# Development of E-Module Physics Based on Local Wisdom of Lampung Written Batik on Temperature and Heat Materials

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## ABSTRACT

Students still think learning physics is boring. For this reason, educators are expected to be able to develop fun physics learning in various ways. This study aims to develop a module based on the local wisdom of Lampung written batik on temperature and heat. The research method used is research and development (R&D) with a Borg and Gall development model design. This research resulted in a product in the form of an e-module based on local wisdom of Lampung written batik on temperature and heat material with 90% media validation results, 91% material experts, and 82% IT experts. The percentages generated in the study indicate that the category is very feasible. Very feasible means that the developed module can be tested and applied to the next process. The trial was divided into two, namely a small trial of students who obtained 86% results in the very interesting category and field trials with teachers in three schools getting 89% results, and field trials of students getting 82% results. From the results of the small test percentage and field trials, the percentage is obtained in a very attractive category. The very interesting category means that the modules developed are well responded to and accepted by students and teachers. This research concludes that an e-module based on local wisdom of Lampung written batik has been developed on the material of temperature and heat.

## INTISARI

Siswa masih menganggap bahwa belajar fisika itu membosankan. Untuk itu, pendidik diharapkan dapat mengembangkan kegiatan pembelajaran jasmani yang menyenangkan dengan berbagai cara. Penelitian ini bertujuan untuk mengembangkan modul berbasis kearifan lokal batik tulis Lampung pada materi temperatur dan panas. Metode penelitian yang digunakan Research and Development (R&D). Ini menggunakan desain model pengembangan Borg dan Gall. Penelitian ini menghasilkan sebuah produk berupa e-modul berbasis kearifan lokal batik tulis Lampung pada materi temperatur dan panas. Didapatkan 90% hasil validasi media, 91% ahli materi, dan 82% ahli IT. Persentase yang dihasilkan dalam penelitian menunjukkan bahwa kategori sangat layak. Modul yang dikembangkan sangat layak untuk diuji dan diterapkan pada proses selanjutnya. Uji coba dibagi menjadi dua yaitu uji coba kecil siswa yang memperoleh hasil 86% dalam kategori sangat menarik; uji coba lapangan dengan guru di tiga sekolah mendapatkan hasil 89%; dan uji coba lapangan siswa mendapatkan hasil 82%. Hasil persentase uji kecil dan uji coba lapangan diperoleh dalam kategori sangat menarik. Kategori sangat menarik artinya modul yang dikembangkan diterima dan diterima dengan baik oleh siswa dan guru. Penelitian ini menyimpulkan bahwa telah dikembangkan e-modul berbasis kearifan lokal batik tulis Lampung pada materi suhu dan kalor.

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## A. Introduction

Various impacts occurred due to the coronavirus pandemic [1]. This pandemic has certainly disrupted and changed the way we socialize, work, and study. Many human activities have been transferred online, including in the world of education [2]. Nowadays, teachers have been using technology a lot as a way to keep interacting with students. This shows the need for technology or distance learning social networking tools [3].

Based on the results of the pre-research conducted in three schools during the post-pandemic period, the researchers concluded that the results of filling out student questionnaires in the form of learning physics at school were still enough to make students bored with learning physics because of the monotonous use of learning media. The teacher also had never applied local wisdom-based physics learning. In addition, the results of the pre-research conducted with the teachers found that the teachers strongly agreed with local wisdom-based learning media. And these teachers had never used learning media, especially e-modules related to local wisdom.

E-modules with local wisdom are one of the learning media listed in Law No. 20 of 2003, namely Article 36 paragraph d concerning the curriculum based on the diversity of regional and environmental potentials. This law requires every school to implement an education model based on local excellence and potential. It can be found in each region as a means to better introduce students to their environment. Therefore, each school can acquire skills that are defined by the potential of their respective regions. This is following the results of Dwi Cahyani's research regarding ethnoscience learning to support the environment. The results of a phenomenon that develops in society can be linked to science (physics). So that, students can more easily master learning because they can see and feel it directly [5].

