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Development of Digital Encyclopedia Fish Diversity in The Auction of Tuban Fish As A Contextual Based Teaching Material Supplement

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Abstract

The diversity of fish as an environmental potential found in Tuban Regency can be used as a supplement to contextual-based teaching materials which are packaged in the form of a digital encyclopedia. Smartphone owned by students can be used in learning biology. This study aims to 1) Study and describe the diversity of fish at TPI Bulu Bancar and Gelondonggede Tambakboyo Tuban, 2) Assess product characteristics, 3) Test product validity based on material and media, 4) Test product effectiveness in improving student learning outcomes, and 5) Testing the practicality of the product. This research belongs to Research and Development. Observation is used as the data collection methodology in obtained fish biodiversity. The development is in the form of an android-based digital encyclopedia which is then used as a supplement to teaching materials for biodiversity. The trial was conducted at SMAN 1 Bancar Tuban by taking control and experimental classes. The results showed 1) The diversity of fish species found in TPI Bulu Bancar and Gelondonggede Tambakboyo Tuban each consisted of 17 species and 23 species, 2) Product characteristics were developed in digital form containing material on biodiversity of fish, 3) Validity by material experts' valid criteria and media experts with very valid criteria. 4) The effectiveness test is seen from the increase in cognitive learning outcomes. The digital encyclopedia of fish diversity can be used as a supplement to be teaching materials on contextual-based biodiversity materials.

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INTRODUCTION

Indonesia is an archipelagic country located between the Asian Continent and the Australian Continent and between the Indian Ocean and the Pacific Ocean so that it has an abundance of biodiversity. One of them is the diversity of marine fish which can be used as a learning resource for students by utilizing local potential. Learning with local utilization is effectively used in biology learning (Sunarsih, 2020).

According to the constitution number 5 of 1994 about diversity, biodiversity is the diversity among living things from all sources, including land, oceans, and other aquatic ecosystems as well as ecological complexes that are part of their diversity, diversity within species among species, and ecosystems. The use of abundant fishery products can be used both to the economic sector is a source of learning. The diversity of fish can be used a source of learning for students to those who can display information contextually.

Based on observational data obtained from the teachers of SMAN 1 Bancar, the learning resources used in biology subject are textbooks and worksheets from the publisher. They are used as the main sources equipped with internet and powerpoint. The use of supplement books can meet the needs of students, develop knowledge, and promote life skills that are useful in social independence (Maryam, 2012).

One of the teaching material supplements that can be developed to help the learning process is a digital encyclopedia. Encyclopedia also has a different character from other learning media. According to Vanessa (2013) encyclopedias can be used as learning resources with accurate and up-to-date information and can broaden their readers' horizons.

Smartphones (smart phones) are items that are owned by students. Based on the observations of students at SMAN 1 Bancar, Tuban, information was obtained that each student has a smartphone. Jayanti et al (2019) 's research shows that digital encyclopedias can be used in the learning process. Therefore, it is necessary to conduct research on "Development of a Digital Encyclopedia of Fish Diversity at TPI Tuban as a Contextual-Based Teaching Material Supplement".

METHOD

This study uses a Research and Development (R&D) approach. The product developed in this study is a digital encyclopedia of fish diversity in TPI Bulu Bancar and Gelondonggede Tambaknoyo Tuban as a contextual-based teaching material supplement. The research and development procedure refers to the Borg & Gall (1983) model and includes the following research steps: 1) Research and Information Collecting; 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; 10) Dissemination and implementation. This research is limited to Operational product revision.

The research on fish diversity was conducted by using the observation method. Fish species diversity is determined by the Shannon-Wiener diversity index. The fish identification that has been carried out is then used as the basis for compiling a digital encyclopedia on biodiversity material for class X students. Compilation of a digital encyclopedia consisting of 1) Biodiversity, 2) Fish diversity, 3) Location Description, 4) Material Map, 5) Exercise questions, 6) Reference, 7) Glossary and 8) Author profile. The digital encyclopedia was compiled using the android studio application.

Instruments for material experts include the suitability of material with the core competences and basic competence, accuracy of material, up-to-date material, encyclopedia components, encyclopedia quality, and presentation techniques. Media experts tested the instruments including graphic components, digital encyclopedia components, and language feasibility. The digital encyclopedia of diversity was improved based on advice provided by material experts and media experts.

Sample selection in a population is carried out using purposive sampling technique. Learning is carried out in class X MIPA 2 totaling 30 students as the experimental class and X MIPA

3 totaling 30 students as the control class. The use of this digital encyclopedia aims to determine the effectiveness and practicality of the product in improving student learning outcomes.

