

Research Article

Developing biology enrichment book of fish diversity of aquatic ecosystems in Kampar District



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ARTICLE INFO

Article history

Received: 27 August 2020
Revised: 17 March 2021
Accepted: 21 March 2021
Published: 31 July 2021

Keywords

Biology enrichment book
Contextual learning resources
Fish diversity
Kampar district

ABSTRACT

Fish diversity in Kampar District is one of natural resources which is potentially developed as a contextual learning resource for student. This Research and Development (R&D) study aimed at developing biology enrichment book of fish diversity in Kampar District as learning resource for X graders. The R&D model employed was ADDIE which was limited to the third phase (i.e development). The validity and practicality tests on the product developed were conducted by material and media experts as well as 20 biology teachers. The instrument used was questionnaire with five Likert scale. It comprised of 18 items in which the 10 items related to content eligibility and material presentation, meanwhile, the other eight items related to language and graphics. The results showed that the product developed was categorized as very valid with several minor revisions. The overall practicality test resulted the score value with high practicality category (83.8). In addition, the results of development stage depicted that the biology enrichment book of fish diversity in Kampar District was categorized as strongly valid. Thus, it can be continued to the next stage in term of implementation and evaluation in order to get the usable product for student as a contextual learning resource.



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How to cite: Syah, F., & Yustina, Y. (2021). Developing biology enrichment book of fish diversity of aquatic ecosystems in Kampar District. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 7(2), 188-197. doi: <https://doi.org/10.22219/jpbi.v7i2.13439>

INTRODUCTION

Contextual learning is a concept that helps teachers relate the material they teach to real-world situations and encourages students to make connections between their knowledge and its application in their lives as community members (E. M. Bergman et al., 2013; Pan et al., 2020; Sung et al., 2019). In practice, contextual learning is carried out authentically, prioritizes real experience, meaningful experience in life, close to real life (Nilasari et al., 2016). Contextual learning can link the material studied with the real life of everyday students, both in the environment, family, school, and community, regarding finding the meaning of the material for life. Contextual learning occurs when students apply and experience their study regarding real-world problems related to their roles and responsibilities as the community (Sitorus & Masrayati, 2016). With contextual learning, students will have meaningful learning.

Contextual learning can succeed if using real-life learning resources. This learning resource can be in the form of problems or phenomena that exist around students (Pan et al., 2020; Sitorus & Masrayati, 2016; Sung et al., 2019). However, sometimes there are limitations for teachers and students to take advantage of this. So,

these problems and phenomena can be adapted to be used as a reference source for students, such as knowledge enrichment books. According to [Direktorat Pembinaan Guru Pendidikan Menengah \(2017\)](#), knowledge enrichment books are aimed to develop students' knowledge. Knowledge enrichment books serve to enrich students' insight, understanding, and reasoning. Knowledge enrichment books for students will relate to the development of educational goals in general. Enrichment books will position students to gain additional knowledge from the results of reading these books that they do not get from textbooks. The characteristics of knowledge enrichment books are (1) presenting material that is real, (2) developing reading material based on science, and (3) developing various knowledge such as factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge.

The knowledge enrichment book can be developed based on potential environmental conditions, such as in the freshwater environment of Riau Province. The freshwater environment in Riau Province is extensive freshwater ecosystems, consisting of rivers and lakes ([Siagian & Simarmata, 2015](#)). More specifically, the Kampar River, which is one of the four major rivers in Riau Province, is the largest contributor to freshwater fish in Riau Province. This phenomenon shows the local potential in the Kampar River. [Marlina \(2013\)](#) explains that a local potential is an event, problem, or phenomenon that occurs in the student's environment.

The diversity of freshwater fish, as a potential resource, must receive public attention, both from the government and the community. As is known, many types of fish in the Kampar River are getting rare. Therefore, there is a need for conservation efforts that begin with the introduction of the diversity of these freshwater fish to students. The first step is to document this diversity and use it in learning in the form of an enrichment book. It is hoped that students in the Kampar district can find out the potential for fish diversity in their area and the future has the awareness to conserve natural resources in their area. The existence of a phenomena-based enrichment book in the Kampar District is expected to improve the quality of learning. Thus, it will have an impact on the social development of the community. As stated by [Marihana and Hikmah \(2013\)](#) that contextual learning is formed which is managed according to the needs of the community.

