Development of Local Potential-Based Ecosystem Modules in Grobogan Regency to Improve Students' Critical Thinking Ability

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Article Info	Abstract
	The local potential of Grobogan Regency is very diverse, which has the potential as a learning resource that can be integrated into learning biology on ecosystem material to improve students' critical thinking skills needed in the 21st century. Critical thinking enables students to apply decision-making abilities and solve problems in everyday life. day. This study aims to produce a module based on local potential in the Grobogan Regency that is feasible based on the validity, readability, and practicality of the module, and effectiveness to improve critical thinking skills. To develop critical thinking skills these students must obtain teaching materials that facilitate these skills. This research is a research and development (R&D) and one-group pretest-posttest research design. The research instruments were expert validation questionnaires by expert validators and teachers, and module readability and practicality questionnaires by teachers and students, effectiveness was measured from the results of the pretest and posttest conducted on students before and after using the module. Data were analyzed by descriptive quantitative. Based on the results of the validation test for ecosystem modules based on local potential, a score percentage of 85.58% was obtained, including the very valid category. The results of readability and practicality using local potential-based ecosystem modules obtained a score of 80.75% including the good category and 80.41% including the practical category. The N-gain results show an average of 0.62 in the medium category. Based on the results of the development of ecosystem modules based on local potential, Grobogan Regency was declared feasible based on validity, readability and practicality, and effectiveness as teaching materials.

INTRODUCTION

Grobogan Regency is one of the areas in Central Java where the district capital is Purwodadi. Its unique geographical location and good natural resource potential make Grobogan one of the regencies that have various tourism sectors. Nature tourism in Grobogan Regency is diverse, such as Bledug Kuwu, Mrapen Eternal Flame, Kedungombo Dam, and so on. The existence of these various natural resources causes the existing ecosystem in the Grobogan area to be relatively tall and attractive, thus having the potential to be utilized as a source of learning. The potential of local natural resources found in Grobogan Regency can be used as a source of learning for students of various levels of education. Learning resources are everything that supports the teaching and learning process including learning materials (Prastowo, 2011). Learning resources must be arranged according to the needs of their users, namely the user's geography, ethnology, and local regional potential (Yani et al., 2021). The use of relevant learning resources is expected to be able to support the achievement of learning objectives properly.

The potential and local wisdom of the area can be integrated into learning biology and embodied in the form of teaching materials, to create contextual learning (Jayanti et al., 2017). Examples of teaching materials that can be developed by integrating contextual local potential are modules. The local potential-based module is a teaching material in which material is presented about ecosystems and relates to the potential of local natural resources in the Grobogan Regency area. So that the material presented is contextual and it is hoped that learning will be more meaningful and can improve critical thinking skills.

Critical thinking skills are urgently needed in developments in the world of education and the workforce in the 21st century (Elisanti et al., 2018). The learning process in the 21st century should be more than just memorizing facts and understanding general concepts of subject matter as happened in the era of industrial development in Indonesia (Ramandha et al., 2018). The results of the 2015 PISA (Program for International Student Assessment) show that the average PISA score of Indonesians ranks 62 out of 70 countries (Irwan et al., 2019).

Based on the results of preliminary observation studies in the field, students agree that learning will be easy to understand if the material presented is related to the surrounding environment. In addition, students felt that their knowledge of the various local potentials of Grobogan Regency related to ecosystems was not good, as seen from the results of the questionnaire. Thus, there is a need for learning that provides information about the potentials and problems that exist in Grobogan Regency with ecosystem material.

Based on this description, it is necessary to conduct research on the development of ecosystem modules based on local potential in Grobogan Regency. This research is expected to produce a teaching material that is appropriate for use in learning biology and is effective for improving students' critical thinking skills.

METHODS

This research is an R&D (Research and Development) research, which is a research method used to produce certain products. This study used the pre-experimental method, namely the one-group pretest-posttest design (Sugiyono, 2017). The product developed is in the form of module teaching materials based on local potential in Grobogan Regency in Biology lessons. The research subjects consisted of one material expert lecturer, one media expert lecturer, one practitioner (biology teacher), and 104 class X MA Nuril Huda students. The research instruments used were expert validation questionnaires, readability and practicality questionnaires, and 20 critical thinking skills test questions. According to Ennis, the critical thinking aspects used in this study are (1) providing simple explanations; (2) building basic skills; (3) concluding; (4) further clarification; (5) setting strategy and tactics according to Ennis in Nejmaoui (2018).

