



Development of Physics Learning Modules Integrated with Wonosobo *Local Wisdom* on Temperature and Heat Materials to Overcome Student Misconceptions

Farah Afika Nur Jannah¹, Abdul Majid², Firdaus^{3,*}

^{1,3} *Physics Education Study Programme, Faculty of Tarbiyah and Keguruan Sciences, Al-Qur'an University of Science*

Jl. KH Hasyim Asy'ari Km.03, Kalibeber, Mojotengah sub-district, Wonosobo district, Indonesia.

² *Department of Early Childhood Islamic Education, Faculty of Tarbiyah and Keguruan Sciences, Al-Qur'an University of Science*

Jl. KH Hasyim Asy'ari Km.03, Kalibeber, Mojotengah sub-district, Wonosobo district, Indonesia.

*E-mail correspondence: firdaus@unsiq.ac.id

Article Info:

Abstract

Sent:
May 17, 2023

Revision:
December 10,
2024

Accepted:
December 14,
2024

Keywords:

Module,
Misconception,
Local Wisdom,
Video

This study aims to: (1) Knowing the level of validity of the Wonosobo *local wisdom* integrated learning module so that it is feasible to be used to overcome students' misconceptions. (2) To know the level of practicality of the learning module integrated with *local wisdom* Wonosobo to overcome students' misconceptions. (3) To determine the effectiveness of the learning module integrated with *local wisdom* Wonosobo to overcome students' misconceptions. The subjects in this study were students of SMA Takhassus Al Qur'an class XI MIPA 5 totalling 20 students. The research used the R & D method with the Borg & Gall development model. The data analysis technique used is quantitative and quantitative analysis. The results of the development of this learning module show that the results of material validity obtained an average score of 3.39 on a scale of 4 or 85.1% while the results of media validity obtained an average score of 3.69 on a scale of 4 or 93.35% so that the module developed is included in the valid category. The results of the analysis resulted in $t_{count} > t_{table}$ where t_{count} is below the H_a acceptance area. The result of an increase of 0.4 or 8% of the increase is not enough, but it is effective enough to overcome misconceptions. The results of the assessment of participants obtained an average score of 14.7 or 90.7% so that it is in the very practical category.

© 2024 State Islamic Univeristy of Mataram

INTRODUCTION

Physical and psychological changes are characteristics that have been closely attached to humans since humans were born. All the potential that humans have will continue to change dynamically. The process of dynamic change is experienced by humans through the process of education [1]. Formal and non-formal educational institutions can be utilised as a means of obtaining education. The purpose of formal and non-formal institutions is to explore knowledge more deeply, build morals and character and prepare themselves to adapt to the habits of society [2]. Education is considered as a process of transferring knowledge that is not just a transfer from the source of knowledge to the recipient but the learning experience is also involved in it [3]. Learning experience can be utilised as a form of motivation and stimulus for students given by educators to students in the learning process. Learning experiences can be obtained by students through a process of observation or activities that involve the surrounding environment or the potential of the area where students live. Basically, every human being has an obligation to study, either directly at school or by studying natural phenomena that can be used as learning materials as well.

As the word of Allah SWT. in the Qur'an which states that Allah will give grace to whomever Allah wants, and only to those who can take lessons. Allah commands in verse 269 of Surah Al Baqarah which reads:

يُؤْتِي الْحِكْمَةَ مَنْ يَشَاءُ وَمَنْ يُؤْتَ الْحِكْمَةَ فَقَدْ أُوتِيَ خَيْرًا كَثِيرًا وَمَا يَذَّكَّرُ إِلَّا أُولُو الْأَلْبَابِ

Meaning: "Allah bestows wisdom on whomever He wills. And whoever is endowed with wisdom has indeed been endowed with a great bounty. And it is only the intellect that learns." (QS. Al Baqarah: 269). [4]

The verse means that Allah will give everything in the form of useful knowledge that can stimulate humans to move and work, to whoever He wants. The verse also emphasises that people who can take lessons from everything that has ever happened or from all the blessings that Allah has given, are people of reason.

