

The Effectiveness of Local Wisdom-Based Teaching Materials of Physics at Hulu Sungai Selatan

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Abstract. This study was conducted due to the absence of physics teaching materials containing local wisdom at Hulu Sungai Selatan—a regency in South Kalimantan, Indonesia, and the less optimization of character building in the learning process. Therefore, Research and Development (R&D) of local wisdom-based teaching materials of physics at Hulu Sungai Selatan was conducted. This study aimed to develop effective and applicable local wisdom-based teaching materials of physics in terms of validity, practicality, effectiveness and attainment of rakat mufakat character at Hulu Sungai Selatan for physics learning. This study was Research and Development (R&D) using ADDIE model. The samples of this study were the students of class XI IPA 2 at SMA Negeri 1 Angkinang. The data were obtained from validation sheet, response questionnaire, achievement test and peer assessment on rakat mufakat character. The results of this study revealed that: (1) the teaching materials of physics were valid based on the content validation sheet and the presentation of the module, (2) the teaching materials of physics were very practical based on the students' response questionnaire, (3) the teaching materials of physics were moderately effective based on the results of the achievement test, and (4) the rakat mufakat character was built very well based on the peer assessment. Based on the results of this study, it was concluded that the local wisdom-based teaching materials of physics at Hulu Sungai Selatan were effective and applicable to physics learning.

Keywords: Teaching Materials of Physics, Local Wisdom, Hulu Sungai Selatan.

INTRODUCTION

Education and culture are two inseparable things regarded as determining factors in the development of a nation. To be able to develop a nation, it is necessary to have plans on beefing up the education and culture. Therefore, the government has proclaimed Strategic Plan of the Ministry of Education and Culture 2015-2019 that education and culture act for intellectual development of Indonesian society. The focus of mission in the education field, according to Renstra Kemendikbud 2015-2019 is to create regional competitiveness among regions in Indonesia. Therefore, it is important to make synergy between education and culture in every region in Indonesia.

The synergy between education and culture has been hampered by the coming of foreign cultures that are far different from the tradition of Indonesian society. The globalization era has resulted in more freedom for young generation to socialize and to act, even no longer under control [1]. The negative impact of globalization era is that it has caused a problem of the synergy of culture and education so that the authentic local cultures and the Indonesian students' character have become eroded. This problem must be overcome, one of the ways is by creating local wisdom-based learning, which brings the values adopted by the local society, to regenerate the local cultures and Indonesian students' character. Therefore, teachers have their role in integrating local wisdom into learning process in the classroom [2].

Based on the observation done at SMAN 1 Angkinang, it was found that there were no teaching materials in the form of a physics module which contained local wisdom. Therefore, it was deemed necessary to develop such module which was expected to help the teachers at SMAN 1 Angkinang relate the subject of physics and the problems concerning local wisdom. Besides, it was revealed that there was lack of discussion and problems regarding local wisdom in physics learning. Furthermore, there was no integration of character building of the values at Hulu Sungai Selatan into the learning.

To overcome these problems, developing teaching materials of physics in the form of a module containing local wisdom is an important thing to do in order to grow character values and of course to improve students' learning achievement. This is intended in order that the students more easily understand the subject by learning the materials which are close to their environment. The module containing local wisdom is applicable to improve the students' cognitive learning outcome and character. Based on the results of their study, stated that module can optimize students' character and improve their cognitive ability by bringing in local wisdom in accordance with the needs of competencies to be achieved, but the character trained is not the original character of society [3]. Furthermore, based on the results of the study conducted by [4], the module containing local wisdom is considered very effective for the enhancement of character of local society and the improvement of the awareness on local culture, i.e. the character of *waja sampai kaputing* as the motto of South Kalimantan society, and also the students' cognitive ability [5].

Based on the results of [6] study, it was revealed that by developing local wisdom as teaching materials, the teacher had a bigger opportunity to make the learning more meaningful and the students were more engaged in the learning. The level of satisfaction when the learning materials were conveyed and when the exercises or learning evaluation were given was high. In addition, it could increase the appreciation and understanding of local wisdom. These clarified that the modul containing local wisdom could be well accepted by the students.

