1 (1), 2022, 26-34
Bulletin of Social Studies and Community Development
https://imrecsjournal.com/journals/index.php/bsscd

Development of Contextual Physics Module inspired by Banyuwangi Local Wisdom for Senior High School

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Abstract: Describe and produce modules based on local wisdom as valid and practical for teaching materials Senior High School. Using Nieveen's research design consisting of preliminary research, prototyping stage, and assessment stage. Preliminary research begins by analyzing the needs of problem analysis and literature studies as a basis for making modules. Prototyping stage is done by expert validation and user validation before the module is taught. In assessment stage, valid modules were tested in class XI MIPA 2 to measure the practicality of the module. Practicality of modules based on learning implementation and student response questionnaire sheets of 95.3% and 91.6%. The contextual physics module based on the local wisdom of Banyuwangi developed is valid and practical so that it is worthy of use.

Keywords: local wisdom, practicality, physics modules, validity

▪ INTRODUCTION

Education in Indonesia has arranged the curriculum in school to introduce the potential of each region. This has been regulated in Government Regulation No. 19 of 2005 concerning Education National Standard article 17 paragraph 1 which states that, "The curriculum for education unit SD / MI / SDLB, SMP / MTs / SMPLB, SMA / MA/ SMALB, SMK / MAK, or other equivalent forms is developed in accordance with educational unit, regional potential / regional characteristics, social culture of the local community, and students ". Therefore, the curriculum gives authority to use the potential each region has as learning, one of them is physics learning.

Physics is a lesson that discusses natural phenomena and all the interactions that accompany them. Therefore, in accordance with Government Regulation No. 19 of 2005, physics learning should be associated with events surrounding local wisdom such as those in the area, for example in the form of teaching materials. Depdiknas (2008: 11), revealed that teaching materials are grouped into four categories namely printed teaching materials (modules, handouts, worksheets), listening teaching materials (tapes, radios, CDs), teaching materials, and interactive teaching materials. According to Widodo & Jasmadi (2008: 42), the making of teaching materials must be adjusted to the characteristics of students, including the objectives of specific learning activities, containing learning material in detail to support the achievement of objectives and evaluation. In other words, the purpose of the module is to help students in self-directed learning.

Depdiknas (2008), states that local wisdom covers aspects of the economy, culture, information technology, agricultural products, culture, services, human resources, natural resources or other potentials of a region. The local wisdom of each region is different. From the local wisdom, it can be implemented as a physics teaching material based on local wisdom, but in reality learning in schools still doesn't associate with local wisdom. In accordance with the Fibonacci statement (2017), physics learning still does not pay attention to the local culture that develops in society.

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Received: 18 March 2022
Accepted: 20 May 2022
Published: 30 May 2022

Banyuwangi's local wisdom is very diverse, including Glenmore Sugar Industry, Bosowa LPG terminal, sardine canning industry, Es Balok production, the practice of air balloon flights in Benculuk each year, and so forth. The wisdom mentioned earlier is an application of the concept of thermodynamics. According to Selvianiresa (2017), the science learning approach that connects with the real situation of students in society is a contextual approach. Contextual learning offers learning that further highlights the ability of students and links material to everyday life (Nisa et al, 2018). The application of a contextual based approach to local culture makes students able to solve problems related to learning in daily living activities (Saparudin, 2017). Therefore, local wisdom can be integrated into learning in schools, one of which is making modules as an example of thermodynamic learning. According to Alias (2012), modules are effective teaching materials for visual, active and reflective. Rufii (2015) also revealed that modules can be used in presenting material during learning, including physics learning.

Trianto (2008: 20), states that contextual learning is a concept of learning that helps connect the material taught to the real-world situation of students. According to Suastra (2005), wisdom-oriented learning gives more impression so students can be interested in learning it. The point is that individuals can in fact build a conception of knowledge in everyday life (Ampa, 2013). The statement refers to previous research conducted by Satriawan & Rosmiati (2016: 1216), contextual physics-based teaching materials that integrate local wisdom can be used as well as increasing concept understanding on the subject of mechanics. Based on research conducted by Diani et al. (2018), the development of physics modules with scientific approaches based on literacy is able to improve student learning outcomes. According to Sinaga et al. (2019), the development of learning resources makes students better able to develop potential without depending on class schedules. From the description, the researcher developed a contextual physics module based on Banyuwangi local wisdom on thermodynamic material.