Preliminary research results in the Kampar River indicate a decrease in fish species diversity ([Yustina et al., 2019](#)). Furthermore, by using a questionnaire on students' knowledge of fish diversity in freshwater, it was found that students did not know the fish diversity in their area. This fact will be detrimental to the preservation of local potential in the Kampar District. There is a need for intervention in the education sector to improve this situation, such as using learning resources based on local potential. But in fact, some learning in schools only use textbooks as the first reference. [Fahmi et al. \(2019\)](#) argue these textbooks generally have learning materials and activities that are not by the conditions of students, teachers, and the school environment. Whereas contextual learning resources are more crucial to help students understand the material more easily ([Conci & Müller, 2012](#); [Hwang et al., 2021](#); [Raub et al., 2015](#); [Stauter et al., 2017](#); [Susilo, 2014](#)). [Nuha et al. \(2016\)](#) added that there is still a lack of learning resources on biology related to utilize local potentials, such as in Kampar District.

Until now, there is no an enrichment book that directly discusses fish diversity, especially in Kampar District. Therefore, the development of an enrichment book on fish diversity in the Kampar District is valuable, as a way for students to learn contextually. Students can get to know the fish diversity in the Kampar District area, so there are efforts to develop sustainable conservation. The use of local potential in learning has been suggested by several studies because the utilization of this local potential can not only support the achievement of learning mastery programs ([Ibrohim, 2015](#)) but can also increase environmental awareness ([B. G. Bergman, 2016](#); [Jena, 2012](#)).

The biology enrichment book of fish diversity was prepared by conveying information related to the presence of fish in the Kampar District. In addition, there are also characteristics, habitat, other names (local names), distribution, and economic potential of the fish. There are also practice questions that can be used to evaluate the achievement of student knowledge. This enrichment book is compiled by having a knowledge window that contains website addresses related to existing materials so that students can access information anywhere online. As stated by [Sadikin et al. \(2020\)](#) that learning resources that are integrated with the website can facilitate students to study anywhere and anytime, that supports the student learning process. The integration of local potential in the form of fish diversity in the Kampar District is expected to increase student literacy regarding the diversity of fish that exist, as well as increase their awareness to preserve the diversity of fish. Thus, this research and development aim to analyze the validity of the biology enrichment book of fish diversity in the Kampar District.

METHOD

This Research and Development (R&D) aim to formulate and produce the biology enrichment book of fish diversity. The R&D model used is ADDIE which consists of the Analysis, Design, Development, Implementation, and Evaluation stages ([McGriff, 2000](#)), with modifications. This R&D is limited to the third phase (development), in detail the R&D phase carried out can be seen in [Figure 1](#). The study was conducted in February – October 2020 at the University of Riau.

