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Learning Module Development on the Nyale Worm Biology for Highschool Students and Teachers

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Abstract: Despite a long tradition of harvesting nyale in southern coast of Lombok island teacher's understanding on the animal producing nyale are very low. This study aimed to develop a learning module of nyale worm biology for teachers and students. The developmental research method was adapted from the Borg and Gall model which includes 10 steps. Data on module feasibility were collected through a process of validation of the learning module. Questionnaires on the student's and teacher's responses to the learning module were administered to assess module practicability. The data were analyzed using descriptive statistics. The results showed that the feasibility of the subject material was 85.90%, the media feasibility was 81.71%, and the user test was 81.09%. The learning module of nyale worm biology is very valid, effective, and practical as a supporting book for learning biology at high schools

Keywords: Learning module; Nyale worm biology; Teachers and students

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Introduction

Nyale worms are a major component of the Lombok 'Bau Nyale' tradition that has been going on for hundreds or thousands of years. Every year, the people of Lombok go to a number of beaches on the south coast to catch nyale (Bau Nyale). Nyale worms are Eunicidae (Polychaeta) worms that produce nyale (epitoke) (Jekti et al., 1993; Bachtiar and Bachtiar 2019). Nyale is the posterior of the worm's body that has a special function for reproduction, which is released into the water for external fertilization. Excessive catching of nyale worms will reduce the rate of fertilization and recruitment of nyale worms, which in the long run threatens the sustainability of the nyale worm population. The preservation of the Bau Nyale culture will depend on the preservation of the nyale worms. The Bau Nyale tradition cannot be carried out if there is no nyale available in the sea, so that people can lose local wisdom that has been around for hundreds of years.

The magnitude of the potential threat to the sustainability of the nyale worms which are the tourism mascots requires a management plan to save the nyale worms which have become cultural and economic assets of Central Lombok Regency. Nyale harvesting during Bau Nyale is thought to have exceeded the sustainable catch limit, although the available data are not sufficient to draw firm conclusions. At the 2016 Nyale Bau event, the results of the census of people leaving the beach in the morning were recorded at around 27,000 people and the highest estimate of Nyale catch on that day was 1.3 tons (Bachtiar et al., 2016). The construction of tourism facilities in the Special Economic Zone (SEZ) of the Mandalika Resort also has the potential to disrupt the habitat of nyale worms. Global threats from warming sea water temperatures are also considerably increasingly coming to Lombok waters (Bachtiar & Hadi, 2019). Therefore, the preparation of a management plan is an urgent need before we lose the nyale worm community, the nyale odor culture and the iconic cultural tourism icon.

The high economic and cultural values of nyale worms to the people of Lombok are not in balance with their understanding on the biology of nyale worms.

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Bachtiar et *al.* (2022) reported that the understanding of junior high school science teachers and high school biology teachers about nyale worm biology is very low. In fact, nyale worms have received attention from researchers in the early 1990s. Jekti et *al.* (1993) investigated the spesies of worms that produce swarming nyale. Previously, Sumarjan et *al.* (1992) identified the nyale worms that came out during Bau Nyale, although it turned out that the intact worm bodies he identified were not referred to as nyale by the Lombok people. Three decades later, there was no more studies on nyale worms. Recently, Bachtiar & Bachtiar (2019) and Bachtiar & Odani (2021) introduced a scientific prediction method for the peak date of nyale swarming. The last four sources of information about the nyale worms were never been accessed by the teachers. There are also six articles about nyale worms in the local newspapers, Lombok Post and Suara NTB, but did not get the teachers' attention. There are virtually no other sources of information available online or in-printed regarding nyale worms in 2020. For this reason, it is crucially important to develop the nyale worm biology learning module as complimentaryinformation material in biology learning at school.

This study aimed to develop a biology learning module on nyaleworms which can be used as additional information in teaching biology at schools. This research is also an effort to prepare materials for learning based on local cultural values which will have an impact on the sustainable use of nyale worms and increase the economic value of Bau Nyale cultural tourism

Method

This study is a research and development (R&D) type. The research and development method is the method used to design, producing and testing the effectiveness of a particular product (Purnama, 2016). The development model was adapted from the Borg and Gall (1989) model which includes 10 steps, namely: (1) Research and Information collection, (2) Planning, (3) Develop Preliminary form of Product, (4) Preliminary Field Testing, (5) Main Product Revision, (6) Main Field Testing, (7) Operational Product Revision, (8) Operational Field Testing, (9) Final Product Revision, and (10) Dissemination and Implementation. However, the research was only carried out until the *Operational Field Testing* stage.