Therefore, it is the responsibility of humans as intelligent beings to continue to expand their knowledge horizons. Some parts of science have been learned by humans directly without realising it, such as through observing phenomena that occur in the surrounding environment. Other parts of science must also be learnt by humans through learning in formal institutions or schools.

One part of science that must be studied at school is science. This is because science subjects will support humans to understand the phenomena of natural phenomena that occur. Science subjects, especially in high school, are divided into 3 main subjects, namely Physics, Chemistry and Biology. Physics learning is one of the lessons with the subject matter that is less desirable. This is because physics learning in almost all of its subject matter, consists of many formulas that are considered difficult to understand. In addition, the lack of teacher efforts to stimulate students' knowledge through things that can be observed in the surrounding environment related to the material that is being or will be studied makes it more difficult for students to understand a concept of material.

Lack of interest in learning physics material affects the speed of students to understand the meaning of the material that is being or will be studied. The low speed of students to understand the material that is being or will be studied, can have an impact on the occurrence of misconceptions of students. The understanding of concepts in students sometimes does not match the understanding of concepts held by the teacher. If the students' understanding of the concept is in accordance with the meaning of the concept presented by the teacher, then the concept cannot be said to be wrong. However, if the concept that students have is not in accordance with the concept presented by the teacher, then the understanding of the concept in these students is said to be wrong or misconceptions occur. The occurrence of misconceptions can be caused by several factors, such as daily experiences gained by students and errors in the delivery of concepts given by teachers at the previous level. In addition, the use of local wisdom in temperature and heat material to help students understand the concept of the material is still lacking [5]. Whereas basically local wisdom can be used to encourage students in the process of understanding the material because this local potential often intersects with the daily lives of students.

The learning model by utilising a learning module in which there is a learning video-assisted stimulus that is integrated with *local wisdom*, aims to stimulate students' knowledge insights and build the concept of material to be learned so that the opportunity for misconceptions in students can be overcome. The teacher's efforts in stimulating students' knowledge insights through learning videos are effective to implement, this is because students are required to actively observe concrete events in the surrounding environment [6].

The utilisation of learning modules in the learning process must have objectives to be achieved, material to be learned by students in the learning process and details of teacher and student activities during the learning process. The development of learning modules that can focus students' knowledge insights is a video-assisted learning module that integrates *local wisdom* or things that often intersect with the daily lives of students. *Local wisdom* or local wisdom is intended to be like the temperature or heat required in the process of making typical Wonosobo food, namely onglklok noodles, candied carica and opak. The application of teaching materials in the form of appropriate learning modules in the learning process, aims to enable all the potential of students to continue to develop according to their respective abilities. In accordance with some of the things that have been explained above, it is very clear that the use of teaching materials, in this case the learning module, is very important.

Based on the description of the problems above, it is necessary to develop teaching materials in the form of learning modules that can overcome the problem of misconceptions of temperature and heat material. Video-assisted temperature and heat learning module integrated with *local wisdom* can help students to understand the concept of temperature and heat material correctly and precisely.

RESEARCH METHODS

The type of research used by researchers is the type of research and *development (Research and Development)*. One of the efforts that can be made to develop a product and validate it is through research and development. The product developed is a book or module, video or film as a stimulus in the learning process integrated with local wisdom. The research process used by researchers is the development model developed by Borg & Gall. Borg & Gall stated that a *Research and Development (R & D)* approach in education consists of 10 steps. The main purpose of the research and development method is to produce a new product as an effort to complement previous products. In addition, another goal of the research and development method is to determine the feasibility of the new product to be developed [7]. This research uses interviews, observations, questionnaires and *pretest* and *posttest* methods in obtaining the necessary data.

RESULTS AND DISCUSSION

This research entitled "Developing Physics Learning Modules *Integrated* with Wonosobo *Local wisdom* assisted by Video to Overcome Students' Misconceptions" aims to develop learning products that are valid, practical and effective in overcoming students' misconceptions about the material being taught. This development has gone through several stages including identifying problems that have the potential to cause misconceptions, collecting data, designing products to be developed, design validation, design revision, product trials, product revision. The development of physics learning modules integrated with Wonosobo *local wisdom* is based on the fact that there are still errors in understanding the concept of material experienced by students and left alone, the lack of intense interaction between educators and students and teaching materials that are still monotonous so that it reduces students' interest in learning [8].