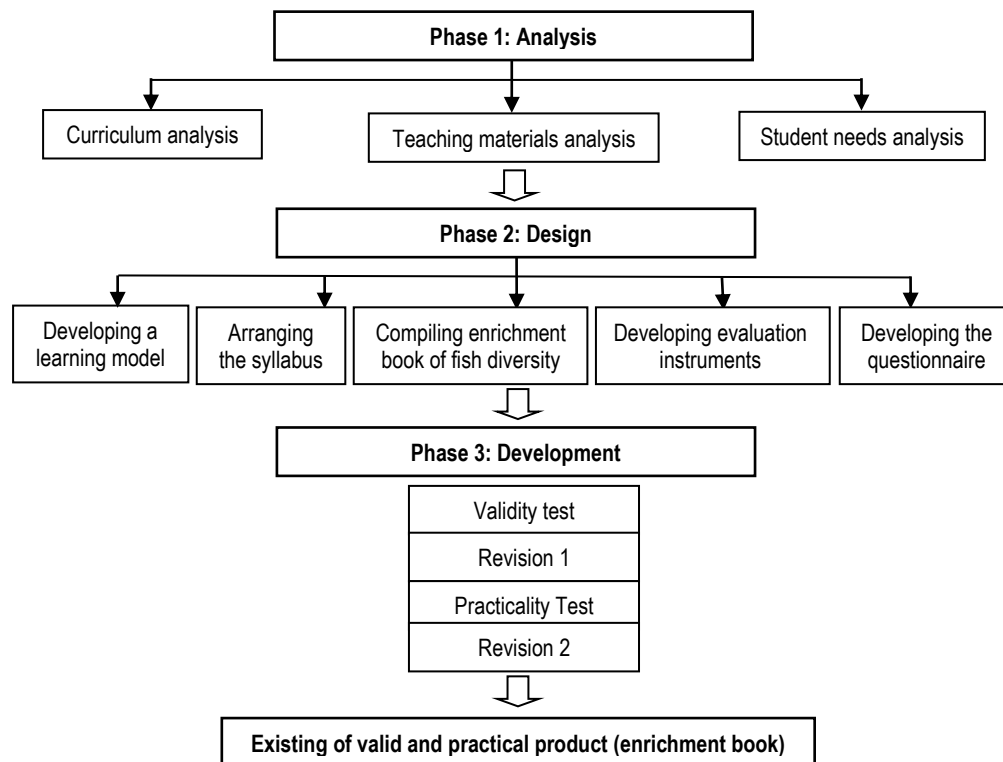


Figure 1. R&D phase in detail

Phase 1: Analysis

The analysis carried out by the researcher includes curriculum analysis, analysis of student needs, analysis of learning concepts, and analysis of teaching materials. It is explained in detail as follows: (1) Curriculum analysis, carried out to analyze the ongoing curriculum in schools and explore how it is implemented and the problems that occur. (2) Analysis of student needs, carried out to analyze what students need in the learning process to achieve learning objectives. (3) Analysis of teaching materials and learning media is carried out to identify the availability of teaching materials in schools that are relevant to ideal learning.

Phase 2: Design

The design stage is carried out to design the form of the biology enrichment book of fish diversity. Based on the specifications of the learning objectives that have been formulated, at the design stage, the format of the enrichment book will be determined, compiling the framework of the enrichment book and designing the material in it. The systematic presentation of material in a coherent textbook starts from the introduction, the body/content page, and the closing section. This is following the requirements for the preparation of the latest textbooks which are good in the preparation of textbooks. The design of the biology enrichment book of fish diversity in Kampar District consists of cover, preface, table of contents, table of tables, list of figures, introduction, contents (chapters 1-4), glossary, and bibliography.

Phase 3: Development

The development stage includes the product validation stage that has been made by material expert validators and media expert validators. In addition, a practicality test was also carried out with product trials to field practitioners, namely 20 biology teachers. Validation and testing activities aim to control the content of teaching materials to suit the curriculum and student needs. Validators and field practitioners use validation instruments. The instrument used was a questionnaire with five Likert scales (1=very poor, 2=poor, 3= average, 4=good, 5=very good). It consists of 18 items in which the 10 items related to content eligibility and material presentation, henceforth, the other eight items related to language and graphics. The questionnaire analysis was performed using the Split Half method with the help of SPSS for windows version 11.5.

The validation results were then analyzed using descriptive statistics and interpreted by the categories listed in Table 1. Furthermore, to find out the results of the assessment for each product indicator measured was to calculate the average value. The average value is obtained by calculating the total score obtained divided by the number of validation components. Furthermore, the average value is converted into a percentage value. Further revisions were made to improve the biology enrichment book of fish diversity from

various aspects, including content eligibility, material presentation, language, and graphics. Revisions are made based on suggestions and input from the validator.

Table 1. Categories of development product validity

Interval	Categories
$X > 3,4$	Very good
$2,8 < X \leq 3,4$	Good
$2,2 < X \leq 2,8$	Average
$1,6 < X \leq 2,2$	Poor
$X \leq 1,6$	Very Poor

After revising the product from the validation results, it was followed by a product practicality test involving 20 biology teachers. Several practical considerations are measured, namely aspects of ease of use, the attractiveness of the product for student interest, and ease of interpretation by other experts or teachers. The data from the practicality test were used to test inferential validity. In addition, the results of the practicality test are also categorized based on the criteria listed in Table 2. Then, data were analyzed using descriptive statistical analysis techniques.

