Multimedia Learning Physics Based on Local Wisdom of PALI Regency in SMA". The purpose of this study is to produce learning multimedia that is valid, practical, and has a potential effect on student learning outcomes and motivation in learning Physics. It is hoped that the existence of multimedia learning Physics based on local wisdom of PALI Regency will have an impact on learning outcomes and make students' learning motivation towards learning Physics high.

METHOD

This research is a development research (Development Research) which aims to produce products [20]. This research usesthe Rowntree development modelincludes three stages, namely planning, development, and evaluation [21]. The evaluation phase uses Tessmer's Formative evaluation which consists of five stages, namely the self-evaluation stage, the expert review stage, the one-on-one evaluation stage, the small group stage and the field test stage [22]. The research was conducted at SMA Negeri 1 Talang Ubi. The research subjects were class X MIPA students at SMA Negeri 1 Talang Ubi. The initial stage, namely the planning stage, includes an analysis of student problems, analysis of student needs, determining material, compiling learning objectives based on basic competencies and indicators, selecting learning multimedia to be produced and collecting data on the local wisdom of the PALI Regency. The wisdom of the PALI Regency is in the form of rubber carts. The next stage is the development stage which is carried out by making an outline of media content, elaborating the contents of the material, flowcharts, storyboards, making products or drafts. The final stage is the evaluation stage, at the evaluation stage using formative evaluation. In formative evaluation, data obtained from the self-evaluation stage, the expert review stage, the one-on-one evaluation stage,.Sequentially the results of the analysis are used to determine the validity, practicality, potential effect on learning outcomes and learning motivation of students.

The data collection technique used in this study, namely the walkthrough, is a data collection technique used to assess the validity of the product. The questionnaire was used to assess the practicality of the product being developed and to determine students' learning motivation. The test was conducted with 10 essay questions to determine the potential effect on learning outcomes.

Walkthrough data obtained at the expert review stage using a Likert scale of 1-4 were analyzed descriptively quantitatively. Walkthrough data is calculated using equation 1 [23]:

$$\overline{\mathrm{X}} = \frac{\sum \mathrm{x}}{\mathrm{N}} \quad (1)$$

Where:
$\bar{X}$ = Average value
$\sum x$ = Number of data values
N = Lots of data

The developed multimedia validation level category ranges from very valid to very invalid [23]:

At the one-on-one evaluation stage and the small group stage, a Likert scale of 1-5 was used to determine the practicality of the developed multimedia. Then it is calculated using equation (2) [24]:

$$\text{Practicality Value} = \frac{\text{Total Score}}{\text{Maximum Score}} \times 100\% \quad (2)$$

To find out the practicality of the product, an analysis was carried out on one-on-one and small group evaluation questionnaires. The practicality of a product has several criteria, which are categorized into five criteria ranging from very practical to impractical [25].

The field test phase involved 25 students as the subject of this study. The purpose of the field test phase is to determine the potential effects of the product being developed. Data were obtained by conducting per-test and post-test to students. Then it is analyzed by calculating the N-gain which is calculated by equation 3 [26]:

$$\text{N} - \text{gain} = \frac{\text{Post test } score - \text{Pre test } score}{\text{Maksimum } score - \text{Pre test } score} \quad (3)$$

The results of calculating the average N-gain value are interpreted into categories of N-gain levels with a low to high range [27].

Questionnaires of students' learning motivation were analyzed descriptively quantitatively using a Likert scalar 1-4. Analysis of students' learning motivation data is processed to determine the range of values and standard deviations that are used as criteria in determining the learning motivation category. Categories of learning motivation measurement with a low to high range [28]:

In determining the category of students' learning motivation in general, it can be done by using the percentage of each category of learning motivation. To find out the percentage of students' learning motivation categories used equation 4 [28]:

$$\text{A} = \frac{\text{N}}{\text{T}} \times 100\% \quad (4)$$

Where:
$A =$ Categories of high/moderate/low student learning motivation (%)
$N =$ The number of students who have high/medium/low learning motivation

RESULTS AND DISCUSSIONS

At the planning stage, interviews were conducted with physics educators at SMA Negeri 1 Talang Ubi to find out the problems of students. Problems that occur in students namelythe low learning motivation of students in learning Physics which makes student learning outcomes on daily tests or midterm tests under the KKM. After knowing the problems of students then carry out an analysis of the needs of students. Students need innovation in learning by utilizing media as a tool in the learning process. Then choose subject matter, namely Work and Energy, make lesson plans and syllabus, develop learning objectives based on Basic Competency (KD) and indicators. Next, select learning multimedia to be produced in the form of PowerPoint and collect data on the local wisdom of the PALI Regency.