From some of the backgrounds above, it is necessary to innovate learning by developing e-modules according to the stages of manufacture. The following studies are research that reflects the type of research (R & D) on physics e-modules based on local wisdom according to their respective regions. Research conducted by Mustika regarding the development of e-modules based on local wisdom takes the theme of making dodol cages [6], Nur Laily's research takes the theme of traditional games [7], and Rizki's research takes the themes of traditional medicine, blacksmithing, lemang bamboo, and coffee culture. 8]. Thus, there has been no development of e-modules based on local wisdom that focuses on one field and in the form of written batik. The researcher took the theme of local wisdom in the form of Lampung's written batik because no one had ever researched the theme, so it gave rise to novelty in research.

The developed e-module will be packaged in the form of images, videos, and text descriptions. This e-module was created through an application called Flip PDF Corporation. It is equipped with a formative test so that it is more interactive and interesting. This study aims to produce an e-module of physics-based on local wisdom in the form of Lampung batik on temperature and heat material. In addition, this study aims to test the feasibility and know the responses of students and teachers. The benefits of this research are in the form of the ability to develop a concept of temperature and heat. It is integrated into the local wisdom of Lampung written batik so that it can foster a love for written batik. It is starting to be rare to develop and know the process of making batik itself.

## B. Method

The method used in this study was Research and Development methods (R&D). This method generally focused on the process of developing and validating educational products [9]. The model used in developing the physics e-module based on local wisdom is Borg and Gall's model with 10 stages. But, the researchers limited it to the product revision stage after the trial. It is because the purpose of this study is to determine the feasibility and attractiveness of e-module learning media based on local wisdom. And it was developed taking into account the limitations of time and resources owned by researchers, and to determine the responses of students. The following are the steps of the complete Borg and Gall's research model as shown in Figure 1.

Potential Problems → Data Collection → Product Design → Design Validity → Design Revision → Product Trial → Product Revision → Trial Usage → Product Revision → Mass Production
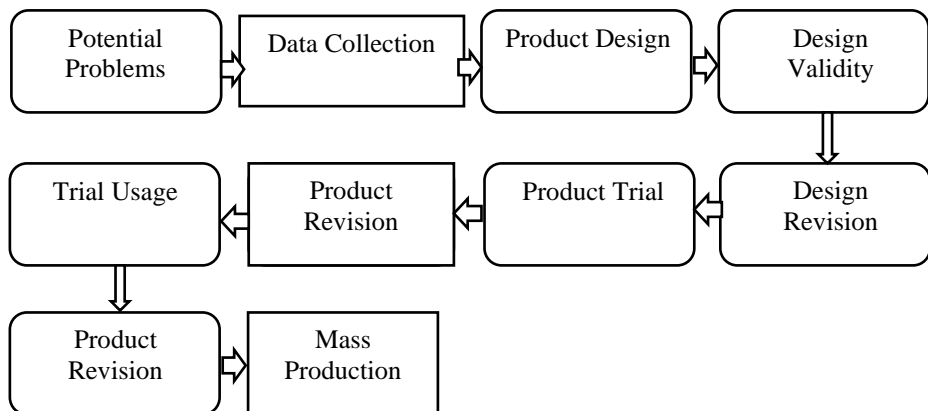
Figure 1. The steps of the Borg and Gall research model

The research locations were held in three schools, namely SMA Negeri 1 Bandar Sribhawono, SMA Negeri 1 Sekampung Udik, and SMA Ma'arif 3 Sekampung Udik. The research was conducted from September-October 2021. The subjects in this study were validators with 3 experts, namely media experts, material experts, and IT experts. They consist of 2 validators. The trial subjects were carried out in two stages, namely small group trials and field trials. It was carried out by teachers of each school and students, with a total of 78 subjects for small group trials and field trials. Sampling

in a small trial was carried out purposively. The technique selection is based on students who have known Lampung batik before. Sampling in the large trial was carried out by simple random sampling. This technique was chosen because the students of these three schools are large.