Students are given pretest questions about fish diversity before learning begins. After the learning is complete, students are given a posttest as the final data collection. The experimental class was given learning using a digital encyclopedia. The control class was given learning using the biodiversity module. The psychomotor aspect is carried out by means of presentation assessment sheets and reports. The affective aspect is carried out with an attitude assessment sheet. Students and teachers are also given a questionnaire to find out their responses after using the digital encyclopedia. The final revision stage after the contextual-based digital encyclopedia is used in learning. The responses of students and teachers are used to improve the product in accordance with the suggestions given so that the product being developed is better.

RESULTS AND DISCUSSION

Diversity of fish.

The types of fish found in TPI Bulu Bancar and Gelondonggede Tambakboyo Tuban consist of 17 species and 23 species, respectively. In this study, the diversity of fish in the Gelondonggede TPI was 2.4, higher than the TPI Bulu Bancar which only reached 1.5 even though it fell into the same category, namely moderate. The criteria for moderate diversity means that the diversity of fish at TPI Bulu Bancar and Gelondonggede Tambakboyo Tuban has sufficient productivity, moderate pressure on the environment, and fairly stable ecosystem and habitat. Maulana et al. (2016) said that the value of insect species diversity is in the medium category and shows that environmental conditions, productivity, ecosystem conditions and ecological pressures in the Karangkamulyan Protected Forest Area are still quite balanced.

The status of fish conservation in research conducted based on IUCN data is categorized as NE (not evaluate), DD (data deficient), LC (least concern) and (near threatened). Fish conservation status data at TPI Bulu Bancar and Gelondonggede Tambakboyo can be seen in the Figure 1.

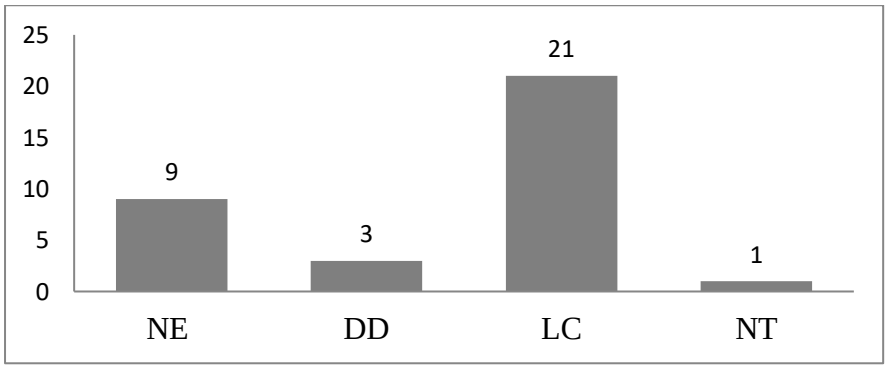

Figure 1. Status of Fish Conservation at TPI Bulu Bancar and Gelondonggede Tambakboyo Tuban

The NE category consists of 6 types including *Ephinephelus sexfasciatus, Lactarius lactarius, Mene maculate, Nemipterus isacanthus, Nemipterus nematopus,* and *Sphyraena forsteri*. A taxon is declared in the NE category when it is not evaluated for extinction criteria.

There is three species that is included in the DD category, namely *Rastrelliger brachysoma*, *Saurida wanieso* dan *Psettodes erumei*. The LC category in this study consisted of 21 types, namely *Anodontostoma chacunda, Dussumeria elopsoides, Chirocentrus dorab, Scomberoides commersonnianus, Ulua arochs, Decapterus kurroides, Selaroides leptolepis, Atule mate, Euthynnus affanis, Gazza minuta, Priacanthus tayenus, Trichiurus lepturus, Dasyatis leylandi, Nemipterus furcosus, Carangoides malabaricus, Carangoides chrysophrys, Megalaspis cordyla, Terapon theraps, Leiognathus equulus, Ephinephelus sexfasciatus* dan *Aluterus monocerus.* Henry, Hakim, & Batoro (2017) stated that the LC category shows that the risk of extinction is still very low.

Taeniura lymma fish is included in the NT category, namely the conservation status given to species that may be in a state of threat or near being threatened with extinction, even though they are not under threatened status. This is in accordance with the research conducted by Juniarti & Sudibyo (2016) that Taeniura lymma is in a NT status.

Characteristics of the digital encyclopedia.

The developed digital encyclopedia of fish diversity requires 16.15MB of memory space on a smartphone. The digital encyclopedia developed is an offline application. According to Hardinata, *et al*, (2018), mobile learning media can be accessed with an Android-based smartphone that can be operated in offline mode.