The design of the learning module pays attention to the components that must be in the module. The content of the material is adjusted to the basic competencies of temperature and heat material class XI curriculum 2013. Referring to several physics book references such as Giancoli's book, Marthen Kanginan, and other supporting books that are relevant to the material [9]. So that the compiled physics learning module integrated *local wisdom* Wonosobo assisted video.

After the initial product is composed, it is then tested for its validity level and practicality so that the developed product can be used. The validity of the learning module is obtained through the results of material validity and media validity as follows:

Table 1. Module validity

Aspects	Average Aspect	\bar{X} Aspect	\bar{X} Whole	%
Appropriateness of Material	3,53	3,395		
Presentation of Material	3,26		3,542	88,56
Grafika	3,78	3,690		
Readability	3,60			

Based on table 1, we can know that the average module validity assessment is 3.542 or if presented at 88.56%. According to table 4.9 on validity, the physics learning module integrated with *local wisdom* Wonosobo that has been developed is included in the valid category.

The development of this learning module aims to overcome the misconceptions experienced by students. Misconceptions are measured using a questionnaire prepared according to a lattice or misconception indicators quoting the book "*Educational Evaluation*" by Supriyadi. According to the book, there are four indicators of misconceptions including students who answer correctly with weak reasons indicating that they do not know the concept, students who answer correctly with strong

reasons indicate high mastery of the concept. Learners who answer incorrectly accompanied by weak reasons indicate that they do not know the concept. Learners who answer wrong with strong reasons indicate misconceptions [10].

Table 2. *Pretest* and *Posttest* Results

Aspects	<i>Pretest</i>	<i>Posttest</i>
Average	3,7	4,1
Percentage	74%	82%
Standard Deviation	0,1	0,2
Variance	0,3	0,4

Measurement of misconception improvement was obtained through *pretest* and *posttest* methods using the same questionnaire. From the implementation of the *pretest* and *posttest*, the data were analysed using the t test as in the data analysis subchapter. According to the results of the analysis, $t_{count} > t_{table}$ where t_{count} is below the H_a acceptance area. This means that there is a difference in the level of misconceptions experienced by students before and after using the module. Supported by the results of the average *pretest* and *posttest* show that the average value of the *posttest* is greater when compared to the average value of the *pretest*, which previously obtained an average score of 3.7 or 74% to 4.1 or 82%, which means that there is an increase in students' understanding of the material taught or a reduction in the level of misconceptions experienced by students after using the module. The result of an increase of 0.4 or 8% of the increase is not enough. This is because students are not used to using modules or teaching materials integrated with *local wisdom*. So that habituation is needed for students in integrating teaching materials with *local wisdom*.

using physics learning modules integrated with Wonosobo *local wisdom*. Thus it can be said that the average results of *pretest* and *posttest* can reduce the level of misconceptions of students. When the *pretest* test obtained an average of 3.7 on a scale of 5, it can be represented as 74%. While at the time of the *posttest* test obtained an average score of 4.1 on a scale of 5 and the percentage was 82%. Thus it can be concluded that the physics learning module integrated with Wonosobo *local wisdom* is proven to be able to overcome misconceptions in students.