The types of data obtained in this study consisted of 2 types, namely qualitative data and quantitative data. Qualitative data obtained from the results of initial observations, criticisms, and suggestions from media experts, material experts, teachers, and students were analyzed. Some suggestions are used for product improvement at the revision stage. Quantitative data were gathered through the completion of assessment questionnaires by validators, teachers, and students. The goal is to find out whether the product is feasible to be used for testing or is interesting to use as a learning medium. The research instruments consisted of interview instruments, questionnaires, and documentation.

Data analysis to determine the feasibility of the product developed by the validators using a Likert scale questionnaire. The response questionnaire to this feasibility has 5 stages of answers according to the questions, namely: "very feasible", "decent", "fair enough", "not feasible", and "very inappropriate" [11]. Each has a different score that indicates its level of conformity. The total scoring score can be searched using the formula (1):

$$I = \frac{\sum T}{\sum M} \tag{1}$$

Notes:

I                : Interpretation of Score Percentage Rating [10].

$\sum J$        :  Score

$\sum M$        : Maximum Score

From the results, the criteria for the percentage of validation are sought. The validator criteria can be seen in Table 1 below.

Table 1. Criteria for the Percentage of Validators.

| Score | Achievement Level | Qualification |
|---|---|---|
| 5 | 80% < x ≤ 100% | Very Feasible |
| 4 | 60%< x ≤ 80% | Decent |
| 3 | 40% < x ≤ 60 % | Fair Enough |
| 2 | 20% < x ≤ 40 % | Not Feasible |
| 1 | 0% ≤  x ≤ 20% | Very Inappropriate |

Data analysis to determine the attractiveness of the product that has been developed is aimed at teachers and students. The response questionnaire to this attractiveness has 5 stages of answers according to the questions, namely: "very interesting", "interesting", "quite interesting", "not interesting", and "very unattractive" [12]. Each has a different score that indicates its level of conformity. The total score can be found using equation (1) above.

From the percentage results that have been obtained, the next step is to change the average score into a feasibility value that matches the criteria, which can be seen in Table 2.

Table 2. The Scale of Learning Media Attractiveness.

| Score | Questionnaire Score | Criteria |
|---|---|---|
| 5 | 80% < x ≤ 100% | Very interesting |
| 4 | 60% < x ≤ 80% | Interesting |
| 3 | 40% < x ≤ 60 % | Quite attractive |
| 2 | 20% < x ≤ 40 % | Not Interesting |
| 1 | 0% ≤ x ≤ 20% | Very Unattractive |

## C. Result and Discussion

**Research Result**

The results of the development research conducted by the researchers produced a product in the form of an e-module based on Lampung local wisdom. Researchers collected the data from SMA Negeri 1 Bandar Sribhawono, SMA Negeri 1 Sekampung Udik and SMA Ma'arif 3 Sekampung Udik. Analysis and small group trials were carried out with 15 students, while the field trials were conducted with a total of 60 students in class XI MIA and 3 teachers in physics.

Before conducting the research, the researcher conducted pre-research by administering questionnaires to teachers and students to determine the importance of holding learning media. The results of interviews with several students showed, that when learning physics, students felt bored. While interviews with several teachers showed that they need learning media in the form of E-modules. Teachers had never linked learning with local wisdom, and they argued that it was necessary to develop e-modules based on Lampung batik local wisdom. The results of each stage of this procedure produced potential problems in data collection, product design, design validation, design revision, product testing, and product revision. Before conducting the trial, the researcher was first validated by validators from media, materials, and IT experts.

Expert validation uses a questionnaire sheet that has been provided by the researcher. Then the validator assesses the aspects that have been provided in the questionnaire. The results obtained for the validation of media, material, and IT experts are as follows.