The local wisdom of the PALI Regency which is linked to this learning multimedia is in the form of harvesting rubber using a rubber cart. Wisdom The local materials can be related to Work and Energy. When pushing the cart there is an initial position, final position, and the force acting. The force acting on the cart can make the cart move or change places. By using a cart someone spends less energy than someone who moves the rubber that has been produced by walking. Energy is needed by an object to do work.

Development Stage
In the early stages of development, it is done by designing a product or draft to be developed. At this stage two stages were carried out, namely paper-based and computer-based. At the paper-based stage, GBIM, JIM, flowcharts, storyboards and evaluation instruments are made. At the computer-based stage, learning multimedia is made using PowerPoint. The parts of learning multimedia that will be made are (1) cover; (2) content (KD, indicators, materials, summaries, practice questions, and sources); and (3) cover. After PowerPoint is finished, hyperlinks are then given in order to facilitate the process of operating the multimedia being developed.

Evaluation Stage
The first stage carried out in formative evaluation is the self-evaluation stage. At the self-evaluation stage the researcher conducted a self-assessment of the learning multimedia that had been developed and consulted with the supervisor covering four aspects, namely language aspects, media aspects, material aspects, and design aspects. After the product is declared feasible, then the product is tested for validity at the field test stage.

The expert review stage aims to determine whether the developed multimedia has valid criteria. At this expert review stage the product is validated covering four aspects, namely language, media, materials, and design. The results of the validation of the language aspect obtained an overall average score from the expert review of 3.68 which is included in the very valid category because the language used is easily understood by students. The validation results of the media aspect produce an average of 34.73, choosing good images makes learning multimedia very valid. The results of the material aspect validation resulted in an average of 3.67 for the whole with a very valid category because the material presented was in accordance with the learning index. The validation results of the design aspect produce an average of 3.75 and the multimedia design developed is in accordance with the character of the students, so it is classified as a very valid category. The results of the assessment recapitulation from the expert review stage can be seen in Figure 1.