The objectives of this research are: (1) Describe the validity of contextual physics modules based on Banyuwangi local wisdom in senior high school thermodynamic material. (2) Describe the practicality of contextual physics modules based on Banyuwangi local wisdom in senior high school thermodynamic material.

▪ METHOD

This type of research is development research, using the Neiveen development design oriented to produce products in the form of modules. The design of Neiveen's development consists of three stages, including preliminary research, prototyping stage, and assessment stage. These three stages are carried out by researchers to produce products that are suitable for use in learning.

At each stage there are steps that must be taken. The preliminary research phase includes needs analysis, problem analysis, and previous research literature studies. The prototyping stage phase on the preparation of the product design module to be developed includes the design of devices, instruments, expert validation, user validation and limited testing. The stage of the assessment stage is explained about the module development test by testing the practicality of using the module in learning with the learning implementation sheet and student questionnaire sheets. The module development test was carried out at SMAN 1 Glenmore in XI MIPA 2 students.

The data analysis technique to describe the validity of the learning module is by using expert and user validation sheets. The validation sheet consists of two components namely construct and content. Yulastri et al. (2017) suggests construct format / validity

related to the suitability of module components developed with predetermined elements. The differentiator from expert and user validation sheets is expert validation to measure the accuracy of module contents while user validation for module suitability with core competencies and basic competencies. The validation sheet used was assessed as feasibility, accuracy and accuracy (Lesmono et al., 2018). According to Nikita (2018), a validation sheet is used to obtain input in the form of suggestions on the module.
The analysis techniques expert validity is calculated by formula

$$V_{ahli} = \frac{T_{se}}{T_{ah}} \times 100\%$$

Description :
V_{ahi} : The Validity of expert- i
T_{se} : The total empirical score obtained
T_{ah} : The maximum total score
The percentage of validity obtained is referred to the validity criteria in Table 1.

Table 1. Criteria module validity

No.	Kriteria pencapain (validitas)	Tingkatan Validitas
1	80 % < $x \leq$ 100 %	Very valid, very effective, very complete, can be used without improvement
2	60 % < $x \leq$ 80 %	Valid enough, quite effective, quite complete, can be used but needs minor improvement Less valid, less effective, less complete, needs major repairs, it isrecommended not to be used
3	40 % < $x \leq$ 60 %	Less valid, less effective, less complete, need major repairs, it is recommended not to be used
4	20 % < $x \leq$ 40 %	Invalid, ineffective, incomplete, needs major repairs, is recommended not to be used
5	0 % < $x \leq$ 20%	Very invalid, very ineffective, very incomplete, unusable

The data analysis technique of user validity is calculated by the formula:

$$V_{pg} = \frac{T_{se}}{T_{ah}} \times 100\%$$

Description:
V_{pg} : The user validity
T_{se} : The total empirical score obtained
T_{ah} : The maximum total score
The percentage of validity obtained is referred to the validity criteria in Table 1.
The analysis to obtain data on practicality of the module is by observing the implementation of learning and disseminating student response questionnaire sheets. Analysis of learning implementation data observed by 2 observers was calculated using the formula:

$$N = \frac{\sum \text{score of acquisition}}{\sum \text{score maximum}} \times 100\%$$

Description: N = The percentage total achieved

The percentage obtained from the calculation of learning implementation is referred to in Table 2

Table 2. The practical criteria based on the effectiveness of learning

No.	Persentase	Attitude Statement
1	80,1 % - 100 %	Very good
2	60,1 % - 80 %	Good
3	40,1 % - 60 %	Enough
4	20,1 % - 40 %	Lacking
5	0 % - 20 %	Very lacking

Likewise with the results of student response questionnaires. The data obtained is analyzed by the formula:

$$N = \frac{\sum \text{score of acquisition}}{\sum \text{score maximum}} \times 100\%$$

Description: N = The percentage total achieved
The percentage obtained from student response questionnaires is referenced in Table 2.

▪ RESULT AND DISCUSSION

The product of the research is a contextual physics module based on Banyuwangi local wisdom in senior high school thermodynamic material. The module developed consists of 2 learning activities, 40 pages, 2-dimensional display printed on A4 paper with cover images of Banyuwangi local wisdom related to thermodynamics. The module section consists of page titles, introductory words, table of contents, module usage instructions, concept maps, module contents associated with Banyuwangi local wisdom, simple experiments, examples of questions, summaries, competency tests, glossaries, bibliography, and answer keys.

