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High School Students' Critical Thinking Skills through the Development of a Popular Book on Coastal Biology

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Abstract

The introduction of the potential of coastal biology as a local treasure is important for the general public and students. This study aims to describe the critical thinking skills of high school students through the development of a popular book on coastal biology. This study focuses on small group testing of the Tessmer development research design. The popular book on coastal biology was implemented at Abdul Kadir High School Penyipatan District Tanah Laut Regency, South Kalimantan Province. The research subjects were three students of grade XII. Critical thinking skills are divided into several aspects according to Facione. The instrument used is student worksheet based on popular books on coastal biology. Data is calculated based on weight, then expressed as percent (%) according to the terms of 76-100% (very good), 51-75% (good), 26-50% (quite), <25% (less). The results showed that five aspects of students' critical thinking skills including interpretation, analysis, evaluation, inference, and self-regulation were in good category, and the skills of doing analysis had increased. On the other hand, the skill of explaining has not shown any improvement.

Abstrak

Pengenalan potensi biologi pesisir sebagai kekayaan lokal penting bagi masyarakat umum dan siswa. Penelitian ini bertujuan untuk mende*Skripsi*kan keterampilan berpikir kritis siswa SMA melalui pengembangan buku popular biologi pesisir. Penelitian ini fokus pada uji kelompok kecil dari desain penelitian pengembangan Tessmer. Buku populer biologi pesisir diimplementasikan di SMA Abdul Kadir Kecamatan Penyipatan Kabupaten Tanah Laut, Provinsi Kalimantan Selatan. Subjek penelitian adalah tiga orang siswa kelas XII. Keterampilan berpikir kritis dibagi dalam beberapa aspek menurut Facione. Instrumen yang digunakan berupa LKPD berdasarkan buku popular biologi pesisir. Data dihitung berdasarkan bobot, kemudian dinyatakan dengan persen (%) sesuai dengan ketentuan 76-100% (baik sekali), 51-75% (baik), 26-50% (cukup), <25% (kurang). Hasil penelitian menunjukkan lima aspek keterampilan berpikir kritis siswa meliputi interpretasi, analisis, evaluasi, inferensi, dan pengaturan diri memperoleh kategori baik, dan keterampilan melakukan analisis mengalami peningkatan. Sebaliknya, keterampilan melakukan eksplanasi belum menunjukkan perbaikan.

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A. Introduction

The interaction between the environment and living things is studied in one branch of biology, namely ecology. According to Barbour *et al*. (1987) studying ecology requires good mastery in the fields of physiology, climatology, zoology, soil science, physics, chemistry and other fields of science so that ecology can be fully understood. To facilitate the development of scientific attitudes by integrating local wisdom values into ecological materials, adequate learning resources are needed, one of which is popular books.

Popular scientific books or popular science books make it easy to introduce local wisdom to the public. Learning based on the culture and local wisdom of an area is a local context that can be developed in an integrated manner in the teaching and learning process. On a micro scale, the steps taken are to improve environmental literacy as part of scientific and technological literacy. However, the availability of information sources for students is still limited, even learning resources that are specific in certain areas. One of the potentials that might provide scientific literacy for students is the potential of coastal biology.

Lambung Mangkurat University is one of the universities with local wisdom of coastal biology. This is in accordance with the 2016-2020 Lambung Mangkurat University research master plans which set the 2015-2019 achievements of the availability of superior resources in the field of coastal biology. One of the strategies adopted is to direct the research topic to coastal biology. Exploring the potential of coastal biology by inviting local resources is expected to contribute to master plan.

Environmental education programs must have goals related to creating awareness, accumulation of knowledge, positive attitudes, problem solving skills and community participation (Singh and Rahman, 2012). If the acquisition of knowledge and skills is designed by teaching, thinking skills can be accommodated. Critical thinking skills, creative thinking, and higher order thinking, all three are means to improve thinking skills.

The 21st century is said to be the "Era of Human Capital" which is an era in which science and technology, especially communication technology is growing very rapidly, especially in the field of education. The skills needed in this century, namely critical thinking skills, interpersonal skills and intrapersonal skills. In developing learning in this century, educators must start one step of change, namely changing the traditional teacher-centered learning pattern into a student-centered learning pattern (Pratiwi *et al*., 2019).

Research on coastal biology has been previously reported. Ripani (2014) stated that 1) students' knowledge about mangrove conservation is very satisfactory; 2) student performance is also very satisfying, including making wall magazines, leaflets, banners and food/drinks made from mangroves. Zaini *et al*. (2010) reported 1) student activity in learning in the environment in various geographical conditions is quite high, 2) teacher activity in managing learning in various environmental conditions is still dominant, 3) student learning outcomes in various learning environments show significant, meaning that the use of PBM and environmental approach in learning has an effect on student learning outcomes. 4) the results during the learning process in various learning environments are quite good. 5) a prototype of a practical green school learning model is used which covers three geographical areas, namely swamp areas (waters), mountainous areas (hills), and transitional areas.

Zaini and Asnida (2015) explain that learning in a natural environment using an environmental approach plays an important role in learning a biological concept because it can motivate students to teach biological concepts and thinking skills. Another activity is a scientific meeting on the potential of coastal biology (Zaini, 2010; Zaini, 2014). All of these activities are packaged in the form of development research (Zaini, 2016) which can be viewed from two sides, namely developing the potential of human resources (students) and exploring the potential of coastal biology.