Based on the explanation aforementioned, therefore this study entitled "the effectiveness of local wisdom-based teaching materials of physics at Hulu Sungai Selatan" was conducted. The formulation of research problem in this study was "how is the feasibility of local wisdom-based teaching materials of physics at Hulu Sungai Selatan in terms of validity, practicality, effectiveness and attainment of *rakat mufakat* character?" Therefore, the purpose of this study is to describe the feasibility of local wisdom-based teaching materials of physics at Hulu Sungai Selatan in terms of validity, practicality, effectiveness and attainment of *rakat mufakat* character.

METHODS

Research Design

This study was Research and Development (R&D) in nature. It used ADDIE model. As far as ADDIE model was concerned, there were five stages undertaken: analysis, design, development, implementation, and evaluation. The product trial was conducted at SMAN 1 Angkinang located on Angkinang St. Hulu Sungai Selatan, South Kalimantan. The subjects for the trial were the students of class XI IPA 2 at SMAN 1 Angkinang registered in the academic year 2016 / 2017. The instruments of this study were validation sheets of module, response questionnaire and achievement test; response questionnaire; achievement test and peer assessment. The module validation sheet includes content and display validation, as well as achievement test validation sheets including construct validation and content validation. The validation sheet is rated by 3 validators consisting of academic validators and practitioners.

Technique of Data Analysis

The validity of the module developed was determined by the categorization based on the percentage of validation formula proposed by Rachman [4].

$$\text{Percentage of validity} = \frac{X}{X_{\max}} \times 100\% \quad (1)$$

Table 1. Categorization of validity of the module

Criteria of Validity	Level of Validity
80% - 100%	Very valid
65% - 79%	Valid
55% - 64%	Less valid
<55	Invalid

The reliability of the instruments in this study was analyzed using the Spearman-Brown equation [7], as follows:

$$r_{11} = \frac{2r_{11}^2}{1+r_{11}^2} \quad (2)$$

The practicality of the module is seen from the students' response to the module developed [8]. The practicality of the module was analyzed based on the response questionnaire filled in by the students after the learning using the modul [9].

Table 2. Categorization of Practicality of the Module

Value (%)	Category
80 < P ≤ 100	Very practical
60 < P ≤ 80	Practical
40 < P ≤ 60	Fairly practical
20 < P ≤ 40	Less practical
P ≤ 20	Not practical

(source of adoption Riduwan et al [9])

Effectiveness, according to Akker [10], is the level of achievement and the process observed through consistent intervention. The effectiveness of the module was seen from the result of calculation of pretest-posttest scores using normalized averaged gain (N-gain) equation. Then, the normality analysis on the result of pretest-posttest scores was undertaken and the average score was substituted to the N-gain equation [11].

$$\langle g \rangle = \left(\frac{S_f - S_i}{100 - S_i} \right) \quad (2)$$

Table 3. Categorization of effectiveness of the learning

Interval	Category
(< g >) ≥ 0,7	High/Very effective
0,3 ≤ (< g >) < 0,7	Moderate/ Effective
(< g >) < 0,3	Low/Less effective

The development of the students' *rakat mufakat* character was measured by using peer assessment. It was in accordance with the idea of [12] that one of the appropriate instruments for assessing the effectiveness of the learning containing local wisdom is a non-test instrument. The non-test instrument used in this study was peer assessment [9].

Table 4 Categorization of *rakat mufakat* character

Value (%)	Category
80 < P ≤ 100	Very Good
60 < P ≤ 80	Good
40 < P ≤ 60	Moderate
20 < P ≤ 40	Poor
P ≤ 20	Very Poor

RESULTS AND DISCUSSION

The Product of Research and Development (R&D)

The development of local wisdom-based teaching materials in the form of a physics module with the topic of dynamic fluid at Hulu Sungai Selatan is intended for the students' character building. The local wisdom under the focuses of this study comprise *balanting* activity and *rakat mufakat* character integrated into the physics learning. This physics module was developed in order that the students are able to understand the subject of physics more deeply since it contains the discussion which is close to the students' environment. Therefore, they are able to learn independently with their individual pace of learning without or with a little guidance. Besides, it trains their individual character. Another purpose of the module is that the students are able to recognize local wisdom in their region, i.e. *balanting*, and to understand the importance of *rakat mufakat* character to always be grown within their individual selves.

