Developing a physics module based on the local wisdom of Hulu Sungai Tengah regency to train the murakata character

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Abstract. This research was conducted due to the unavailability of the physics module containing the local wisdom as well as a lack of comprehension to students on the cultural diversity in South Kalimantan. Therefore, this study aimed at producing the physics module based on the local wisdom of Hulu Sungai Tengah (HST) Regency in South Kalimantan province which was feasible on the basis of validity, practicality, the effectiveness of the physics module and the achievement of murakata character. This study was a research and development using the ADDIE model. The subjects of the study were 30 students of XI MIA class at one of the high schools in Barabai, HST regency. The instruments used were a module validation sheet, a questionnaire, an achievement test and a student characteristic observation sheet. The results showed that the validity of the module was categorized as highly valid, the practicality of the module was categorized as practical, and the effectiveness of the module was categorized as high, and the attainment of murakata character was categorized as good. It could be concluded that the physics module based on the local wisdom of HST regency to train murakata character is feasible to use in the teaching and learning.

1. Introduction

Education is one of the primary needs of human life. Education is a systematic process to improve human dignity as a whole [1]. Educational institutions are not only a place to transfer knowledge, but also a place to shape youths’ attitude, character, habit, and leadership [2]. One of the subjects taught in educational institutions in Indonesia is Physics. Physics is an essential subject that must exist in the curriculum school [3] because physics contribute to the development of science and technology in society. Physic learning will be more meaningful if learners can develop experience to understand better the real world through physics learning [4]. Significant physics learning can be obtained when the physics learning process is associated with the daily life of learners, especially the local wisdom of a region.

The local wisdom is local ideas that are wise, full of wisdom, good value, embedded and followed by members of the community [5]. Therefore, the implementation of local wisdom values of a nation in learning becomes very important so that it can form a personality following the noble values of the nation's culture. Local forms of wisdom in society can be cultural (norms, values, ethics, beliefs, customary laws, customs and special rules) [6]. The integration of local culture is a crucial thing to fill the cultural element in education, to make culture stronger and to be able to survive in the globalization era [7]. Based on the result of the interview with physics teachers in one of the high schools in Barabai, it shows that physics learning in this school has not yet linked with local wisdom. Teaching material used in this school is the teaching material from the publisher and has not been inserted with the local wisdom. Based on the results of questionnaires...
distributed to learners in the school, it shows that 63.6% of the learners are not familiar with local wisdom in South Kalimantan. Local wisdom in the area of South Kalimantan, especially Hulu Sungai Tengah (HST), is the culture of murakata and the regional culinary of Barabai cake. Apam is a common culinary region of Hulu Sungai Tengah [8]. The process of learning physics, particularly on the material of temperature and heat, can load the examples of everyday life such as the process of making the Apam which is the application of the heat topic. The process of making the Apam can be integrated with Murakata values. Murakata which is an acronym of mufakat (agreement), ratak (society), and seiy-sekata (understanding each other) is the slogan of Banjar people in HST District. Murakata means consensus or deliberation in social life and honest behavior in everyday life [9]. Values of murakata character with the indicators like cooperation and tolerance can be instilled, trained, and developed through learning activities. The character is that of which distinguishes one individual from others [10]. Children's character can be formed through the integration of learning resources into learning [11]. The research by Oktaviana et al. [12] shows that the module integrated with local wisdom can increase the achievement of hard-work character and persistence. It shows that the learning process can be implemented by incorporating local wisdom through teaching materials.

One type of instructional material is a module. The module has its explanatory power and contains complete learning content so it can make students learn independently [13]. The module has the benefit that students can utilize the module without the teacher's presence [14]. According to Prastowo [15] module is a teaching material that is arranged systematically by using language that is easy to understand by learners with the level of knowledge and age learners so that they can learn independently with minimal help from an educator. Kurniash and Berlin [16] stated that the module is a set of teaching materials that are systematically presented so that readers can learn independently. Based on those opinions, it can be concluded that the module is one form of instructional materials arranged in such a way that allows students to learn independently.

The research finding Hartini et al. [17] shows that physics-based modules of local wisdom can trace the character with excellent achievement. In line with this, the result of Cahyaningtyas et al. research [18] shows that the science teaching material integrated with the local wisdom is able to improve critical thinking skills significantly. Based on the described problems above, the researchers aim to conduct research and development of physics module on temperature and heat integrated with the local wisdom of HST to trace the character of murakata.