Table 3. Media Expert Validation Results

| No | Skill Aspect | Percentage Score (%) | Criteria |
|---|---|---|---|
| 1 | Visual Display | 90% | Very Feasible |
| 2 | Use of Letters | 85% | Very Feasible |
| 3 | Physical Criteria | 87% | Very Feasible |
| 4 | Voice | 90% | Very Feasible |
| 5 | Ease of Use | 100% | Very Feasible |
| The average number of aspects | | 89% | Very Feasible |

Table 4. Material Expert Validation Results

| No | Skill Aspect | Percentage Score (%) | Criteria |
|----|--------------|----------------------|----------|
| 1 | Presentation | 93% | Very Feasible |
| 2 | Content | 92% | Very Feasible |
| 3 | Language | 87% | Very Feasible |
| 4 | Scientific Approach | 93% | Very Feasible |
| The average number of aspects | | 91% | Very Feasible |

Table 5. IT Expert Validation Results

| No | Skill Aspect | Percentage Score (%) | Criteria |
|----|--------------|----------------------|----------|
| 1 | Screen design effectiveness | 87% | Very Feasible |
| 2 | Ease of operation | 80% | Very Feasible |
| 3 | Consistency | 80% | Very Feasible |
| 4 | Animation | 80% | Very Feasible |
| The average number of aspects | | 82% | Very Feasible |

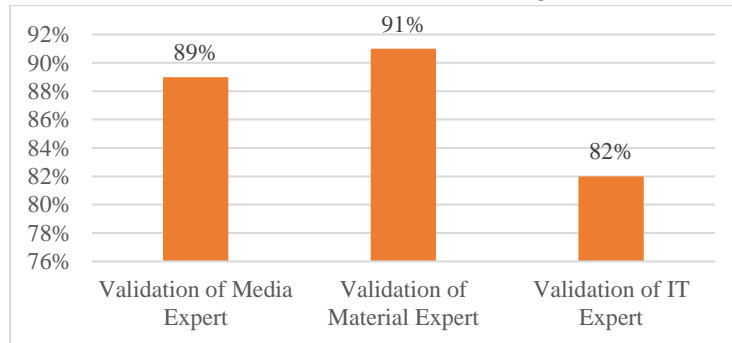So that the overall validation results can be seen in Figure (2) below:



Figure 2. Validator Overall Validation Results

According to the graph, the material expert is the one who gets the highest validation results. This means that the product developed is very feasible for further use in trials in terms of feasibility, content, language, and scientific approach. Because the average skill aspect receives an average of 80% from the aspects of ease of operation, consistency, and animation. The result of validation from IT experts yields got lower than the validation of both. This was deemed very feasible by the three validators for further trials to be conducted.

Following the validation results from the validators, the next step is to test the product's attractiveness. The trials were split into two categories: small group trials and field trials.

Table 6. Field Trial Results

| No | Skill Aspect | Percentage Score (%) | Criteria |
|----|--------------|----------------------|----------|
| 1 | Interest | 86% | Very Interesting |
| 2 | Material | 87% | Very Interesting |
| 3 | Language | 89% | Very Interesting |
| 4 | Benefit | 86% | Very Interesting |

| | | | |
|---|---|---|---|
| 5 | Graphic | 88% | Very Interesting |
| The average number of aspects | | 87% | Very Interesting |

The following are the results of the small group trial in graphic form as shown in Figure 3 below.
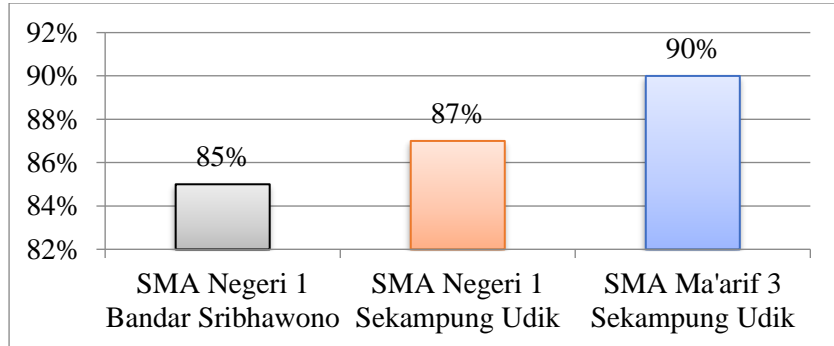