Based on the research that has been done previously, it is felt that there is still a research opportunity, namely a book by compiling all research supplements. This supplement is packaged in a popular book on coastal biology. When this book was used, one of the things that was learned and became the focus of research was that users were led to express their critical thinking skills guided by student worksheet. On this basis, the research question is raised, how are high school students' critical thinking skills through the development of popular books on coastal biology?

B. Materials and Method

This study focuses on the small group evaluation stage of development research based on the Tessmer model. The research was conducted for 13 months (November 2019-November 2020). The development of a popular book on coastal biology was carried out at Abdul Kadir High School Penyipatan District Tanah Laut Regency, South Kalimantan Province. The research subjects were

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small groups of three students of grade XII SMA Abdul Kadir.

Critical thinking skills are divided into several aspects referring to Facione (2010). The instrument used is student worksheet based on popular books on coastal biology. Data collected from student worksheet answers were given weights, then the results obtained were expressed as % with the terms Very Good (76-100%), Good (51-75%), Quite (26-50%), Less (< 25%).

C. Results and Discussions

Critical thinking skills obtained from students' answers to student worksheet assignments are presented in Table 1.

Table 1 Summary of Students' Critical Thinking Skill Results

Aspecs of Critical Thinking	Maks. Score	I		II		III		IV		V	
		Rt	%	Rt	%	Rt	%	Rt	%	Rt	%
Interpretation	15	12	80	9,33	77,8	7,33	48,9	12,66	84,4	10	66,7
Analysis	15	7,33	48,9	7,33	48,9	11,33	75,5	11,33	75,5	8,66	57,7
Evaluation	15	8,66	57,7	12,66	84,4	11,33	75,5	9,33	77,8	12	80
Inference	15	12	80	11,33	75,5	8,66	57,7	9,33	77,8	9,33	77,8
Eksplanation	20	9,33	46,7	10,66	53,3	12	60	10	50	9,33	46,7
Self-regulation	20	14,66	73,3	11,33	56,7	14,66	73,3	14,66	73,3	11,33	56,7

Description: 76-100% (very good), 51-75% (good), 26-50% (quite), < 25% (less).
Roman Numerals Source KBK (Title of Popular Book Chapter). Rt (Average Score).

Students' critical thinking skills in Table 1 are in good categories, namely interpretation, analysis, evaluation, inference, and self-regulation. The skills of doing analysis have increased, but the skills of doing explanations have not shown any improvement.

The focus of research in the form of students' critical thinking skills is one of the mandates of learning in the 21st century. Critical thinking skills as part of cognitive skills are one of the components in 21st century learning. The critical thinking skills of students in the good category have been widely supported by previous studies that have been reported (Zaini and Asnida, 2015). He explained that learning in a natural environment using an environmental approach plays an important role in learning a biological concept because it can motivate students to teach biological concepts and thinking skills. Nur (2011) explains that learning process skills is not limited to being done in schools in whole classes, but can be carried out in small groups, in this case through group or individual tests. Students can begin working individually in class or at home, and then discuss their strategies and results in small groups or the whole class.

Popular books are effectively used because students' critical thinking skills have improved (Patmawati, 2017; Zaini and Jumirah, 2016; Ramadhan, 2020). So this book can be accounted for as truth/scientific (Setiawan, 2017).

The teacher acts as a facilitator in improving critical thinking skills through student-centered learning. Irhayana (2011) reported an increase in metacognitive abilities, critical thinking skills, and cognitive abilities of students with high and low academic abilities. Critical thinking teaches strategies and skills that can enhance our ability to engage in critical evaluations. This study deals with aspects of critical thinking skills of interpretation, analysis, evaluation, inference, and self-regulation (Facione, 2010).

Student worksheets as part of teaching materials have an important position in learning to explore critical thinking skills. Hairiani *et al*. (2016) reported that the practicality of student worksheets as a result of the development of process skills in the good category, Wahyulina *et al*. (2018) reported that cognitive learning outcome and critical thinking skills were very good. Student worksheets to improve critical thinking skills developed by researchers (Yunita, 2021; Amelia, 2021; Hasanah, 2021) reported that the effectiveness of student worksheets increased in students' critical thinking skills from good to very good categories from six aspects of critical thinking skills contained in the student worksheet.

Angkowati *et al*. (2018) reported cognitive learning outcomes with very good category results, critical thinking skills in very good categories. They found that students' critical thinking skills were good, including formulating problems, formulating hypotheses, collecting data, analyzing data, and making conclusions.

The aspect of critical thinking skills as the dependent variable has been reported by previous researchers. Inquiry-based learning in biology learning affects the ability to analyze and evaluate, does not affect the ability to apply (Zaini *et al*., 2017). Wahyulina *et al*. (2018) reported that cognitive learning outcome and critical thinking skills were very good, good behavior assessment results, good social skills, and good student activities.

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D. Conclusion

Based on the results of research and discussion, it is concluded that students' critical thinking skills are in good categories, namely interpretation, analysis, evaluation, inference, and self-regulation. The skills of doing analysis have increased, but the skills of doing explanations have not shown any improvement.

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