Development of a Natural Science Module Based on Local Tourism, Wonosobo Color Lake, to Improve Mastery of Concepts for Junior High School Students on Light and Optical Instruments

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Abstract – *This study aims to develop valid and practical physics modules to be used in teaching physics in class. The module developed is a module that is integrated with local tourism of the colorful lakes in Wonosobo, with the material described in the module being light material and optical devices. In addition, the developed module also aims to improve students' mastery of concepts. This study used Research and Development (R&D), namely research methods that produce products in the form of modules, media and others. Data collection techniques used in this study were observation, questionnaires, tests and documentation. The instruments used in data collection were media expert validation sheets, material experts, student response questionnaires, and student concept mastery tests. The subjects of this study were 17 students of grade VIII junior high school. From the research that has been done, the results are (1) module validation by media experts, material experts, and practitioner experts, an overall percentage of 80.1% is included in the valid category; (2) the results of the practicality of the modules assessed by students obtained an overall percentage of 87.82% including the very practical category; (3) being able to improve students' mastery of concepts based on the results of the average pretest and posttest scores, there was an increase in scores, the pretest obtained an average score -an average of 52.05, while the posttest obtained an average of 88.52.*

Keywords*: Local Tourism; Mastery of Concept; Light & Optical Instrument*

INTRODUCTION

Natural Science (IPA) is a learning concept that pays attention to natural phenomena related to human life and is the subject of extensive research, consisting of a collection of concepts, principles, laws, and theories (Setyowati et al., 2013). Scientific learning that presents real concepts in everyday life has greater potential to develop students' experiences and abilities in understanding nature based on scientific concepts (Listyawati, 2012). Therefore, the atmosphere and learning environment of the scientific learning process greatly influences the mastery of the concepts. It will be easier to achieve if students optimize local wisdom with a natural science learning process based on regional uniqueness and excellence (Sarah, (2019); Mustofa et al., (2022)).

One of the junior high schools (SMP) in Wonosobo, which has the potential for regional uniqueness and excellence, is SMPN 2 Kejajar. Even though it has this potential, it turns out that there is still no application of local tourism-based learning, so many students still feel that learning science is very difficult and not easy to learn because learning is rigid and monotonous, especially in light and optical instruments. From this statement, the author has an innovation to develop a science module that will overcome the mastery of the concept. There are several opportunities around Wonosobo that can be explored and developed to support science learning. For example, the tourism potential of the Wonosobo Color Lake located in Wonosobo is a local potential owned by the community.

Integrating local potential into science learning is important because it contains many scientific concepts. One of the science concepts found in the environment around Wonosobo is the material of light and optical devices. The material of light and optical tools can be combined with local tourism because the concept of light and optical tools is related to vision in lakes of color (Safitri et al., 2020).

In fact, integrating local wisdom into the learning process, especially science, is still rare, and the values embraced by local people full of local wisdom values are ignored in various learning activities, including science learning. It was reinforced by the results of interviews with students at one of the junior high schools in the Wonosobo area, who stated that they were unfamiliar with local tourism in their area and that science learning had never been associated with it. It raises concerns because students' knowledge of local tourism in their area is not grown in learning (Lia & Sugiarti, 2022).

Based on observations with science teachers at the school, it was found that the use of teaching materials at the school was not optimal. The teaching materials used are limited to using textbooks provided by the school. There is no use of teaching materials that support local wisdom in the student environment, such as local tourism-based learning modules.

One of the local tourism wisdom near SMPN 2 Kejajar Wonosobo is Telaga Warna. The color lake is a lake that has various colors; namely, it is illustrated that the Color Lake has four kinds of colors. Namely the colors red, white, blue and yellow. A simple analysis can be formulated that the color of Telaga Warna occurs because, as a volcanic area, this lake is a former crater of a dead volcano where the bottom is created from various deposits (Fransiska & Maria, 2017). The red and yellow colors in the lake may come from precipitated sulfur. The white color comes from precipitated limestone and quartz. Then, from the sedimentation of various rocks and chemical elements, when exposed to sunlight, they will reflect various lights (Otto, 2021).

Then, to support local tourism-based learning to improve students' mastery of concepts, it is important to know that one of the objectives of learning science in schools is for students to understand study material (concepts, principles, laws, theories) in a meaningful way to explain phenomena in everyday life (Mustofa et al., (2022).

Therefore, the effort that can be made to overcome the problem of mastering the concept is to innovate teaching materials for participants. One of these efforts is to develop teaching materials that students can use in independent learning. The teaching materials in question are in the form of modules. The module itself is teaching material that is designed and printed so that it can be studied by students independently.

