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# Development of an Interactive E-booklet on Fish Diversity at TPI Tambaklorok to Improve Science Process Skills of High School Students

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**Abstract:** The purpose of this study is to develop interactive e-booklets based on the local potential to improve learners' science process skills. This research method is Research & Development (R&D) with a 4D model consisting of 4 main stages, namely, define. Design, develop and disseminate. The product of this research is an interactive e-booklet. The subject of the study was a grade X student of Al Fattah Terboyo High School. The e-booklet was validated by media experts and material experts, each consisting of one lecturer and two teachers as experts. The results showed that interactive e-booklets are included in the category of very valid and worthy of use in learning, and interactive e-booklets are effective enough to improve the science process skills of learners, but science process skills still need to be trained again to learners.

**Keywords:** Interactive e-booklet; Local potential; Science process skills

## Introduction

Indonesia is one of the countries that has a very high wealth of marine resources in the world, both biological and non-biological marine resources. Indonesia's territorial waters that are on the equator and have a tropical climate make Indonesia a wealth of more types of aquatic biota when compared to subtropical regions. One of the biggest potentials in Indonesia's seas is fisheries resources (Suman et al., 2017).

Tambaklorok area is one of the areas that has considerable fisheries potential in Semarang City. The geographical location of the Tambaklorok area, which is in direct contact with the Java Sea, makes this area have attractive natural resources. Some of the potential resources in Tambaklorok include mangrove ecosystems, Fish Auction Sites (TPI) and ponds. Based on pre-survey data in the environment around Tambaklorok, it is known that the existence of various potential natural resources has not been utilized optimally and has the potential to be used as a learning resource for students. In fact, these various potentials should be related to the objectives of biodiversity learning contained in phase E regarding biodiversity.

Setiawan et al. (2018) stated that understanding the material on the diversity of living things would be better if it was done by observing the diversity of types of living things in the surrounding environment directly, but due to limited learning meeting time, this can be overcome by using learning resources based on local potential in the surrounding environment. Resources must be adjusted to the needs of users, namely user geography, ethnographic and local potential in the local area to be relevant so that it can support the learning process for students and can support the achievement of the expected learning goals. Zulhalifah et al. (2021) also stated that the use of learning resources based on local potential could increase students' understanding of the surrounding environment and can increase their concern for the environment.

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The rapid development of science and technology in the 21st Century certainly affects various aspects of life, including in the world of education. According to Nisa et al. (2018), learning in the 21st Century is not only focused on providing materials and concepts but also focuses on developing students' skills. These skills are commonly referred to as the 4Cs, which include creativity, critical thinking, communication and collaboration. These skills can be integrated directly into learning activities in schools. Through science learning, these various skills are implemented in the form of science process skills or commonly called KPS (Senisum, 2021). According to Khairunnisa et al. (2019), science process skills cannot be obtained in just an instant but need to be habituated in learning activities, so this skill also has a role in directing students to master their cognitive material but can also develop their minds and provide opportunities for students to conduct an experiment and can help students learn the concepts in science.

From the explanation above, it can be seen that science process skills are an essential part of learning science. Meanwhile, in fact, the quality of science learning in Indonesia is still very low when viewed from the PISA score in 2018 for science skills, which is 396, which places Indonesia in 74th place or sixth from the bottom (OECD, 2019). The low science process skills are stated by Anisa et al. (2021), based on her research, that the science process skills of high school/vocational students in Semarang City are still very low because science process skills are rarely trained in students. Science process skills that appear in learning are only limited to observing and communicating, whereas both skills are skills that are still relatively low. This was also stated by Rani et al. (2019), who obtained results that the science process skills of grade X high school students in Palembang were still low for several indicators (compiling hypotheses, carrying out experiments, and communicating).

Based on the results of the analysis of student needs in the field involving 108 respondents of grade X students, information was obtained that science process skills were only trained occasionally by teachers, judging from the results of the questionnaire, in which 66.7% of students stated this. In addition, students feel that their knowledge about local potential is also still lacking; as seen from the results of the questionnaire, namely, 65.7% of students do not know the local potential around them. Students also showed that they were interested in learning biodiversity material that was associated with the local potential of the surrounding environment; as seen from the results of the questionnaire, 89.8% of students expressed interest.