2. Method

This was a research and development using the ADDIE model [19]. The phases of the ADDIE model are Analyze, Design, Develop, Implement, and Evaluate. These phases are sequential; each depended upon the successful completion of the preceding phase. Moreover, the ADDIE model is an iterative feedback model, which means the results of the evaluation phase are returned to the feedback, closing the loop and facilitating further refinement of the learning product [19]. The steps of ADDIE development can be seen in Table 1.

| Step          | Sample Task                                      | Sample Output                                      |
|---------------|--------------------------------------------------|----------------------------------------------------|
| Analysis      | Needs analysis, task analysis, and instructional analysis | Learner profile and problem statement, description of instructional content and establish what must be learned. |
| Design        | Identification of objectives, Plan instruction and Identify resources | Measurable objectives, instructional strategy, and specification. |
| Development   | Developing learning materials, expert validation and small group testing | Module prototype and validator comments |
| Implementation| Tryout in real condition                         | Student comments and data                          |
| Evaluation    | Formative and summative evaluation                | Revised module prototype and the package report    |

Table 1. Steps for developing ADDIE model.
The product developed was the module. The module was validated by two validators using module validation sheet. The subjects of this study were 30 students of XI MIA class at one of the high schools in Barabai in the academic year 2017/2018. The object of this research was the appropriateness of the physics module based on the local wisdom of HST regency to trace the character of *murakata*. Data collection instruments used in this study can be seen in Table 2.

| Aspect               | Instrument                  |
|----------------------|------------------------------|
| Validity             | Module Validation Sheet      |
| Practicality         | Questionnaire                |
| Effectiveness        | Test of the learning achievement |
| Murakata Character   | Questionnaire                |

Module validation consisted of content and displays validation with the criteria based on [20]. Module practicality could be seen through three aspects: the ease of module use, the module benefit and the efficiency of learning time [21]. Module practicality criteria were based on [20]. The module effectiveness value can be analyzed by using the following equation average normalized gain (g) [22]. Module effectiveness criteria were based on [22]. Criteria for students’ *murakata* character achievement was based on [20].

### 3. Result and discussion
The product developed in this research was the Physics module on Temperature and Heat Topic based on Local Wisdom of HST Regency to train the Character of *murakata*. The module was developed according to the criteria [1]. The module consisted of cover, table of contents, introduction (including module guideline, core and basic competencies, learning indicators and learning objectives), introduction to cooking Apam, a brief history of Kab. HST, mindmaps, chapter titles, keywords, material descriptions, a corner of *murakata* characters, summaries, exercise questions, and competency tests, bibliography and glossary and key answer of the formative tests. The product consisted of 4 sections: thermal expansion, heat and change shape, the principle of black and heat transfer. The Module was compiled based on local wisdom by linking the process of making an Apam. The difference between the developed module and the existing modules was the local wisdom of HST regency by adding an illustration of the process of making Apam in explaining the matter of physics and train *murakata* characters. One example was the use of firewood in the procedure of manufacture which there was heat emission through convection and radiation process. The word character could be derived from the philosophy of the heat as well as the process of making Apam that uphold the behavior of cooperation and tolerance.

![Figure 1. The process of making Apam used as illustrations in the learning process heat material.](image.png)

#### 3.1. Module validity
Validation result of physic module based on local wisdom on making Apam cake to trace the *murakata* character can be seen in Tables 3 and 4.
Table 3. The calculation result of content validation of the module

| Scoring Aspects   | Mean | Category     |
|-------------------|------|--------------|
| Content Quality   | 3.45 | Highly Valid |
| Organization      | 3.50 | Highly Valid |
| Language          | 3.25 | Valid        |
| Evaluation        | 3.33 | Valid        |
| Validity          | 3.40 | Highly Valid |

Table 4. The calculation result of appearance validation of the module

| Scoring Aspects        | Average | Category   |
|------------------------|---------|------------|
| Consistency            | 3.33    | Valid      |
| Format                 | 3.78    | Highly valid |
| Attraction             | 3.58    | Highly valid |
| Font and Font Size     | 3.89    | Highly valid |
| Language               | 3.67    | Highly valid |
| Validity               | 3.64    | Highly valid |

Validation result of the module content validated by the experts reached 3.40 average score which was in a highly valid category. The highly valid category indicated that the contents of the module could be used in the learning. Module appearance validation had an average score of 3.64 which was categorized as highly valid. The module appearance aspects such as consistency, format, attraction, font and font size, and language are good and correct.