Balanting itself is a tradition of Dayak Meratus villagers living at Loksado, Hulu Sungai Selatan. The tradition is to get on bamboo rafts (*lanting*). *Balanting* in Banjar language means using *lanting* for transportation. This activity is usually done on Mount Meratus which has varied pace of stream; therefore, it is suitable for the topic of dynamic fluid in physics subject. *Rakat mufakat* is a local motto which becomes one of the elements of symbol of Hulu Sungai Selatan. *Rakat mufakat* means solid unity with deliberation [13] or cooperation in the principle of kinship [14] To gain cooperation that can form integrity hence the attitude of openness is needed in cooperation to achieve the goals of the motto of *Rakat Mufakat*. Such character values of openness and cooperation refer to scientific attitude—the application of character values in the learning, proposed by Harlen [15].

There were several parts in this module. These parts contained *balanting* activities and *rakat mufakat* character on dynamic fluid material which included cover, acknowledgement, standard contents (including standard competence, standard basic, indicator, and the learning goal), the instructions on how to use this module, the introduction of local wisdom to evoke the students' curiosity and motivate them to study, mapping concept, keywords, the elaboration of material, *lanting* information about local wisdom, the famous figures in physics, students' worksheets with the instruction on how to do it to practice *the rakat mufakat* character, the sample questions, competence testing, *rakat mufakat* corner explaining the urgency of this character to apply, peer assessment as medium to evaluate the character and feedback to peers, glossary and references. Then, the teaching materials were further developed into 3 meetings (the characteristics of fluid, continuity, Bernoulli Law). In every meeting, there were students' worksheet to involve them in group discussion, peer assessment sheet as medium to measure *rakat mufakat* character and competence testing to clarify the goal that the students would achieve.

Validation of Module

The results of validation of module contents, module presentation, research instruments and the development of local wisdom-based module of physics are presented on table 4, 5, 6, and 7.

Table 4. Results of validation of module contents

Content validation			Presentation validation		
Assessment	Mean	Category	Assessment	Mean	Category
Content Quality	3.00	Good	Consistency	2.89	Good
Organization	3.33	Very good	Format	3.33	Good
Language	3.08	Good	Attractiveness	3.67	Good
Evaluation	2.83	Good	Font type and size	3.11	Good
Glossary	3.00	Good	Language	3.00	Good
Validity	75.88%	Valid	Validity	81.41%	Valid
Reliability	0.98	High	Reliability	0.96	High

Table 5. Results of validation of questionnaires on students' responses

Assessment	Mean	Category
Format	3.07	Good
Content	3.20	Very Good
Construction	3.11	Good

Language	3.11	Good
Validity	78.07%	Valid
Reliability	0.50	Moderate

Table 6. Results of validation of achievement test construction

Assessment	Mean	Category
Instruction of test	2.33	Poor
Scoring guidance	3.00	Good
Printing quality	3.33	Very Good
Font type and size	3.00	Good
Design	2.67	Moderate
Practicality of Instruments	3.33	Very Good
Time	3.00	Good
Validity	73.81%	Valid
Reliability	0.97	High

Table 7. Results of validation of test items

Assessment	Mean	Category
Validity of the questions	85.83%	Very valid
Reliability	0.99	High

Based on results of validation of module content and module presentation, the module of physics was feasible to be further developed to the next step which was trying it out in the class. This was also valid for validity of questionnaires on students' responses, the validity of test construction, and the validity of the test items. Testing the validity of the instruments aimed to make sure that the test in this research could measure the observed variables, namely validity, practicality and effectiveness. Besides based on result of analysis using Spearman Brown equation on module validation sheet learning test obtained that instrument reliability in this study is high category. This indicates that the level of concordance between the validators are not much different. Additionally, the validity of instruments is the degree which shows the measurement results of what is supposed to measure. Besides, this result can be a benchmark for the quality and meaningfulness of research. Thus, the research will be meaningless if the instruments are not valid since invalid instruments can lead to unexpected findings [16]. This module hopefully can appropriately be used in teaching and learning process. This is in line with [17] who states that module is one of the teaching materials, which is completely and systematically packaged, containing teaching experiences which are well planned and designed to assist the students in achieving the specific learning goal. Moreover, the module is valid if it is developed accordance with the target competence [5]

Practicality of Module

The practicality of the module can be viewed from the results of questionnaires. The aspects which are taken into consideration are practicality, the usefulness and efficiency of the time [4]. The results of the analysis are as follows:

Table 8. Analysis result of questionnaire on students 'responses

Aspects	Percentage	Category
Practicality	81.67	Very Practical
Usefulness	83.55	Very Practical
Efficiency of Time	80.36	Very Practical
Mean	81.86	Very Practical