At the design stage, the aim is to design an ecosystem module consisting of a front cover, preface, module characteristics, table of contents, instructions for use, learning outcomes, material maps, introduction, material/content, worksheet/exploration, practice questions, independent assignments, reflections, glossary, bibliography, and author biography. At the development stage, it aims to produce ecosystem

modules based on local potential in Grobogan Regency which are valid and practical to use in learning. This stage includes: (a) the validity test aims to reveal the level of validity of the developed Grobogan Regency local potential-based ecosystem module; (b) revision to improve the part of the ecosystem module based on local potential in Grobogan Regency which was deemed inappropriate by the validator before the product was tested; (c) the trial aims to determine the legibility and practicality of the Grobogan District-based local potential-based ecosystem module being developed. This research was only carried out until the development stage due to time constraints.

RESULTS AND DISCUSSION

The research that has been developed produces a product in the form of an ecosystem module based on local potential in Grobogan Regency to improve students' critical thinking skills. The developed module has different characteristics from other teaching materials. The modules are arranged based on the results of an analysis of the needs of teachers and students, with the contents of the material coming from exploration results. The module design is made attractive to increase student motivation and interest in learning. The local potential-based ecosystem module consists of several components, namely an introductory section consisting of the front cover, preface, module characteristics, table of contents, instructions for using the module, material map and introduction. The material section consists of learning activities 1, appreciation, keywords, bio info, LKPD/exploration, practice questions, independent assignments, assessment, reflection. The closing section contains a glossary, bibliography, author biography and back cover. The resulting module is a learning media found in Grobogan Regency in printed form. In the developed module there are 2 main topics, namely ecosystem components and energy flow in ecosystems. The following shows the layout and design of the local potential-based ecosystem modules developed:
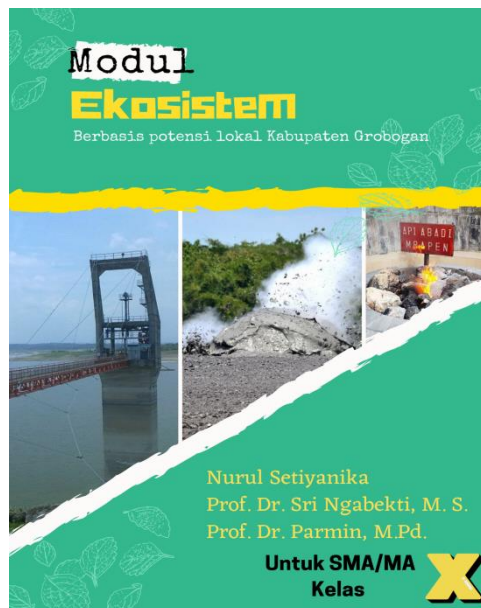

Figure 1. Front cover view

Figure 2. Back cover view

This study uses assessments namely validation, readability and practicality, effectiveness to determine the feasibility of local potential-based ecosystem modules in Grobogan Regency to improve the critical thinking skills of class X SMA/MA students that can be used in learning.

1) Validation of ecosystem modules based on local potential in Grobogan Regency

This learning media goes through a validation test process by several validators before being used as a learning resource in learning. The calculation of media results consists of 2 aspects, namely material, and media, which can be seen in Table 1 as follows:

Table 1. Module validation results

Aspect	Validator	Percentage (%)	Category
Material	Material expert	79.65	Valid
	Practitioner	79.16	Valid
	Average	79.40	Valid
Media	Media expert	95.45	Very valid
	Practitioner	88.07	Very valid
	Average	91.76	Very valid

Based on Table 1, it is known that the material aspect by the material expert validator and practitioners obtained an average percentage of 79.40% with a valid category so that the module in the material aspect is feasible to use. These results indicate that the module has completeness, straightforwardness, and depth of contents/materials and activities that are relevant to the Learning Outcomes (CP). The materials and activities in the module can encourage students' critical thinking skills through materials, questions, and discussion activities. Media experts and practitioners also consider that the language used in the communicative module is coherent. The material taught is by the real situation of students through learning based on local potential.

Based on Table 1 it is known that media experts and practitioners obtained an average percentage of 91.76% with a very valid category, so that the module in the media aspect is feasible to use. These results indicate that the size of the module has followed the ISO standard for books, namely A4 with a size of 210 x 297. The font used on the cover of the module is attractive, easy to read, and reflects the contents of the module. Expert validators and practitioners also assess the consistent placement of layout elements (titles, subtitles) and conformity in shape, color, and size. Typography in simple modules, easy to read and easy for students to understand. Appropriate display of material can generate student interest, and systematic consistency in the presentation of the module is by the principles of introduction, content, and closing.