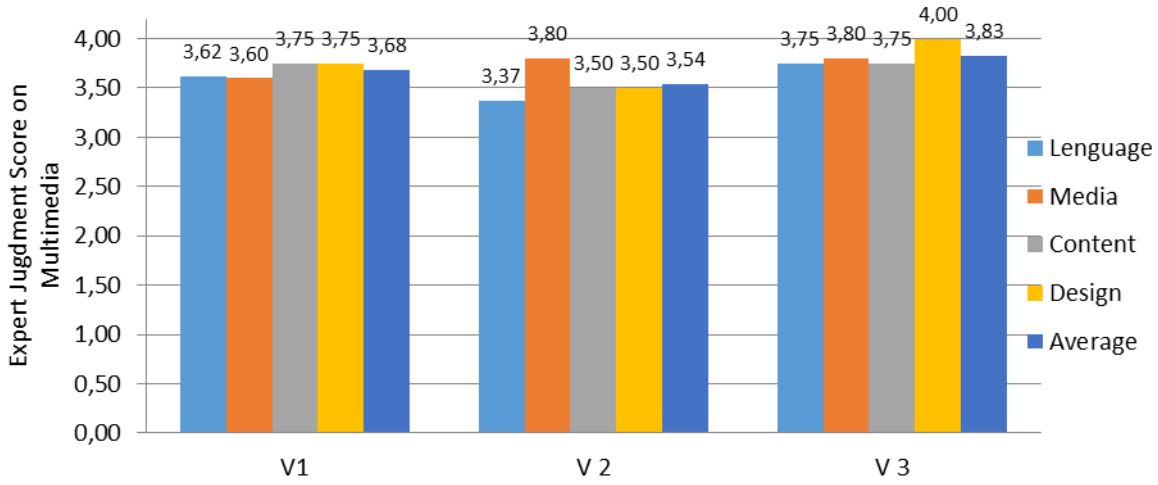

Fig 1. *Expert Review Recapitulation Results*

Based onfigure 1 is obtainedthe overall average value at the expert review stage is 3.70 in the very valid category. So that the multimedia developed at the expert review stage can be tried out. In line with interactive multimedia based on Google Slides, it also has a very good category for material, media, and language experts with a percentage of 90% [29]. This means that the developed multimedia meets valid criteria and is feasible to be tested. Another study that developed interactive learning multimedia oriented to local wisdom was declared valid through the review of material experts who obtained a percentage of 94.6% in the very good category, reviews of media experts who obtained a percentage of 92.9% in the very good category, and reviews of design experts who obtained

a percentage96.6%very good category [30]. This shows that interactive learning multimedia oriented to local wisdom is valid and can be continued to the next stage. At the review stage, the validator expert provides input on the developed multimedia. After the product has been revised according to the validator's input, the product is then tested at the one-on-one evaluation stage to determine the practicality of the product being developed.

The one-on-one evaluation stage involved three students of class X MIPA 5. The one-on-one evaluation stage aimed to find out the practicality of the multimedia being developed. Data analysisassessment questionnaire pThe students at the one-on-one evaluation stage can be seen intable 5.

Table 5. Results of One-on-one Evaluation Analysis

No	Score of Question Items										Amount	%
	1	2	3	4	5	6	7	8	9	10		
A1	5	4	4	5	4	4	5	3	4	4	42	84
A2	3	4	4	5	4	4	4	3	5	4	40	80
A3	4	4	4	4	4	4	4	3	5	4	40	80
Percentage of Questionnaire Results												**81.3**

Based on the table of the results of the one-on-one evaluation analysis, a percentage of 81.3% is obtained in the very practical category because learning multimedia makes it easier to understand learning material. In line with the interactive PowerPoint-based learning multimedia that was developed, it received good responses from students through questionnaires by obtaining an average percentage for each aspect of 82.08% in the very practical category [31]. After going through the one-on-one evaluation stage, the product can then be tested at the small group stage.

Involving small group stageten class studentsX MIPA 5. The small group stage aims to find out the practicality of the developed multimedia. The results of the questionnaire data analysis at the small group stage can be seen in table 6.

Table 6. Small Group Stage Results

No	Score of Question Items										Amount	%
	1	2	3	4	5	6	7	8	9	10		
B1	4	4	4	4	5	4	4	3	5	4	41	82
B2	4	4	4	5	5	5	4	4	5	4	44	88
B3	5	5	5	4	4	4	4	3	5	4	43	86
B3	5	4	5	4	4	5	4	4	4	3	42	84
B4	5	4	5	3	4	5	5	4	5	4	44	88
B4	4	4	5	4	5	4	4	3	5	4	42	84
B5	4	4	4	5	4	5	5	5	4	4	44	88
B6	5	4	5	4	4	5	5	3	4	4	43	86
B7	4	5	4	4	5	5	3	3	4	4	41	82
B8	4	4	4	5	4	4	4	4	5	5	43	86
Percentage of Questionnaire Results												**85.4**

Based on the results table for the small group stage, a percentage of 85.4% is obtained in the very practical category, meaning that the developed multimedia meets practical criteria and according to students the developed learning multimedia can facilitate the learning process. In line with the development of flash flip book learning media, an average percentage of 83.75% was obtained at the small group stage in the good category [32]. So that the developed media is practical and feasible to be tested in the field test stage. After going through the individual and small group evaluation stages, multimedia was declared practical so that the product could be tried out to the next stage, namely the fielded test stage to determine the potential effect on student learning outcomes and motivation.

The field test phase involved all students in class X MIPA 3. This field test stage was carried out to find out whether the product developed in the form of multimedia learning Physics based on local wisdom of PALI Regency has a potential effect on students as seen from learning outcomes and learning motivation. The field test stage was carried out 2 times to measure student learning outcomes before and after using local wisdom-based physics learning multimedia. The field test phase involved 25 students. At the field test stage students are given questionsinitial testuTo measure the abilities of students, then students are given learning multimedia as a medium in the learning process. After students study using multimedia, students are then given a final test to find out if there is an increase in learning outcomes after using the product that was developed. N-gain analysis of valuesinitial test and final test can be seen on table 7.