The modules that researchers will compile are learning modules that have the characteristics of being integrated with local tourism of the Wonosobo Color Lake to improve students' mastery of concepts in the material of Light and Optical Instruments so that students can recognize and preserve existing local wisdom. With that in mind, the authors put their research into a science module development with the local wisdom of Telaga Warna Wonosobo Tourism with the title "Development of a Natural Tourism Module Based on Local Tourism Telaga Warna Wonosobo to Improve Mastery of Middle School Students' Concepts".

RESEARCH METHODS

This research uses Research and Development (R&D) research, which is a

research method that produces products in the form of media, modules and so on. The model used by researchers is Borg & Gall, which has several stages, namely: (1) preliminary study, (2) planning, (3) initial module development, (4) limited test, (5) main product revision, (6) test field, (7) operational product revision, (8) operational field testing, (9) final product revision, (10) product implementation. However, this study only reached stage 6, namely conducting field tests. It is due to limited research time.

Techniques for collecting data carried out by researchers are observation, questionnaires, tests and documentation. The instruments used were material expert validation sheets, media expert validation sheets, student response questionnaires, and student concept mastery tests.

The procedures for carrying out the research carried out by the researchers were (1) conducting an initial analysis of the problems at school, and it was found that science learning was still very monotonous and did not use many teaching materials that integrated learning materials with students' daily lives such as local tours around students so that causing low students' mastery of concepts, especially in the material of light and optical instruments; (2) planning and designing modules to be developed; (3) develop science learning modules following the plans that have been made; (4) conducting module validation by media experts, materials, and practitioners; (5) revise modules that have gone through a validation process; (6) conducting field tests on the module to assess the practicality of the module and the effectiveness of the module in increasing students' mastery of concepts.

RESULTS AND DISCUSSION

The research entitled "Development of Lake Warna Local Tourism-Based Natural Science Modules to Improve Students' Mastery of Concepts in Light and Optical Instruments" aims to develop learning modules that are valid and practical to use in science learning. In addition, developing this module is also expected to improve students' mastery of concepts.

The development of the Natural Tourism-Based Local Tourism module at Telaga Warna Wonosobo is based on the low interest in student learning, which causes laziness in learning and low mastery of students' concepts. In addition, there is a lack of learning modules that can be studied independently so that students still learn monotonously and teacher-centred. Considering these problems, the authors developed a science module based on local tourism at Telaga Warna Wonosobo for class VIII students in semester II.

The development of this module includes several stages; according to Borg and Gall's research, it is reduced only to the sixth stage, which includes (1) Potentials and Problems, (2) Data Collection, (3) Product Design, (4) Product Validation, (5) Product Revision (6) Product Trial. To achieve the planned objectives, it is necessary to have data and analysis to determine the level of validity, practicality, and effectiveness of the module in improving students' mastery of concepts.

The validity level of the module was assessed by one media expert, material expert, and practitioner expert. Based on the results obtained through the module validity questionnaire. According to Table 1, the validity results get an average score of 4.005 or 80.1%, so it is included in the valid category. The validity obtained a valid category, which means that the developed module is in conformity with the Standard

Textbooks and Teaching Modules, where the assessment components include content, presentation, linguistic, and graphic feasibility components. The following is a module validity analysis table, namely as follows:

Table 1. Module Validity Analysis Results

Aspect	Aspect Average	$\bar{X}$ aspect	$\bar{X}$ whole	%
Content Eligibility	3,87	3,88	4,005	80,1%
Presentation Eligibility	3,89			
Language Eligibility	4,06	4,13		
Graphical Eligibility	4,21			

After the learning module has gone through the validation and revision stages, the learning module is suitable for use in field research. Testing the learning module in the field to determine the module's practicality level through student assessment using a student response questionnaire. Based on the research, the overall average result is 4.39 or if it is percentage 87.82%. This value is included in the very practical category. The overall product practicality test results are presented in the Figure 1.