Need analysis study was carried out using a questionnaire to obtain initial information related to the availability of printed and written information on the biology of nyale worms for teachers, teachers' preference in learning of nyale worm, and existing teachers' understanding of the biology of nyale worms, as well as the teacher's response on the need of having the nyale worm module. Assessment of the effectiveness of the nyale worm biology module was measured using a validation questionnaire sheet on material and media aspects by the appointed validators. As for assessing the practicality of the learning module, a field test of the main product on a small and wide scales (audience test) was conducted on biology students and teachers in the high-schools of the Central Lombok.

The material validation data and media validation obtained were then classified into effectiveness categories of the learning module referring to Akbar (2015) with the criteria presented in Table 1.

Table 1. Category of Learning Module Effectiveness

Achievement Criteria Score (%)	Effectiveness Level
80.00-100.00	Very valid, very effective, and used without repair
61.00-80.00	Fairly valid, moderately effective and usable but needs minor improvements
41.00-60.00	Invalid, less effective, and in need of major repairs, it is recommended not to use it
21.00-40.00	Invalid, ineffective, and unusable
00.00-20.00	Totally invalid, utterly ineffective, and utterly unusable

Result and Discussion

The *Research and Information Collection* stage (research and data collection) contains needs analysis activities carried out through literature studies to obtain reasons for the need to develop a biology module for nyale worms. At this stage, a survey was carried out to prospective users, namely biology teachers as many as 37 teachers obtained through a university-alumni networking. The results revealed that teachers' initial knowledge regarding nyale worm material was still very low. The average teachers' score was 4,75 (four point seven five) in the scale of 10. The teacher's low understanding of the biology of nyale worms was due to the unavailability of adequate information related to the biology of nyale worms. As many as 100% of teachers never read about nyale worms from books and modules. The questionaires also found that 95% of teachers never read about nyale worms from scientific articles or newspapers and only 5% of teachers obtained information on nyale worms from articles and newspapers. So based on the needs analysis, it is necessary to develop a valid, practical and effective module as a learning source of the biology of nyale worms.

Planning (planning). Planning was done to determine the design of learning materials to be developed. In planning activities, an analysis of core competencies (KI) and basic competencies was carried out in the 2013 curriculum for high school level. Based

on the results of the analysis of the concept of nyale worms in the 2013 curriculum, there are basic competencies 3.9 which states "Grouping animals into phyla based on body layers, body cavity symmetry, and reproduction." triploblastic), body symmetry, body cavity, and reproduction. The nyale worm material which is related to basic competence consists of four subjects, namely: (1) morphology (classification), (2) anatomy (physiology), (3) reproduction (life cycle), and (4) ecology (habitat).

Develop Preliminary Form of Product (development of initial product draft). At this stage, the drafting is carried out. Based on the predetermined topics, namely morphology (classification), anatomy (physiology), reproduction (life cycle), and ecology (habitat). Each subject contains: learning objectives, learning materials, student activity sheets, and evaluation tools. The amount of material from each subject in the range of 13 to 20 pages, which includes practice questions and student activity sheets. In addition, questions are also designed for placement test purposes which will be used at the feasibility test stage. Before the questions were used, construct validation was carried out by expert validators covering aspects of content, construction aspects, language aspects, and time allocation. Based on the results of the validation of the questions obtained a value of 91.60% which means the questions are valid in construction.

The next stage is *Preliminary Field Testing* (initial field trials). Initial field trials of the module. Suggestions and input for the module were discussed through Zoom meetings. Some of the inputs and suggestions given by the teacher were related to the pictures. Illustration images presented were considered not similar to the real animals, the sentences used were not simple and there were a number of technical terms that were difficult for students and teachers, as well as the evaluation instruments used in the module. In addition, at this stage, module validation is also carried out by two experts, namely material and media experts. Material expert validation includes content feasibility, image feasibility, and presentation feasibility. Media expert validation includes cover size, module cover design, and module content design. In the initial validation of the initial product, input or suggestions were obtained from the validator. The inputs from the validator include those related to the essence and bibliography, the naming of the evaluation tool is replaced with practice questions, only one correct answer is included in the question, as well as correction of sentence formulation and typing errors. While input from media validation suggested to make the frame on the image more varied and the image on the cover be made more symmetrical. The media expert validator does not comment on the image illustrations in the module, which means that all the image illustrations in the module are important and interesting to the reader.

The results of the initial field trials are then revised at the *Main Product Revision* stage (revision of the product of the trial results). Based on input from the validator, the module is made into 2 (two) modules, namely a module for teachers and a module for students, both modules have the same characteristics that differ only in the number of subjects in each module. The module for teachers consists of four subjects, namely: morphology (classification), anatomy (physiology), reproduction (life cycle), and ecology (habitat), while the module for students consists of three chapters, namely: morphology (classification), reproduction (life cycle), and ecology (habitat). So that all assessments for validity and practicality apply to both modules.