2) Legibility and practicality of the ecosystem module based on local potential in Grobogan Regency

The (limited) readability test aims to determine the responses of teachers and students which are used as a benchmark for the quality of the modules being developed. The teaching material products along with the readability assessment

questionnaire were given to 15 students of class XI MIPA to determine the level of readability. While practicality is done by giving a questionnaire to the teacher and all class X which consists of 104 to find out the level of practicality of the module. The results of the readability assessment can be seen in Table 2 as follows:

Table 2. The results of the module readability analysis

Practitioner	Percentage (%)	Category
Teacher	79.17	Good
Student	82.33	Very good
Average	80.75	Good

Based on Table 2, the results of readability assessed by teachers and students have an average percentage of 80.75% with good criteria. From the average results of the readability assessment by teachers and students on all aspects of the readability assessment, it is said that the local potential-based ecosystem module in Grobogan Regency is feasible to be used as a student learning resource. This is because the material and pictures and illustrations in the module teaching materials are made attractive with a consistent layout and supported by a design appearance that makes students interested in reading the module so that students are interested in participating in learning. The results of the practicality of the module can be seen in Table 3 as follows:

Table 3. Result of the practicality analysis of the module

Practitioner	Percentage (%)	Category
Teacher	80.56	Practical
Student	80.27	Practical
Average	80.41	Practical

Based on Table 3, the results of practicality assessed by teachers and students have an average

percentage of 80.41% with practical criteria. From the results of the average practicality assessment by teachers and students on all aspects of practicality assessment, it can be said that the ecosystem module based on local potential in Grobogan Regency is practical for use in learning. This is because the module teaching materials are easy to understand, and related to everyday life and students feel enthusiastic about learning.

3) The effectiveness of the local potential-based ecosystem module in Grobogan Regency

After the development product is produced in the form of an ecosystem module based on local potential in Grobogan Regency and has been validated by expert validators and teachers, then the module is applied to learning. To find out the effectiveness of using local potential-based modules on students' critical thinking skills can be known through the pretest-posttest. Research on the effectiveness of the use of local potential-based ecosystem module teaching materials developed on students' critical thinking skills was measured based on the increase in pretest and posttest scores which were analyzed using the N-gain index. The results of the N-gain test are presented in Table 4 as follows:

Table 4 Student's N-gain test results

Class	Category N-gain(%)			Average	Criteria
	High	Medium	Low		
X.2	34.28	60	5.71	0.63	Medium
X.3	31.42	57.14	11.42	0.58	Medium
X.4	32.35	67.64	0	0.65	Medium
Average	36.68	61.59	5.71	0.62	Medium

Based on Table 4, shows that the increase in learning outcomes (N-gain) obtained an average of 0.62 with moderate criteria, so the teaching materials for modules based on local potential can be said to be effectively used in learning activities. This is in line with the results of research (Utami & Aznam, 2020; Siburian et al., 2019) which explains that integrated learning with local potential can improve students' critical thinking skills and understanding of concepts (Lidi, 2019). The learning outcomes of students' critical thinking skills using module teaching materials based on local potential in Grobogan Regency were obtained from the pretest and posttest scores. The results of the N-gain test for each aspect of critical thinking skills can be seen in Figure 3 as follows:
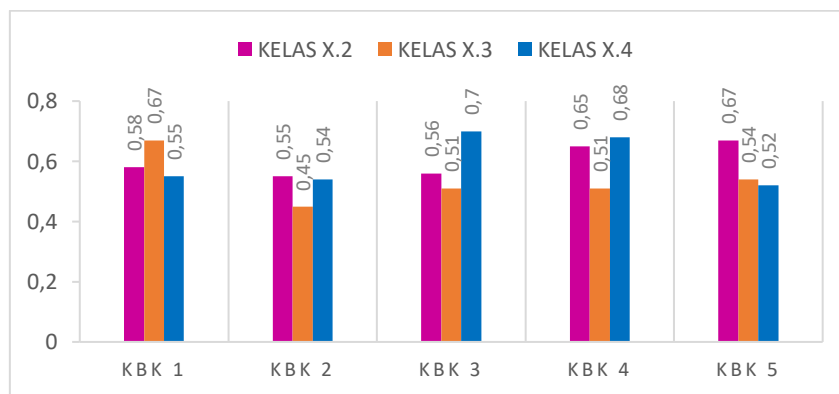

Figure 3. Graph of the N-gain test results

Based on the research results, the ecosystem module based on local potential in Grobogan Regency can improve students' critical thinking skills. Posttest average scores from class X.2, X.3 and X.4 for each aspect of critical thinking indicators namely providing simple explanations, building basic skills, concluding, further clarification and organizing strategies and tactics have been achieved. This is in line with the results of research (Rosvita et al., 2020) learning by using contextual-based teaching materials can train students' critical thinking skills very well. Learning with ecosystem

module teaching materials based on local potential in Grobogan Regency which is contextual and factual can provide benefits for students to see first-hand examples related to ecosystem material. This is in line with the opinion (Kahar & Fadhilah, 2019) which states that by observing directly students will have the opportunity to make connections between theory and reality.