Based on this description, the purpose of this study is to develop an interactive e-booklet based on the local potential to improve the science process skills of high school students, especially in class X.

## Method

The method used in this study is Research & Development (R&D) with a 4D model consisting of 4 main stages, namely define. Design, develop and disseminate. According to Sugiyono (2019), development research is research that serves to validate and develop products. Borg and Gall also state that "research and development is a process to develop and validate educational product". This method and model were chosen because it aims to produce interactive e-booklets. The purpose of this study is to improve the science process skills of learners.

The data obtained from this study are qualitative and quantitative. Qualitative data is obtained from suggestions/comments from validators, media experts, and material experts. The information obtained from validators is used as evaluation material to improve the developed e-booklet. Quantitative data is obtained from pretest and post-test results, which will be analyzed using the N-gain index to determine the effectiveness of e-booklet products on science process skills.

*Test the Validity of the E-Booklet*

Validity tests are carried out to determine the validity of the developed e-booklet. This test is carried out by media experts and material experts. The instrument used is the Likert scale. The e-booklet validation data was analyzed using the following formula proposed by (Sugiyono, 2017) as equation 1.

$$P = \frac{\text{obtained score}}{\text{maximum } score} \; x \; 100\% \qquad (1)$$

The validation results of media experts and material experts are then interpreted using the score interpretation as Table 1.

**Table 1.** Validity Criteria Based on Percent

| Percentage | Interpretation |
|---|---|
| Score ≥ 76% | Highly Valid |
| 51% - 75% | Valid |
| 26% - 50% | Less valid |
| Score ≤ 25% | Not valid |

*Analysis of the Effectiveness of E-booklets on Science Process Skills*

This test was conducted to determine the effectiveness of the e-booklet on students' science process skills. Students are given questions related to

science process skills before (pretest) and after (post-test) the use of interactive e-booklets, after which the data is analyzed by researchers. Furthermore, pretest and post-test data will be analyzed using the N-gain index, which aims to determine the increase in pretest and post-test scores. This data analysis technique will be explained in the description below.

The N-gain test is used to obtain a neutral N-gain value; this is done to eliminate the assumption that the largest post-test value shows the best results. The N-gain formula to be used is as equation 2:

$$Gain\ Index = \frac{Posttest - Pretest}{\text{Max score} - \text{Pretest}} \quad (2)$$

The N-gain index results obtained are then interpreted with the following score interpretation criteria as Table 2.

**Table 2.** Gain Index Criteria (Syahfitri, 2008)

| N-Gain Value | Criterion |
|---|---|
| g > 0.700 | Tall |
| 0.300 ≤ g ≤ 0.700 | Keep |
| g < 0.300 | Low |

After knowing the level of gain index produced, the next is to interpret the percentage N-gain score and whether it is effective or not.

**Table 3.** Categories of Interpretation of N-Gain Score Effectiveness (Hake, 1999)

| Percentage (%) | Interpretation |
|---|---|
| < 40 | Ineffective |
| 40 – 55 | Less Effective |
| 56-75 | Quite Effective |
| > 76 | Effective |

## Result and Discussion

Initial operation activities were carried out to analyze the potential problems that exist around the Tambaklorok environment. The initial observation aims to identify problems that exist at SMA Al Fattah Terboyo, which includes curriculum analysis and learning activities. The curriculum used at Al Fattah Terboyo High School is the Merdeka Curriculum. With regard to learning activities, it can be seen that students are not used to applying science process skills.

In addition, an analysis was carried out to determine the characteristics of students, their background skills and initial attitudes of students. Based on observations with students, it is known that science process skills are still rarely trained to students; this can be seen from the teaching materials used by teachers and practice questions given to students. The teaching materials used are mostly in the form of materials that contain a lot of writing, while the practice questions given are in the form of simple questions in the form of multiple choice. After analyzing the potential and problems that exist in the Tambaklorok environment, then planned products to be developed. The product developed in this study is an interactive e-booklet of fish species diversity based on local potential in Tambaklorok. This product is used to improve the science process skills of learners.