Table 2. Categories of development product practicality

Interval	Categories
$81 < X \leq 100$	Very practical
$61 < X \leq 80$	Practical
$41 < X \leq 60$	Quite practical
$21 < X \leq 40$	Less practical
$0 < X \leq 20$	Impractical

RESULTS AND DISCUSSION

Phase 1: Analysis

The results of curriculum analysis conducted by interviewing biology teachers at MAN 1 Kampar show that schools use the 2013 Curriculum which is currently in effect in Indonesia. Referring to the curriculum, the books developed are directed at the 2013 Curriculum. In this curriculum, there are learning activities that are directed at a contextual approach, namely the daily lives of students (Weldi, 2020). Then, the material analysis result showed that the product development is pointing to biodiversity topics based on the local potential in the Kampar District.

Furthermore, the results of the analysis of student needs are known that students crave learning that is interesting and not monotonous. In addition, learning is not only done at school but also at home independently. The results of the initial observation also showed that students' knowledge was found that 62% of 67 students did not know the diversity of fish in their area. This will of course be detrimental to the preservation of local potential in the Kampar District. Furthermore, from filling out student questionnaires, several problems were found, including (1) lack of motivation for students to learn with their environment; (2) low creativity and curiosity of students to their environment; (3) lack of learning resources that utilize the student's environment. From the results of this analysis, teachers can apply contextual learning, one of which is contextual learning resources, so that the learning delivered will be more meaningful (Asbari et al., 2019). In addition to achieving learning objectives, a contextual approach will be building students' awareness of their environment.

Phase 2: Design

At this stage, product design is carried out using Microsoft Word by making a cover and then proceeding to draft the contents, including image layouts and others. The design of the biology enrichment book of fish diversity in Kampar District consists of cover, preface, table of contents, table of tables, list of figures, introduction, contents (chapters 1-4), glossary, and bibliography. The cover design of the biology enrichment book of fish diversity are shown in Figure 2. The biology enrichment book of fish diversity consists of four chapters. Chapter one is related to the description of ecosystem diversity. Chapter two describes fish morphology found in the Kampar River. Chapter three is about species diversity. Then, chapter four explains gene diversity. Each chapter is equipped with practice questions. There are additional practice questions at the end of each chapter to evaluate students' level of understanding. Hansen and Ringdal (2018) stated that evaluation is needed for reflection and giving feedback when students learn the material. This evaluation question can also be used by teachers to measure the achievement of student competencies. The enrichment book design process is also carried out by considering color contrast. The appearance of learning resources as students' learning media can affect their motivation and absorption of understanding (Serrat et al., 2014; Sharma & Pooja, 2016; Williams & Williams, 2011).