Table 7. N-gain Data Summary

Total N-gains	N-gain Interpretation Indicator	Number of Students	N-gain interpretation
17.01	N-gain > 0.7	6	High
	0.3 N-gain 0.7≤≤	19	Medium
	N-gain < 0.3	0	Low
N-gain Average = 0.68		**Medium**	

Based on the N-gain data recapitulation table, 6 students with high interpretation and 19 students with moderate interpretation. *Pre-test* obtained on average of 28.4 and *post-test* obtained on average of 76.8, with this seen an increase in student learning outcomes of 48.4. As for *N-gain* the average obtained is 0.68 which is categorized as moderate. This proves that by using local wisdom-based physics learning multimedia, PALI regency developed in learning process has a potential effect that can improve student learning outcomes in learning Physics. This is supported by research on the development of local wisdom interactive media Banyuwangi, where there were 35 students who obtained maximum learning results after using local wisdom interactive media Banyuwangi [33]. This proves that using learning media based on local wisdom can improve student learning outcomes.

Other research that develops media in the form of comics based on the local wisdom of the city of Palembang also showsenhancement student learning outcomes with a final test result of 28.71 [34]. This shows that Physics comics based on local wisdom in Palembang City are appropriate for use in the learning process because they have a potential impact on improving student learning outcomes. The advantage of learning media is that it can improve learning outcomes, because multimedia is a combination of various media elements such as text, images, animation, and video [35]. Using Animated video learning media can also improve learning outcomes because students pay attention to videos and are active in class so that they have a good impact on improving learning outcomes [36].

At the field test stage, students were also given a motivational questionnaire to learn Physics. The questionnaire was used to determine the motivation to learn Physics from each student. The results of the analysis of students' learning motivation questionnaire can be seen in figure 2.

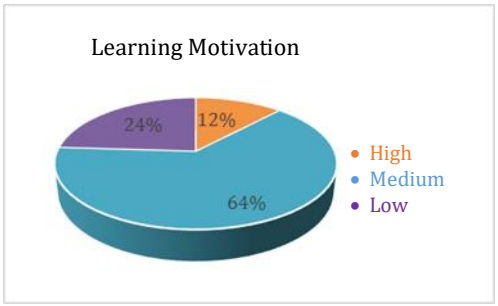

Fig 2. *Results of Learning Motivation Analysis*

Based on the picture of the results of the analysis of students' learning motivation after using the local

wisdom-based Physics learning multimedia of PALI Regency show that there are 3 students with a score of 12% in the high category, 16 students with a score of 64% in the medium category, and 6 students with a score of 24% in the low category. When using interactive multimedia there is an increase in students' learning motivation with an average 95% that included in the high category [37]. This proves that using multimedia learning can increase students' learning motivation towards learning Physics, because students are more active and enthusiastic in the learning process [38].

There is an increase in learning outcomes and learning motivation after using local wisdom-based physics learning multimedia because the developed multimedia can make the learning process more meaningful and fun. Students are more active and play a full role during the learning process. The use of technology and local wisdom in learning can create an interesting and meaningful learning process [39]. The developed PALI Regency Local Wisdom-based Physics learning ultimedia can be seen in Figure 3.

Fig 3. *Local Wisdom-Based Physical Learning Multimedia*

The developed learning multimedia contains Work and Energy material. In this multimedia there is a main menu containing basic competencies, indicators, materials, summaries, exercises and resources. Then, in the multimedia there are also videos, pictures and other animations that can be used to convey material related to the local wisdom of PALI Regency. The practice questions contained in the multimedia can be filled in directly and students can find out if the answers chosen are right or wrong.

CONCLUSION AND SUGGESTION

The developed learning multimedia was stated very highly valid based on the results of expert reviews covering aspects of language, media, materials and design with an overall average of 3.70. Multimedia learning which is highly developedpractical dwith an average obtained at the individual evaluation stage of 81.3% and an average obtained at the small group stage of 85.4%. The developed learning multimedia has a potential effect on learning outcomes in the cognitive domain with an average N-gain of 0.68categorizedmedium and multimedia have a potential effect on students' learning motivation with an average of 34.24 in the medium category. For subsequent research, it is possible to develop learning multimedia which can contain some learning materials in it and use control class and experimental class for the data collection stage.

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