The first stage carried out is the design of the product to be developed. At this stage, researchers design e-booklet products to be developed. The purpose of product design at this stage is to produce e-booklets that can help improve students' science process skills.

The second stage is to validate the product that has been developed. This stage aims to evaluate the feasibility of the e-booklet product. Validation is carried out by media experts and material experts. Based on the results of the validation carried out, it is possible that the e-booklet still needs to be improved according to the suggestions and assessments provided by validators. The suggestions and assessments provided are used as material to improve the e-booklet developed.

The effectiveness test of e-booklets was carried out to determine the effectiveness of using e-booklets on students' science process skills. Students will be given questions related to science process skills before (pretest) and after (post-test) the use of e-booklets. Furthermore, the pretest and post-test data were analyzed using the N-gain index.

*E-Booklet Validation Stage*

The validation carried out is media validation and material validation. Media validators are two teachers and one lecturer, while material validators are also carried out by two teachers and one expert lecturer. The e-booklet product that has been developed is then submitted to validators by submitting the products that have been made and submitting questionnaires to validators to assess whether or not the product developed is valid.

Based on the results of the analysis using the formula proposed by (Sugiyono, 2017), it is known that the average resulting from the validation of media experts is 95.55 and is included in the very valid category**.** Based on the results of expert validation, the material was obtained on average 89.45 with a very valid category. Thus, it can be concluded that the e-booklet that has been developed can be used as a learning resource in classroom learning activities.

*Revision Phase*

After validation, the product is then revised according to the assessment and suggestions provided

by the validator. After the e-booklet product is revised according to the next suggestion, the product is tested by students.

*Product Trial Phase*

The revised product was then piloted to students in schools. The trial was conducted in class X of IPA of Al Fattah Terboyo High School with a total of 20 students. Field trials were conducted to determine the effectiveness of e-booklets on science process skills. Science process skills improvement is assessed based on the pretest and post-test scores. Students are given a pretest before using the e-booklet, and then after learning activities using the e-booklet, students are given a post-test.

Based on the results of the N-gain analysis, an average N-gain value of 0.69 was obtained with moderate criteria and an interpretation of effectiveness as "quite effective". The "moderately effective" category shows that science process skills cannot be improved only once or twice but also requires continuous practice so that students' science process skills can be optimally trained, as stated by (Khairunnisa et al., 2019). The results also show that the use of local potential-based e-booklets can increase students' understanding of the material, especially biodiversity material. This is in accordance with what was stated by Setiawan et al. (2018) that understanding the material diversity of living things will be better if done by directly observing the diversity of types of living things in the surrounding environment.

## Conclusion

Based on the results of the study and discussion, it can be concluded that the results of the e-booklet validation test developed are in the category of very valid and suitable for use in learning activities. In addition, field trials were conducted to determine the effectiveness of the developed e-booklet on students' science process skills. From the results of field trials, it can be concluded that interactive e-booklets are effective enough to improve science process skills. In connection with the suggestions that researchers can add, namely considering that science process skills are still rarely trained in students, it is hoped that teachers or other researchers can develop teaching materials with complete material and questions that can train science process skills on a larger scale.

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**Author Contributions**

Conceptualization, Resti Fitriati and Ari Yuniastuti.; methodology, Nur Kusuma Dewi.; validation, Nur Kusuma Dewi.; formal analysis, Resti Fitriati.; investigation, Resti Fitriati, Ari Yuniastuti; resources, Resti Fitriati; data curation, Ari Yuniastuti,: writing—original draft preparation, Resti Fitriati, Ari Yuniastuti, Nur Kusuma Dewi; writing—review and editing, Resti Fitriati, Ari Yuniastuti and Nur Kusuma Dewi.

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**Conflicts of Interest**

The authors declare no conflict of interest. This research was conducted as an alternative solution to improve science process skills of students.

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