After making improvements, this first revised module was reassessed by material expert validators and media expert validators. The module assessment by experts aims to determine the level of validity of the revised module. Assessment for material experts includes aspects of content feasibility, presentation feasibility, and language. Meanwhile, the media expert's assessment covers aspects of module size, module cover design, and module content design. The final result of expert validation is presented in Table 2.

Table 2. Validation Results of the Learning Module on the Biology of Nyale Worms

Validator	Aspect of Validation	Results (%)	Interpretation
Material Expert	Content eligibility	88.64	Very valid
	Serving eligibility	84.37	Very valid
	Language aspect	91.67	Very valid
Media Expert	Module size	75.00	Quite valid
	Module cover design	96.83	Very valid
	Module content design	83.30	Very valid
	Material expert validation average	85.90	Very valid
	Media experts' validation average	81.71	Very valid

Table 2. shows that the average validation of material experts is 85.90% and the average validation of media experts is 81.71%. This value is included in the very valid category. Thus, the nyale worm learning module has met the requirements to be tested on students.

Setiyadi et *al*. (2017) explained that the learning module can be said to be valid if all validators state that it is valid. This is reinforced by the results of research conducted by Sawitri et *al*. (2014) which states that the learning module is said to be feasible and of good quality if it has reached the standard of validity assessed by experts and experts. Furthermore, Hala et *al*. (2015) also

explained that validation has met the criteria of validity if in this case the instrument developed has been based on a strong theoretical rational study and has internal consistency.

Main Field Testing stage (main product field test). The main product field test was carried out on five Biology teachers in Central Lombok, to see the practicality of the module. The results of the product trial show that the nyale worm learning module has a very good score, which is an average of 84.02% (Table 3). The practicality test was not given to students because according to the researchers they did not have enough ability to assess the quality of learning modules.

Operational Product Revision stage (implementation of product revision). Because at the initial product trial stage on a small scale there was no input, the next stage the research team conducted a trial on a wider scale to find out whether the small scale trial got the same results as the large scale trial. In the next stage, we do not only look at the level of practicality of the module but also the level of effectiveness of the module by giving pretest and posttest questions to students.

The next stage is *Operational Field Testing* (implementation of large-scale field trials). At this stage a trial was conducted to obtain information on the practicality and effectiveness of the module on a wider scale. The test results are then used as an indicator of the practicality and effectiveness of the nyale worm module. A wide-scale trial was conducted on 200 students and 21 teachers from high schools in District of Lombok Tengah. The teacher's response to the evaluation of the biology module of nyale worms can be seen in Table 3.

Table 3. Results of the Board Scale Product Trials

Assessment Aspect	Results (%)	Interpretation
Physical aspect	83.00	Very Practical
Introductory Aspect	82.90	Very Practical
Content aspect	84.60	Very Practical
Aspects of the task	83.00	Very Practical
Summary aspect	76.00	Practical enough
Average	81.09	Very Practical

Table 3. shows that the average aspects of assessing the practicality of the module which include the physical, introduction, content, task and summary aspects are 81.09%. This value is included in the very practical category, which means the module is very practical to implement. Yogica et *al*. (2014) explained that practical modules can make it easier for teachers to deliver learning materials to students in accordance with biological concepts.

Implementation of the learning module could be more difficult than its development. Firstly, many studies revealed that both students' and teachers' reading habits are generally low. Reading for leisure is not popular among university students (Bachtiar, 2020), and recreational reading is very important to improve reading comprehension (Rogiers et al., 2020). The reading habit will be the most challenging situation. How can we make students and teachers voluntarily read the nyale worm module with pleasure? Obligatory reading may be a solution but voluntarily reading from curiosity is a very much better motivation. Secondly, many people including teachers do not want to get out from their comfort zone (Palmer et al. 2018; Yucel & Bos, 2015). Starting to implement the learning module is something new beyond teachers' formal obligation. There are many examples that teachers do not want to change their teaching-style with a better one because it is not obligatory, for example introduction to inquirybased teaching (Akuma et al. 2019).

External motivation is therefore needed to implement the learning module of nyale worm biology. Local government, particularly in the District of Lombok Tengah, should encourage teachers to use the module for their biology teachings. Even better if the government makes it as teachers' obligation to teach students about nyale worms biology. The students also need the external motivation. When teachers put nyale worms on the semester test, students will learn nyale worms biology. As there are no other learning sources on the nyale worm biology, teachers and students will use the learning module.

Conclusion

The present study suggests that the learning module of nyale worm biology can be used for complimentary learning source in high school. The learning module demonstrate its validity in both content and media assessments. The learning module is also practical to be uses in high school both for students and teachers. Implementation of the learning module in schools needs external motivation for both teachers and students. Local government should encourage teachers to teach about nyale worm biology to the students.

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