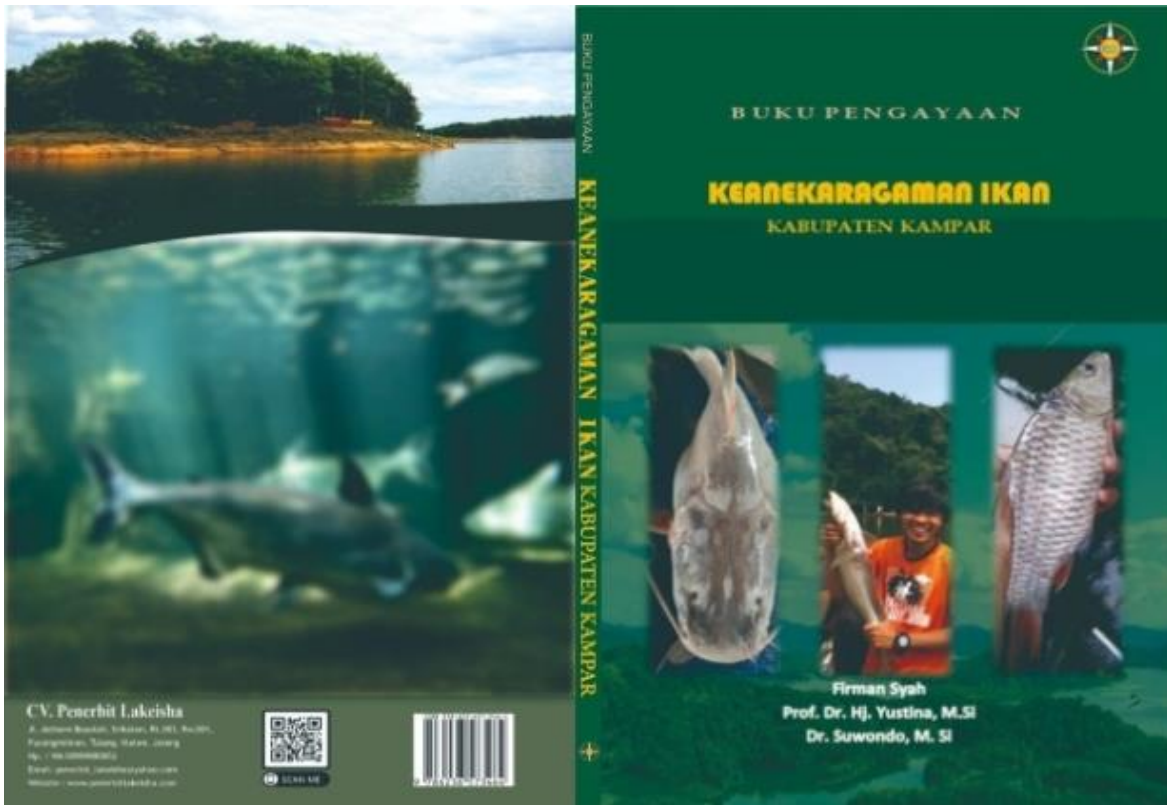


Figure 2. The cover design of the biology enrichment book of fish diversity

Phase 3: Development

The results of the enrichment book design are then validated by material expert and media expert. Validation is done by giving validation questionnaires to validators. The results of the questionnaire reliability test showed the Cronbach's Alpha value of 0.740. So it can be concluded that the questionnaire is reliable (Cronbach's Alpha > 0.60) to be used in product assessment. The results of the questionnaires filled out by validators are summarized in Figure 3. These results indicate that the content eligibility indicator of the enrichment book has a very valid category with a percentage of 80% (from material expert) and reaches 95% (from field practitioners). It also occurred to the material presentation indicator showing very valid results with the percentages of 88% (material expert) and 83.3% (field practitioners). Furthermore, the assessment result for the language indicator is also showed a valid category according to both linguists and field practitioners, with a percentage of 70% and 85%, respectively. Furthermore, on the graphics indicator, media expert and field practitioners stated the same results, which reached a percentage of 90% (a very valid category).

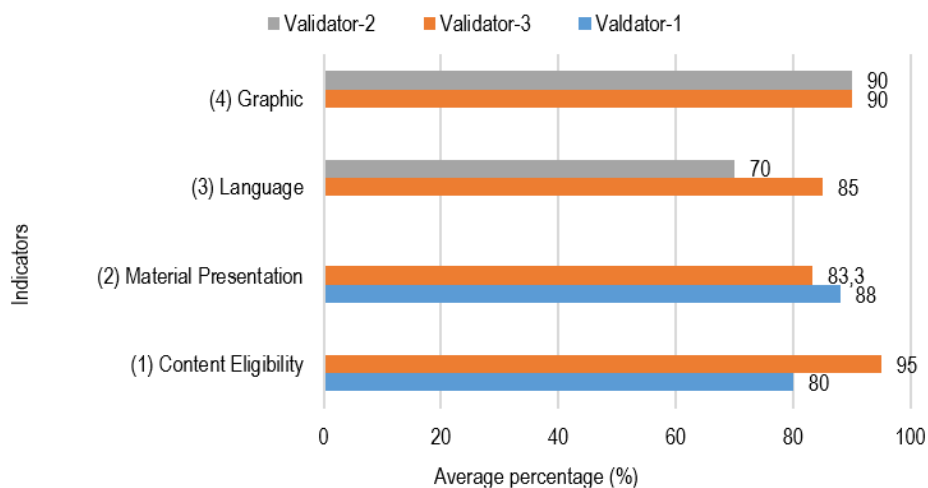


Figure 3. The validation results of the biology enrichment book of fish diversity in Kampar District (Validator 1=Material expert, Validator 2=Media expert, Validator 3=Field practitioner)

The results of the validity test through the questionnaire show that the biology enrichment book of fish diversity in Kampar District is valid for each measurement indicator. It can be concluded that this enrichment book can be used in the learning process. As stated by M. E. Setiawan et al. (2019) that the validation results have a significant effect in improving the learning resources developed. Cahyaningrum et al. (2017) added that products that have very good validity can be used as learning resources. Guswika et al. (2017) reinforces that validated content and media of books with very good validity is suitable for learning.