Preliminary Research

This stage includes analyzing problems through observation and interviews with physics teachers at SMAN 1 Glenmore related to the development of modules based on local wisdom. Banyuwangi has local wisdom such as the Glenmore sugar industry, the manufacture of Muncar ice blocks, the Bosowa LPG terminal, the tradition of the Muncar community in air balloon flights, sardine canning which can be associated with physics learning in thermodynamic material. The next is analysis by looking at the curriculum used in schools to meet the competencies that must be mastered and owned by students. From the results of the analysis of the needs and problems obtained, the study of literature is continued by examining several theories from previous studies. All data obtained from the preliminary research stage form the basis for making contextual physics modules based on Banyuwangi local wisdom in high school thermodynamic material.

Prototyping Stage

The prototyping stage in the form of drafting module draft 1. Draft module 1 consists of two learning activities, learning activities 1 about law I thermodynamics and learning activities 2 about law II thermodynamics. Draft module 1 of Banyuwangi local wisdom based contextual physics that was formed, validated by expert validation and user validation. The module expert validation was carried out by 2 lecturers of Jember

University physics education while the module user validation was carried out by physics teacher at SMAN 1 Glenmore.

Data obtained from two expert validators in the form of quantitative data and qualitative data. Quantitative data is data in the form of numbers, while qualitative data are in the form of conclusions and suggestions from the validation sheet. Quantitative data on expert validation of contextual physics modules based on Banyuwangi local wisdom in high school thermodynamic material are shown in Table 4.

Table 4. The results of the expert validation of the contextual physics module based on Banyuwangi local wisdom on high school thermodynamic material

No.	Validation Aspect	Aspect Average Value	Total Score Obtained	Percentage	Validity Category
1	Feasibility of content	3.5			Very Valid, very effective, very complete can be used without revision
2	Needs	3.5	14	87.5 %	
3	Language	3.5			
4	Renewal	3.5			

Table 4 shows the average value of each aspect, for the feasibility of contents worth 3.5; needs worth 3.5; language 3.5; and the value of 3.5. Then the total score obtained by Tse is 14 which is then converted in percent to 87.5%. From the percentage produced then refer to the module interval interval. The percentage shows that the contextual physics module based on Banyuwangi local wisdom in the material of High School Thermodynamics meets very valid criteria. Hidayati et al. (2018), the module is said to be very valid by the validator if the module is presented systematically. Qualitative data obtained from two expert validators on the module developed shows that the module can be used without revision.

The next is the module user validation conducted by a physics class XI teacher at SMAN 1 Glenmore. Quantitative data on user validation of contextual physics modules based on Banyuwangi local wisdom in high school thermodynamic material can be seen in Table 5.

Tabel 5. The results of the validation of users of contextual physics modules based on Banyuwangi local wisdom on senior high school thermodynamic material

No.	Validation Aspect	Aspect Average Value	Total Score Obtained	Percentage	Validity Category
1	Feasibility of content	3.67			Very Valid, very effective, very complete can be used without revision
2	Needs	3.78	15.45	96.5 %	
3	Language	4			
4	Renewal	4			

The table shows the average value of each aspect, for the feasibility of the contents valued at 3.67; worth of 3.78; language 4; and the renewal of value 4. Then the total score obtained by Tse is 15.45 which is then converted in percent to 96.5%. This percentage shows that the contextual physics module based on Banyuwangi local wisdom in the material of High School Thermodynamics meets very valid criteria. This is similar to the

research of Wati (2017), stating that the results of the validation of the physics module integrating the upstream local wisdom of the south river were 80.5%. Qualitative data obtained from user validation namely contextual physics modules based on Banyuwangi local wisdom in high school thermodynamic material can be used without revision. It can be concluded, that the contextual physics module based on Banyuwangi local wisdom that has been validated by an expert validator can be used and is worth testing.

User validation and expert validation have been carried out, then continued limited trials using the draft 1 module. Limited trials were conducted on students of class XI Mathematics 1 at SMAN 1 Glenmore. from the limited trial there are several improvements to the module namely the enlargement of the image on the question, the addition of question data, and the addition of sample problems in the module. The results of the improvements from the limited trial were presented in the draft 2 module.

Asessment Stage

The draft 2 modules formed were tested on XI MIPA 2 class at SMAN 1 Glenmore. The test results from the assessment stage are data on the practicality of contextual physics modules based on Banyuwangi local wisdom in high school thermodynamic material. The practicality of the module is obtained from the implementation sheet of student learning during the learning process and the distribution of student response questionnaires.