Table 3. Module Practicality

Aspects	Indicators	\bar{X}	Percentage
Ease of Use Aspect	Total Score	17,7	88,5%
	Average	4,4	
	Category	Very Practical	
Aspects of Attractiveness	Total Score	14,4	96%
	Average	4,8	
	Category	Very Practical	
Aspects of Effectiveness	Total Score	13,3	88,6%
	Average	4,43	
	Category	Very Practical	
Practicality Aspect	Total Score	13,5	90%
	Average	4,5	
	Category	Very Practical	
	Total Score	58,9	90,7%
	Overall Average	14,7	
	Categories	Very Practical	

After that, the final results of the module were then tested on students to obtain the practicality value of the module. This questionnaire instrument includes aspects of ease of use, aspects of attractiveness, aspects of effectiveness, and aspects of practicality. The results of the students'

assessment are described in the table to get an average score of 14.7 or 90.7% so that it is in the very practical category. In the aspect of ease of use obtained a score with a percentage of 88.5%, the attractiveness aspect obtained a percentage score of 96%, the effectiveness aspect obtained a percentage score of 88.6% and the practicality aspect obtained a score with a percentage of 90%. From all aspects of the assessment, the final result is that the learning module developed is very practical and can be used as a means of self-learning and can overcome the misconceptions experienced by students.

This research aims to develop valid, practical and effective learning products to overcome students' misconceptions of the material taught. This development has gone through several stages including identifying problems that have the potential to cause misconceptions, collecting data, designing products to be developed, design validation, design revision, product trials, product revision. The development of physics learning modules integrated with Wonosobo *local wisdom* is based on the fact that there are still errors in understanding the concept of material experienced by students and left alone, the lack of intense interaction between educators and students and teaching materials that are still monotonous so that it reduces students' interest in learning [11].

The design of the learning module pays attention to the components that must be in the module. The content of the material is adjusted to the basic competencies of temperature and heat material class XI curriculum 2013. Referring to several physics book references such as Giancoli's book, Marthen Kanginan, and other supporting books that are relevant to the material [12]. So that the compiled physics learning module integrated *local wisdom* Wonosobo assisted video.

The development of this learning module aims to overcome the misconceptions experienced by students. Misconceptions are measured using a questionnaire prepared according to a lattice or misconception indicators quoting the book "*Educational Evaluation*" by Supriyadi. According to the book, there are four indicators of misconceptions including students who answer correctly with weak reasons indicating that they do not know the concept, students who answer correctly with strong reasons indicate high mastery of the concept. Learners who answer incorrectly accompanied by weak reasons indicate that they do not know the concept. Learners who answer wrong with strong reasons indicate misconceptions [13].

In addition to integrating with *local wisdom*, the increase in students' understanding of the material is due to the presence of videos that can be accessed through links or barcodes contained in the learning module. The link or barcode presented to watch the video in the module supports students to understand the learning material taught as well as can increase students' interest in understanding the learning material so that misconceptions can be resolved. Then the combination of material integration with *local wisdom* and learning videos that can be accessed through links or barcodes in it can also overcome misconceptions that occur in students. This happens because at each stage presented in the module directs students to understand the material which is equipped with an explanation of the material in the form of a video as well. So with the integration of material with *local wisdom* and videos that can be accessed through the link or barcode can overcome the misconceptions of students.

The results of the research that has been carried out are in line with some of the results of previous research including research conducted by Devi febriani with the research title "Development of Physics Learning Modules on Temperature and Caloric Materials Based on STEM Integrated Local Potential of Pekalongan Batik". The results of the research conducted by Devi Febriani obtained very good results in the material expert trial process with a score of 3.48; 3.71 and 3.84 on a scale of 4. Students gave an agreeable response to the module developed [14].

The next research that is in line with the results of the research that the researchers have done is research conducted by Foni S Sae et al with the research title "Development of Physics Teaching Materials Based on Nyiru Woven Local Wisdom to Improve Students' Concept Understanding". The results of research conducted by Foni et al obtained valid results for use during the validation process from material experts and media experts. The increase in understanding of concepts experienced by students after using the module is very high at 0.82 and students give a good response of 74.86% [15].

CONCLUSIONS

From the results of the research that has been done, it can be concluded that the validity level of the physics learning module integrated with *local wisdom* Wonosobo obtained an average score of 3.39 on a scale of 4 or 85.1%. As for the results of media validity obtained an average score of 3.69 on a scale of 4 or 93.35% so that the developed module is included in the valid category which means that there is conformity between the modules developed with the Teaching Book Standards and Teaching Modules.