The result of content validation and module appearance was valid based on the validity level. According to [23], aspects of the teaching material validity could be associated with two things. They were material developed was based on a strong theoretical rationale and internal consistency. Depdiknas [1] adds that the indicators of feasibility of a teaching material included the feasibility of content, language, presentation, and graphics. The validation result showed that the developed module had a strong theoretical basis and had internal consistency.

3.2. Module practicality

The result of students’ response questionnaire to measure the practicality of physics modules is shown in Table 5.

Table 5. The analysis result of students’ response questionnaire

| Indicators     | Average | Criteria |
|----------------|---------|----------|
| Easy to use    | 3.14    | Practical|
| Benefit        | 3.07    | Practical|
| Time efficiency| 3.03    | Practical|
| Average        | 3.08    | Practical|

The result of the practical analysis was obtained by measuring students’ response questionnaire. It is shown in table 5 that the average score is 3.08 which is in the practical category. Wati et al. [24] state that an easy-to-use product is practical. Meanwhile, Sumbada’s research [25] showed that the integration of local
wisdom in the learning process made students active in the process of reconstructing their own knowledge, this would have an impact on the increase of students' cognitive abilities.

3.3. Module effectiveness
The effectiveness of the developed modules could be identified from the learner's test result after learning. The test was done through two activities namely pre-test and post-test. The test was about ten essays and was calculated using N-gain. Learning achievement of learners can be seen in Table 6.

| Table 6. Learning achievement of pre-test and post-test. |
|-----------------|-----------------|-----------------|-----------------|
| Pretest average score | Posttest average score | N-gain | Category |
| 4.3 | 70.7 | 0.77 | High |

The calculations of students’ cognitive learning achievement using the n-gain test to 30 learners can be seen in table 6. It is shown that the n-gain score obtained <g> 0.77 which is categorized as high. The N-gain value of 0.77 with the high category indicates that the developed module is effective for learning. Improvement of learning outcomes was tested using the significance test obtained values of significance 0.000 smaller than 0.05 which means there was an increase in student learning outcomes through developed modules. Daryanto [21] revealed that the use of the module was effective if an expected learning objective could be achieved. Akker et al. [23] also argued that one aspect that must be met by a teaching material to be effective was that the teaching material was operationally able to deliver the expected result.

3.4. Murakata character achievement
The Murakata assessed character aspect is the character of cooperation and tolerance. The result of character achievement analysis of learners can be seen in Table 7.

| Table 7. Character achievement analysis result. |
|-----------------|-----------------|-----------------|
| Character criteria | Average | Category |
| Cooperation | 2.99 | Good |
| Tolerance | 3.14 | Good |
| Average | 3.06 | Good |

The assessed cooperation criteria consist of six aspects: learners’ willingness to accept the division of group tasks, willingness to use time discussion, participation in giving opinions during the discussion, willingness to provide information to help to complete group tasks, willingness to solve problems during group discussions and willingness to accept decisions made by the group.

Aspects of learners' cooperation character were obtained an overall average of 2.99 which was in a good category. Based on the data, it could be interpreted that overall learners were getting used to familiarize with the cooperation character in learning that included aspects of the division of tasks, utilization of time, providing opinions and information, complete reports and problem-solving.

The assessed tolerance criteria consisted of four aspects: learners’ willingness to get along with other group members, willingness to create a familiar atmosphere within the group, willingness to accept the decisions made by the group, and willingness to accept friends’ opinion. The tolerance aspect obtained average score 3.14 which was categorized as good. This showed that learners had been able to appreciate differences and had not imposed personal opinions.

Overall murakata character obtained average score was 3.06 which was in the good category. Based on these data, the students had been able to accommodate tolerance in learning by showing a good attitude in maintaining cohesiveness and creating a familiar atmosphere within the group, and
free to accept friends’ opinions and decisions that had been agreed upon one another. These results are in line with Kamaruddin’s opinion [26] that says that education can instill good habits in students. This is also in line with the idea of Agung [27] suggesting that the value of a character can be developed through local wisdom.

4. Conclusion
Based on the results of development and test, it is concluded that the physics module on temperature and heat materials based on the local wisdom of HST regency is feasible to use to trace the character of murakata. This is supported by the validity which was categorized as highly valid, the practicality which was categorized as practical, the effectiveness which was categorized as a highly effective module. The murakata character achievement is categorized as good.

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