During the learning using the Banyuwangi local wisdom-based physics module, researchers were accompanied by two observers, to observe the implementation of learning. The implementation sheet contains five indicators. In accordance with Zainudin's statement (2017: 26-27), five indicators in the learning implementation instrument, namely a) convey learning objectives and prepare students to learn and motivate students to relate material to daily life, b) deliver material with modules, c) guiding students to make observations or discussions guided by modules, d) ask students to present the results of the discussion or observation, and e) ask students to learn. A summary of the results of the learning implementation of class XI MIPA 2 students on the subject of thermodynamics is shown in Table 6.

Table 6. The results of the implementation of learning XI MIPA 2 class

No.	Meeting	Percentage of each meeting	Criteria
1	1st meeting	95.1 %	Very good
2	2nd meeting	95.5 %	

Table 6 shows that the implementation of learning in class XI XI MIPA 2 using a contextual physics module based on Banyuwangi local wisdom is done well. This can be seen from the percentage value of each meeting. The implementation of learning in class XI MIPA 2, at the 1st meeting was worth 95.1% and the second meeting was worth 95.5%. The percentage value of the whole aspects for the two meetings was 95.3%. Based on the analysis of learning implementation data obtained, it can be concluded that learning using the Banyuwangi local wisdom based contextual physics module in class XI MIPA 2 is well implemented.

The practicality of the Banyuwangi local wisdom-based contextual physics module was also obtained from the student questionnaire responses distributed after learning. There are 10 statements in the questionnaire responses of students regarding opinions

after using the contextual physics module based on Banyuwangi local wisdom in high school thermodynamic material. In the questionnaire sheet, students check the "yes" or "no" statement. The results of the analysis of student questionnaire response data after using the XI MIPA 2 class module are shown in Table 7.

Table 7. The analysis of student response questionnaire data

No.	Statement	The number of positive questionnaire voters	Percentge (%)	Average Percentage	Criteria
1	Suitability of modules with Basic Competencies	34	100 %		
2	The module's own independence	27	79.4 %		
3	Banyuwangi local wisdom presented in the module	32	94.1 %		
4	Ease of learning modules	30	88.2 %		
5	Module presentation	29	85.3 %	91.6 %	Good
6	Image of module illustration	32	94.1 %		
7	Interest in the module	30	88.2 %		
8	Language module	32	94.1 %		
9	New knowledge in the module	34	100 %		
10	Material deepening in the module	30	88.2 %		

Table 7 shows the practicality data from the questionnaire sheet after using the contextual physics module based on Banyuwangi local wisdom of thermodynamic material in senior high school worth 91.6%. In accordance with Ningrum et al. The average student response questionnaire results were 91.8% of Quantum Teaching-based modules in physics learning in high school. If referred to the Arikunto (2013: 36), practicality interval criteria, the results of the data from the student questionnaire sheet on the module are good because they lie in the range of 75% - <100%. Then it can be concluded that the response of students of class XI MIPA 2 after using the contextual physics module based on Banyuwangi local wisdom on the subject of chemistry is good.

Based on the description of practicality data obtained from the implementation of learning using modules and questionnaire sheets of students' responses about the module statements developed, amounting to 95.3% and 91.8%. Products are categorized as practical if the student response questionnaire data reaches 60% according to Masruroh & Listiadi's ((2015: 3), statement, then the contextual physics module based on Banyuwangi local wisdom on thermodynamic material developed is declared practical and feasible to use in learning.

▪ CONCLUSION

Based on the analysis of the data obtained it can be concluded: (1) the validity of experts & users of contextual physics modules based on Banyuwangi local wisdom on thermodynamic material by 87.5% & 97.3% which are categorized as very valid; (2) the practicality of contextual physics modules based on Banyuwangi local wisdom on thermodynamic material amounting to 94.75 and percentage questionnaires valued at 91.6% which are practically categorized.

Suggestions that can be given for further research: (1) time management during learning so that learning runs smoothly and each meeting runs thoroughly; (2) monitor student and teacher learning activities only as facilities for students to truly learn independently; (3) contextual physics modules based on Banyuwangi local wisdom in high school thermodynamics material need to be tested more in different schools to measure their effectiveness; (4) for other researchers, this development research should also be carried out by studying the local wisdom in Banyuwangi so that diverse local wisdom-based learning can be obtained.

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