Furthermore, the validator's response to the improvement of the enrichment book is presented in Table 3. According to Charlina and Septyanti (2019), the validated product requires improvement until the product developed is said to be feasible for use at a later stage. The revised result from the input provided by the validator is presented in Figure 4 and Figure 5. As shown in Table 3, media expert provided input for adding website links related to the material. The addition of information and website links is presented in Figure 5.

Table 3. The results of the book validity and the revisions

Validator	Response	Revision
Material expert	The addition of fish species found in the Kampar District. It so that the students' understanding of fish diversity is varied.	Added variety of fish types (Figure 3)
Media expert	The addition of web links makes it easier for students to find sources of information and add insight to students independently.	Added student website-based learning media (Figure 4)

SALINCAH

Belontia hasselti (Cuvier in Cuvier & Valenciennes, 1831)
Oshphronemidae



Sumber: dokumentasi pribadi
Gambar 3.42 Ikan salincah

KARAKTERISTIK
Ikan yang bertubuh relatif pipih sedikit melebar, moncongnya meruncing seperti sepat, tetapi jantainya (cambuk) sirip perutnya tidak seberapa panjang. Badan berwarna kecoklatan, dengan pinggiran hitam pada tiap-tiap sisiknya. Ekor dengan pola jala berwarna hitam. Ikan remaja dengan bercak hitam pada pangkal sirip punggung bagian belakang.

HABITAT
Ikan ini hidup di sungai, parit dan rawah-rawah.

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POTENSI
Konsumsi lokal

(a)

Sepat Siam

Trichogaster pectoralis (Regan, 1910)
F. Oshphronemidae



Sumber: Wikipedia
Gambar 3.31 Ikan Sepat siam

KARAKTERISTIK
Ikan yang liar biasanya berwarna perak kusam kehitaman sampai agak kehijauan pada hampir seluruh tubuhnya. Terkadang sisi tubuh bagian belakang tampak agak terang berbelang-belang miring. Sejalur bintang besar kehitaman yang hanya terlihat pada individu berwarna terang terdapat di sisi tubuh mulai dari belakang mata hingga ke pangkal ekor.

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Asia Tenggara, terutama di lembah Sungai Mekong di Laos, Thailand Kamboja dan Vietnam; juga dar lembah Sungai Chao Phraya[®]. Ikan ini diintroduksi ke Filipina, Malaysia Indonesia, Singapura, Papua Nugini

(b)

Figure 4. Example of revision, addition the types of fish in Kampar River, *Belontia hasselti* (a), *Trichogaster pectoralis* (b)

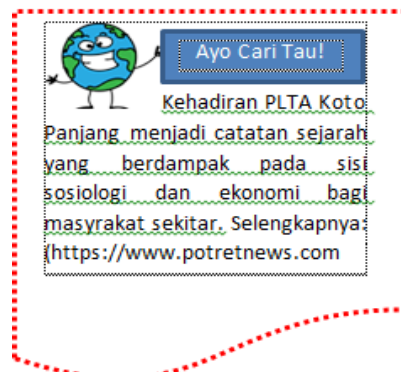


Figure 5. Example of revision, addition of website information related to the material

The result showed that the content eligibility was valid. According to Suwono et al. (2017), the appropriateness of the content in the textbook is included in contextual accuracy. Content eligibility is supported by the material presentation indicator that is also valid. The material presentation has followed the accuracy of the illustrations and variations in the presentation. According to Juita (2017), every material

presented must have the same composition. This is because each material has a different level of difficulty, so the presentation must be based on its difficulty level. Materials that have a high level of difficulty must be explained in more detail. The components of presenting the material are carried out coherently and systematically. Thus students will find it easy to use these learning resources and feel motivated to learn to use them. Several studies have shown that the content of a learning resource that is systematically arranged will help increase student motivation in learning (Suwarni, 2015) and also improve student literacy (Genlott & Grönlund, 2013; Handayani et al., 2018)