The average score for the practicality of module was 81.86% and it was included in very practical category. This result, thus, clarified that the module was seemingly practical, useful and effective in assisting the students to learn. The practicality of the module reflects the effect of module as teaching materials either using it in the class or using it independently [18]. In terms of the practicality aspect, the results are in line with the proper function of module which is as a medium which can be used easily to learn independently [3]. Then, in terms of usefulness aspect, module aids

the students to achieve the higher quality of learning [19]. Moreover, teaching based local wisdom also boosts the students' motivation in learning, as a result the learning becomes enormously fun [20]. In terms of time efficiency, the use of module provides the well planned, independent and complete learning activities, and clear learning outcomes [21].

Effectiveness of Module

The effectiveness of a module is simply measured from the students' learning outcome [22]. The analysis results of the effectiveness are presented in table 9.

Table 9. Results of students' pretest and posttest

Mean of pretest	Mean of posttest	N-gain	Category
0.52	70.57	0.64	Moderate

Based on the N-gain score obtained, the students got 0.64 which was in moderate category. This result showed that that local wisdom-based module of physics in Hulu Sungai Selatan was effective as it could increase the students' learning outcomes; therefore, the learning goals could be achieved successfully. This result is in line with the study conducted by [23] which showed that local wisdom-based module could significantly increase the effectiveness of learning. It also turned the learning into more contextual. Besides, module assists the students to link teaching materials of physic to the real context that happens around them; therefore, it motivates them in learning [24] and positively impacts the students' learning outcome. The development of module also assists the students in learning independently; thus, it eventually increases the students learning outcome [25]. Additionally, the learning process will be more meaningful since there is interaction between teaching materials and daily activities that regularly happen around them [26]; thus, it will be much easier for students to understand the materials [27].

Attainment of *Rakat Mufakat* Character

Attainment of *rakat mufakat* character was measured based on peer assessment sheet which was filled in at the end of every meeting. The results of attainment of *rakat mufakat* character are presented in the following table.

Table 10. Result of peer assessment on *rakat mufakat* characters

Rakat mufakat character	Mean in every meeting	Category
Respecting opinion	88.10	Very Good
Changing opinion if less data available	88.10	Very Good
Willingness in accepting suggestion	88.69	Very Good
Open minded	89.88	Very Good
Not dominating	89.89	Very Good
Joint conclusion making	89.88	Very Good
Active in group	88.69	Very Good
Average	89.20	Very Good

Based on the results, the attainment of *rakat mufakat* character was in very good category; thus, it led to the conclusion that the students possessed the *rakat mufakat* character values (opened and cooperative during the learning activities). This finding clarifies that this module could aid the students to practice the *rakat mufakat* character values with *balanting* activities on dynamic fluid materials. The successful of this module in attaining the character values was influenced and supported by several aspects namely; (1) *rakat mufakat* corner containing the story of explanation which are related to *rakat mufakat* character value and implemented in society, (2), *rakat mufakat* character training which was in students' worksheet, containing instruction on applying those character values during the group activities, (3) peer assessment which enabled the students to give feedback towards the measured character values. According to Johnson and Johnson [28], in peer assessment the students should have commitment to objectively assess their peers and diminish the resistance on feedback. This is in line with the study conducted by [4] which revealed that local wisdom-based module of physics assisted the students for character training which was related to the local

wisdom in their region. In addition to this matter, [29] state that the attainment of character values could be accomplished through learning physic based local wisdom. Learning science (especially physics) hopefully enables the students to build the character values such as respectful and aware of the cultural preservation [30]. Furthermore, this integration aims not only to enable the students to understand the materials correctly, but also to understand the local culture which can be faded because of other cultures' influences [23].

CONCLUSION

Based on the results of analysis, it was revealed that local-based module of physics was effective and feasible to be applied in learning. The rationale of development of module of physics on dynamic fluid material based on balancing local wisdom is to practice rakat mufakat character. It is proven by: (1) valid teaching materials which are proven by the results of validation of module contents and presentation of module, (2) the practicality of teaching materials which is in very practical category and it can be seen from results of questionnaires on students' responses, (3) the effectiveness of teaching material which is in moderate category and it is seen from the results of students' achievement test, and (4) the attainment of rakat mufakat character which is in very good category which is proven by the results of peer assessment.

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