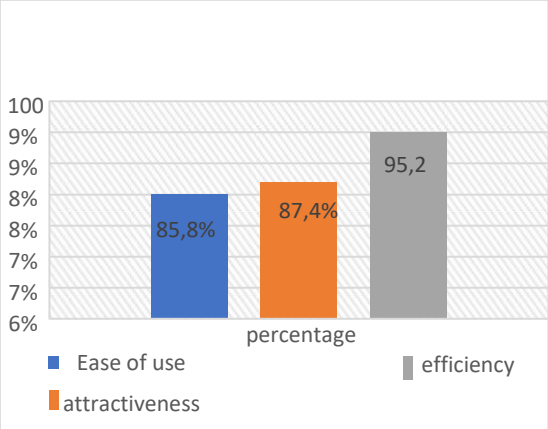

Figure 1. Percentage product practicality test

Then its effectiveness in increasing students' mastery of concepts was obtained using the same questionnaire using the pretest and posttest methods. From the implementation of the pretest and posttest, the data were analyzed using the t-test. According to the results of this analysis, it produces a t count < t table, where the indicated t count is -6.008 while the t table is 2.037. It is concluded that Ha is accepted and Ho is rejected. So it can be interpreted that there are differences in students' mastery of concepts before and after using the module. Supported by the results of the average pretest and posttest data analysis, it shows that the average posttest score is greater than the average pretest score, that is, previously obtained an average score of 52.05, and if it is presented, it is 88.52%, which means there is an increase in mastery of the concept. Students, after using the learning modules that have been developed. The results increased by 36.47%. This increase has been quite a lot because students are used to using teaching materials (books, modules, etc.), but they have not been linked to local potential.

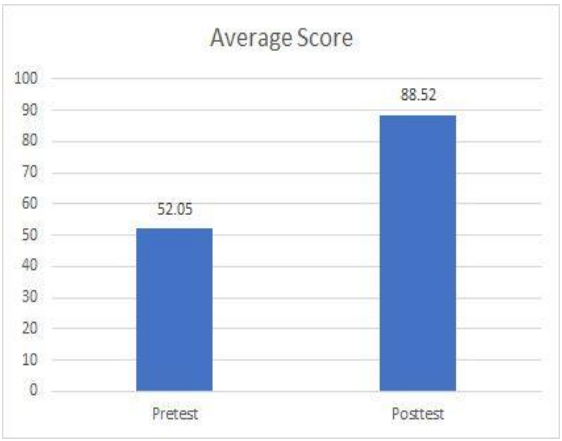

Figure 2. Average Score

Before proving the t test, the researcher conducted a normality test. The normality test is used to find out whether the data has been normally distributed or not.

Analysis of normality test data was calculated using Microsoft Excel with the Kolmogorov Smirnov formula. The following is the result of the calculation of the pretest and posttest data normality test for class VIII SMP N 2 Kejajar students.

Table 2. Pretest and Post-test Normality Test Results

Data	D Table	D max	Information
Pretest	0,2340710	0,318	Normal
Postest	0,139946	0,318	Normal

Based on the table above, the values from the pretest and posttest results show that Dmax < Dtable, it is stated that the pretest and posttest results of students are normally distributed.

Furthermore, a homogeneity test is carried out, a homogeneity test is used to find out whether the data is homogeneous or not. The calculation of the pretest and posttest homogeneity tests can be seen in the following table.

Table 3. Pretest and Posttest Homogeneity Tests

F count	F table	Decision	Criteria
1,351275	2,333484	FCount < Ftable	Homogene-ous

The calculation of the pretest and posttest data values obtained Fcount results of 1.351275 while the Ftable was 2.333484. The magnitude of Fcount is smaller than Ftable, so it can be said to be homogeneous. From the results of the calculations and explanations above, the data for the pretest and posttest results are normal and homogeneous.

Then, based on the results of limited interviews with students, many students who previously complained about learning the material of light and optical instruments, which were so complicated, now find it easier to understand the material by using the local tourism-based learning module developed by the researcher. According to students, this is because the module presents material well, which is integrated with local tourism around students, making it easier for students to observe and analyze material and concepts to improve their mastery of concepts.

It is proven by the other research where this research shows that modules that are integrated with local wisdom are very effectively used in learning and make learning more meaningful (Putri & Ananda, 2020). Research from Firdaus (2018) regarding the development of teaching aids based on local potential. These media can increase students' motivation, understanding, and active engagement in the classroom.

CONCLUSION

Based on the results of the research that researchers have carried out, it can be concluded that the Science Module Based on Local Travel Wonosobo Color Lake on Light and Optical Instruments material that has been developed by researchers is suitable for use in learning activities. This eligibility is based on a validation test by material experts with a percentage of 77.6% and media experts with 82.6% or overall a percentage of 80.1%. These results are included in the "decent" category.

Then for the practicality value of the module to be used in learning activities. This practicality is based on practicality tests by users (students), getting an average score of 4.39 with a percentage of 87.82%, which is included in the "very practical" category.

Based on its effectiveness, the module is effective in increasing students' mastery of concepts. It is based on the pretest and posttest values analyzed using the t-test. The results of the t-test analysis produce a t count

of -6.005, with a t count <t table. It means t counts entering the acceptance area Ha, which means there are differences between the experiment and control group in students' mastery of concepts. In addition, an increase in posttest scores indicates an increase in students' mastery of concepts.

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