Measurement of misconception improvement was obtained through *pretest* and *posttest* methods using the same questionnaire. From the implementation of the pretest and posttest, the data were analysed using the t test. According to the results of the analysis, $t_{count} > t_{table}$ where t_{count} is 2.2 while t_{table} is 1.686 and is under the H_a acceptance area. This means that there is a difference in the level of misconceptions experienced by students before and after using the module. The result of an increase of 0.4 or 8% of the increase is not enough, but it is effective enough to overcome misconceptions. This is because students are not used to using modules or teaching materials integrated with *local wisdom*. So that habituation is needed for students in integrating teaching materials with *local wisdom*.

To obtain the practicality value of the module. This questionnaire instrument includes aspects of ease of use, aspects of attractiveness, aspects of effectiveness, and aspects of practicality. The results of the students' assessment obtained an average score of 14.7 or 90.7% so that it entered the very practical category. The development module integrated with *local wisdom* assisted by video still requires a trial stage on a wider scale to improve the stages of development research. The results of this study can be used as a reference for similar research with other materials and can be developed by adding other variables. This research is still limited to field tests involving only one school so that further research and dissemination need to be carried out using a wider sample.

ACKNOWLEDGEMENTS

This research was supported by SMA Takhassus Al Qur'an as a place to collect research data. The author would like to thank the research supervisor who has guided the author from beginning to end. All parties who have supported researchers in carrying out research from start to finish which the researchers cannot mention one by one.

REFERENCES

- [1] Teguh Triwiyanto, Introduction to Education (Malang: PT. Bumi Aksara, 2017) pp. 1.
- [2] Moh. Khoerul Anwar, *Deep Learning to Shape Student Character as Learning*, Tadris Journal: Journal of Teacher Training and Tarbiyah Science, Volume 2 Number 2, December 2017, pp. 97 - 104.
- [3] Mardayeli Danhas and Yun Hendri Danhas, *Environmental Education* (Sleman: Deepublish Publisher, 2020) p 7.
- [4] Nafan Akhun, Qur'an and Translations, (Jakarta: Ministry of Religious Affairs of the Republic of Indonesia, 2022).
- [5] Dewinta Oktaviana et al, Development of Physics Module Integrated with Local Wisdom of Making Lala Oil to Train Sanggam Character, Scientific Periodical of Physics Education, Volume 5 Number 3, 2017, p. 272. 272.
- [6] Friendha Yuanta, Development of Social Science Learning Video Media for Elementary School Students, Trapsila: Journal of Basic Education, Volume 1 Number 2, December 2019, pp. 91 – 100
- [7] Risa Nur Sa'adah and Wahyu, R & D Research Methods (Malang: Literasi Nusantara, 2020) pp. 1

- [8] Sakti Alamsyah & Sudrajat, Learning Learning in Primary Schools (Yogyakarta: Deepublish, 2021) p. 157.
- [9] Nurul Huda Panggabean and Amir Danis, Science-based Teaching Material Development Design (Medan: Yayasan Kita Menulis, 2020). pp. 26 – 36
- [10] Supriyadi, Educational Evaluation (Pekalongan: PT. Nasya Expanding Management, 2021) p. 93
- [11] Sakti Alamsyah & Sudrajat, Learning Learning in Primary Schools (Yogyakarta: Deepublish, 2021) p. 157.
- [12] Nurul Huda Panggabean and Amir Danis, Science-based Teaching Material Development Design (Medan: Yayasan Kita Menulis, 2020). pp. 26 – 36
- [13] Supriyadi, Educational Evaluation (Pekalongan: PT. Nasya Expanding Management, 2021) p. 93
- [14] Devi Febriani, "Development of Physics Learning Modules on Temperature and Heat Materials Based on STEM Integrated with Local Potential of Pekalongan Batik" (Thesis, UIN Sunan Kalijaga, 2022).
- [15] Foni S Sae et al, "Development of Physics Teaching Materials Based on Nyiru Woven Local Wisdom to Improve Students' Concept Understanding", Variables, Volume 4, Number 1, April 2021, pp. 27 - 33