Figure 3. Small Group Trial Results

Based on the graph, it can be seen that the graph that has the highest percentage is in the SMA Ma'arif 3 Sekampung Udik. It is based on the high level of interest in students at the school. They rarely find diverse learning media. So when the e-module learning media is introduced, students feel interested in learning. SMA Negeri 1 Bandar Sribhawono got the lowest attractiveness of the three because the school has often used interactive learning media. But, no one has ever linked local wisdom with learning. After this small group trial, the students considered that the e-module was very interesting to use under some of the suggestions.

The field trial used an instrument in the form of a Likert scale questionnaire filled out by students via Google form. The assessment aspect consists of attractiveness, material, language, usefulness, and graphic aspects. The results of student responses in field trials will be presented in Table 7 below:

Table 7. Students' Field Trial Results

| No | Skill Aspect | Percentage Score (%) | Criteria |
|---|---|---|---|
| 1 | Attractiveness | 82% | Very Interesting |
| 2 | Material | 82% | Very Interesting |
| 3 | Language | 84% | Very Interesting |
| 4 | Usefulness | 80% | Very Interesting |
| 5 | Graphic | 83% | Very Interesting |
| The average number of aspects | | 82% | Very Interesting |

Based on the results of field trials in 3 schools, the average was obtained as follows:
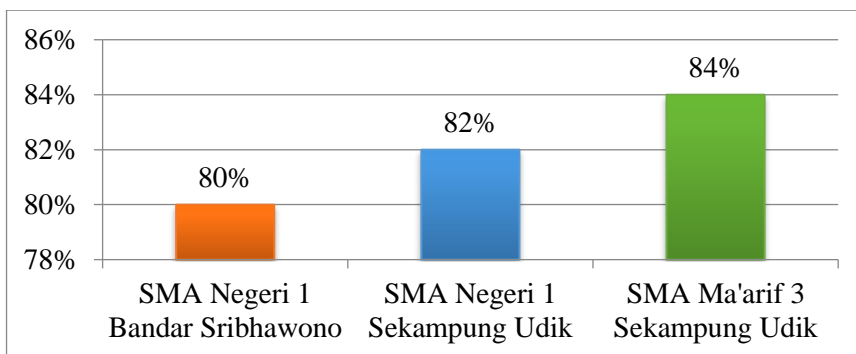
Figure 4. The results of the students' field trials

Based on the graph, SMA Ma'arif 3 Sekampung Udik still has the highest percentage of the attractiveness of the product that the researchers made among the other schools. After the product was tested in small groups, the percentage value was not too much different because it had been revised according to the suggestions from students. The product can be said as very attractive.

The results of the teacher assessment were carried out on three physics subject teachers at SMA Negeri 1 Bandar Sribhawono, SMA Negeri 1 Sekampung Udik, and SMA Ma'arif 3 Sekampung Udik. The following is the teacher assessment data in Table 8.