The digital encyclopedia developed is an interactive media that can attract students' interest, motivation and learning interest. According to Widiansyah, *et al*, (2018) learning media made with original images are more attractive, easy to operate and contribute to increasing attention.

The digital encyclopedia was developed with ease of use anywhere or portable. According Suryanda, *et al*, (2016) state that mobile learning based on the Android operating system utilizes the development of information and communication technology for the world of education to increase learning activities that can be accessed at any time.

The digital encyclopedia developed is a contextual-based supplement for teaching materials for biodiversity. The development of contextual-based learning media aims to motivate students to learn because they learn something around them. Contextual learning according to Ritonga, Khadijah, & Susanti (2020) is a learning concept presented by teachers about the real world inti the classroom and motivates students to link their knowledge witd everyday life.

The advantages of a digital encyclopedia of fish diversity developed according to their characteristics are as follows; 1) Digital encyclopedia of fish diversity using relatively small memory space, 2) Offline based where the operation does not depend on signals, 3) Interactive media that can attract the attention of students to learn, 4) Portable, which can be used anywhere when carrying a smartphone, and 5) Based on contextual, which is arranged based on what is around students.

The validity of the digital encyclopedia

Based on the product validity assessment by material experts and media experts, it was obtained a percentage of 62.50% and 92.11%, respectively. The material expert validator declared the digital encyclopdeia of fish diversity in the valid category. The media expert validator stated the digital encyclopedia of fish diversity in the very valid category. Based on those data, a digital encyclopedia of fish diversity can be used in biology learning.

The effectiveness of the digital encyclopedia.

The test of the effectiveness of cognitive learning outcomes was carried out using 20 items given as pretest and posttest questions. Student cognitive learning outcomes can be seen in the following Table 1.

Table 1. Students' Cognitive Learning Outcomes

Number	Aspects	Experiment		Control	
		Pretest	Post test	Pretest	Post test
1	Highest value	65	95	65	85
2	Lowest value	45	80	40	70
3	Value	53.91	87.83	52.33	81.67
4	Classical Completeness (%)	0	100	0	97
5	Classical Completeness Criteria	Very ineffective	Very effective	Very ineffective	Very effective
6	N gain score	0.75		0.62	
7	N-gain score category	High		Medium	

Classical completeness of the experimental and control classes after conducting biodiversity learning belonged in the very effective category. Ngain score of the experimental class in the high

category. Based on these data, it shows that the encyclopedia is suitable to be used in learning biology. The digital encyclopedia used in learning attracts and motivates students to be active so that it can improve student learning outcomes. Biological applications based on android gadgets can be used and validated by experts can increase learning motivation in students (Nofitasari et al., 2021). Surachman & Surjono (2016) research show that increasing learning outcomes is very effective after using mobile learning products.

The psychomotor learning outcomes in the experimental class are 85.12% (very skilled) and the control class is 81.31% (very skilled). The use of a digital encyclopedia can be used by students to carry out practicum activities. The results of the research conducted by Irwansyah et al. (2018) show that the use of smartphones in practicum to determine the mass of colored solutions can develop student KPS.

Affective learning outcomes in the experimental class 90.28% (very good) and 90.14% (very good) control class. Based on these data, it shows that learning using an encyclopedia is effectively used in learning biodiversity.

Practicality of Digital Encyclopedia.

The response score of the digital encyclopedia students in class X MIPA 2 obtained a percentage of 86,82% (very practical). This shows that the digital encyclopedia developed is practically used in learning biodiversity. Hardinata et al. (2018) said students stated that this mobile learning application is a new innovation that is used in the learning process in the classroom and the application is easy to use.

The response score given by the teacher as a digital encyclopedia user is 85.26% (very practical). The digital encyclopedia is practically used in learning biodiversity. According to Harlis & Budiarti (2018) that the development of an appypie-based android application as a learning media for biology education students is very practical to use. Suggestions are given that information in the form of important words is given a clearer and more attractive color, research is more focused on one place (TPI), and a digital encyclopedia of fish diversity should be disseminated so that it can be used by teachers, for example at Subject Teacher Deliberation.

CONCLUSION

Based on the description above, it can be concluded that (1) the diversity of fish in the TPI Bulu Bancar and Gelondonggede Tambakboyo has sufficient productivity, moderate pressure on the environment, and fairly stable ecosystem and habitat. (2) The characteristics of the digital encyclopedia of fish diversity consist of material on biodiversity, and (3) The digital encyclopedia is valid, effective, and practically used as a supplement to contextual-based teaching materials in learning biodiversity material.

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