In class X.2 the highest N-gain value is in the KBK 5 aspect (setting strategy and tactics). This aspect is related to the ability of students to determine an action to solve the problem. Learning by using local potential-based ecosystem modules can facilitate students to determine actions during observation activities or after observations contained in LKPD/exploration. Discussion activities when working on LKPD are a way to train critical thinking skills, because in discussion activities there is an exchange of opinions between students. In the process of exchanging opinions, students consider, reject or accept their own opinions or the opinions of others so that they are in accordance with the opinions of the group and through discussion students can reduce disagreements between themselves and other students (Arfianawati et al., 2016). These activities help students build the meaning of a concept that is useful for the development of critical thinking skills. While the lowest N-gain value is on the KBK 2 aspect (building basic skills). The ability to build basic skills that is the lowest compared to other aspects of CBC can be caused by students not reading the information presented in the questions carefully and students are used to learning by receiving information from the teacher. students do not master relevant information related to the problem, meaning that students do not master the concept correctly.

In class X.3 the highest N-gain value is the aspect of KBK 1 (giving a simple explanation). The results of this increase were due to the use of module teaching materials based on local potential in Grobogan Regency to explore students' ideas and beliefs through questions contained in apperception and discussion activities. The skill of making simple explanations is a basic skill for students to be able to think critically (Sundari et al., 2018). This skill is related to the ability of how students focus their minds on a problem and efforts to solve it. This is supported by the results of research (Luzyawati,

2018) which explains that students can provide explanations of the facts obtained from the results of analyzing information or images and discussing through questions and answers according to the concepts being studied. While the lowest N-gain value is the KBK 2 aspect (building basic skills). This can be caused because students are not used to learning based on local potential, so the aspect of building basic skills is the lowest compared to other KBK aspects. This is supported by research (Primayana et al., 2019) explaining that through the application of an environment-based contextual learning model students indirectly provide meaning for students, besides that students are also able to relate the material studied to real-world conditions and motivate making connections between knowledge and its application in life.

In class X.4 the highest N-gain value is the KBK 3 aspect (concludes). Questions in the discussion material contained in the LKPD involve critical thinking skills so that students feel challenged and practice their ability to determine an action to conclude. Learning uses problems in everyday life to be identified and solved because this learning encourages students to discuss and provides opportunities for opinions to conclude the results of the discussion (Suhita, 2019). While the lowest N-gain value is the KBK 5 aspect (setting strategy and tactics). Obtaining the lowest gain value compared to other aspects is because students are not used to exploring the surrounding environment and learning that links local potential with learning materials. This is supported by research results (A'yun et al., 2020) which explain that students' abilities to observe the application of a concept and formulate alternative solutions still need to be trained in learning.

Local potential-based module teaching materials are closely related to everyday life, thus helping students to understand ecosystem material. The results of this study indicate that the use of local potential knowledge in learning is necessary. This is in line with research results (Anisa, 2017) which show that local potential-based learning can improve critical thinking skills.

The development of modules based on local potential is one of the innovations that contains ecosystem material and is linked to the potential of local natural resources in the Grobogan Regency. The existence of the module wants the reader to be

able to absorb the material presented independently (Daryanto, 2013). This independence is intended so that students have the responsibility to regulate and discipline themselves and develop learning abilities. Students are invited to take more initiative in carrying out learning activities. Even though they study independently, students can still discuss with their group mates to find various learning resources to solve the problems they face. When learning with a module system is applied to classical learning, students will learn at the same time. That way, to proceed to the next module can also be done simultaneously.

CONCLUSION

The conclusion based on the research that has been done is that this research produces an ecosystem module based on local potential in Grobogan Regency to improve the critical thinking skills of class X SMA/MA students that are feasible to apply in learning biology. Teaching materials have readability with good criteria and a level of practicality that is practical to use. This shows that the module teaching materials are easy to read and understand by students. Based on the results of the pretest and posttest by applying the developed ecosystem module based on local potential in Grobogan Regency, it has been effectively used in learning to improve students' critical thinking skills.

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