Table 8. Teacher's Field Trial Results

| No | Skill Aspect | Percentage Score (%) | Criteria |
|----|--------------|---------------------|----------|
| 1 | Content Quality and Purpose | 88% | Very interesting |
| 2 | Instructional Quality | 92% | Very interesting |
| 3 | Technical Quality | 88% | Very interesting |
| The average number of aspects | | 89% | Very interesting |

The following are the results of the field trials in the form of graphs that were tested on teachers of each school.
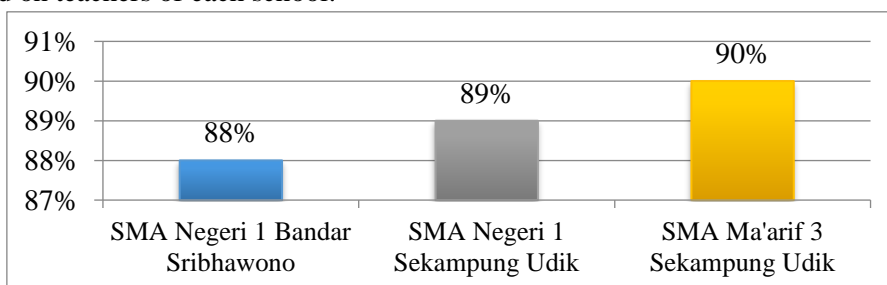


Figure 5. The Results of the Teacher's Field Trial

Based on the graph, it can be seen that the highest graph is in the teacher of SMA Ma'arif 3 Sekampung Udik. The teacher is very enthusiastic about the research. It is because it can add references for teachers to make effective learning media, especially based on local wisdom. So far, the teacher admits that he has not used varied learning media for teaching. The lowest graph is at SMA Negeri 1 Bandar Sribhawono.

Teachers are also interested in the product that researchers have developed, only some assessment indicators that are still lacking. All teachers consider that the product developed is very interesting to use in learning.

**Discussion**

The learning media developed is in the form of e-modules based on local wisdom in the form of Lampung written batik. It can be accessed via the internet (online). This is intended for the use of technology in an increasingly advanced era. Learning is not done face-to-face, it requires teachers to do innovative things for learning. So that, the knowledge provided is still conveyed properly. According to Tyas' research, the appropriate learning media during this pandemic is using e-modules. One of the characteristics of this e-module can be used for independent study [13]. This also supports the researchers' use of e-module learning media because it has advantages according to its characteristics of it. Researchers also chose local wisdom to tell them that there is a culture in Lampung. And, we must protect and preserve through learning.

This development is carried out by conducting a literature study to find out the needs for this research. Field studies were conducted at SMA Negeri 1 Bandar Sribhawono, SMA Negeri 1 Sekampung Udik, and SMA Ma'arif 3 Sekampung Udik to determine the state of learning in schools. There are differences in the number of schools used in previous studies. In the research and development conducted by Rini Mujizah [14] and Yaspin Yolanda [15], they only used one school in their research. While Stefanni Viga [16] used three schools in his research. The researcher considers the number of schools and looks at the researcher's ability.

The results of the field study revealed that the three schools were the object of the research. They needed learning media that allowed students to learn independently during online activities. So far, there are no teachers who use e-modules based on local wisdom as learning resources. They do not forget the culture and nature around them. According to Mustika Wati's research, the existence of e-modules containing local wisdom is appropriate for use in research. Huda's research on physics learning with local wisdom also said that it is effective for improving student learning outcomes [17]. This research concludes that the physics e-module based on local wisdom in the form of Lampung batik is considered very feasible and very interesting to be used as a medium for learning physics.

## D. Conclusion

This study concludes that researchers have succeeded in making an e-module learning media based on the local wisdom of Lampung written batik on temperature and heat material. The result has very feasible validation and the field trials are very interesting. The advantage of the product (local wisdom-based e-module) is an online media can be accessed using hardware such as cellphones, laptops, and so on. It also

can be accessed anytime and anywhere with the condition that it is connected to an internet connection. This e-module is the latest variation in learning to find out local wisdom while studying physics material. It is equipped with pictures and interactive videos so students do not feel bored when studying the material. The disadvantages of this product are, that it must be connected to the internet to access this e-module, the material used is still limited to temperature and heat material; and the local wisdom used for the object of research is also limited to the local wisdom of the Lampung Batik art and culture. The Suggestions from researchers for further research, need to develop other local wisdom-based e-modules with different materials and topics of local wisdom.

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