Scientific literacy skills can also be improved by paying attention to the characteristics, potential, and learning environment of students. The low level of scientific literacy on the quality of education in Indonesia is predicted to be due to a lack of attention to the socio-cultural environment as a source of learning (B. Setiawan et al., 2017). Local cultural values and norms known as local wisdom can be a fortress of literacy (Mazdalifah et al., 2019). Local wisdom cannot be separated from the development of values in society because it contributes and plays a role in the development of education (Dwianto et al., 2017). Dewi et al. (2019) stated that understanding local wisdom is rooted in learning. Local wisdom can be integrated into Biology lessons through a learning approach (Adinugraha & Ratnapuri, 2020). One effort to pour this local potential is in the form of the biology enrichment book of fish diversity in Kampar District.

The assessment of the language and graphic indicators in the enrichment book is categorized as valid. This is supported by easy-to-understand diagrams, as stated by Pratama et al. (2020). The language used in making learning resources is made simple, straightforward, easy to understand, and communicative. These factors will make it easier for students to use learning resources, such as the statement of (Suwarni, 2015). In addition, the language used is following the rules of writing books (standard) and uses terms that are under the concept of the subject matter. Illustrations and color selection are valid, so they are expected to attract students' attention to read them. It is known that the graphic design of a good product can reduce student boredom in learning (Fahmi et al., 2019).

After validation and adding some information to the enrichment book, it was continued to test the practicality of the book. A limited trial was conducted to see the practicality of the biology enrichment book of fish diversity in Kampar District. The practicality test consists of three aspects, namely: (1) content eligibility; (2) material presentation; and (3) language and graphics. The overall practicality test results can be seen in Table 4. The results show that the enrichment book has a very practical category (Mean=83.8) for the three indicators measured. Zainuddin et al. (2019) stated that practical learning resources can be seen from an attractive appearance, easy-to-understand explanations and sentences, and easy-to-translate images. In addition, the use of vocabulary and language that is easy to understand is a determinant of the success of the practical test (Hendriyani et al., 2020). Thus, the enrichment book has passed the practicality test and can be used for the next stage.

Table 4. Practicality test results

No	Indicators	Score	Category
1.	Content eligibility	83.3	Very Practical
2.	Presentation of Material	83.3	Very Practical
3.	Language and Graphic	84.7	Very Practical
	Mean	83.8	Very Practical

Due to the conclusion that the enrichment book is practical, the learning activities use the product. According to Fatmawati (2016) the validation of subject teachers to determine the practical value of enrichment books aims to find out the advantages or disadvantages of the book. Of course, all indicators are assessed to be able to provide input for book improvement. The enrichment book developed is expected to be able to help students improve their learning outcomes in the learning process. Enrichment books contain additional material that can support the use of student textbooks. Students get better knowledge by using enrichment books as reading material (Supriyatin & Ichsan, 2018). In addition, the integration of local potential in the form of fish diversity in the Kampar River is expected to build environmental awareness among students. This local potential must be preserved and integrated into education (Kurniawati et al., 2017; Yustina et al., 2018). Furthermore, Suarman et al. (2018) writes that the low quality of education in Indonesia is caused by the lack of attention to the accommodation of local potential by science curriculum developers in schools. Local potential can be a source of inspiration in learning and can also support contextual learning to teach science in schools. In the future, the use of local potential in this learning is expected to be one of the environmental conservation efforts.

CONCLUSION

The results showed that the product developed was categorized as very valid with several minor revisions. The practicality test resulted the score value with high practicality category (83.8). In addition, the results of development stage depicted that the biology enrichment book of fish diversity in Kampar District was categorized as strongly valid for each indicator measured. Thus, it can be continued to the next stage in term of implementation and evaluation in order to get the usable product for student as a contextual learning resource. It is hoped that in the future the use of this enrichment book can be one of the environmental conservation efforts.

ACKNOWLEDGEMENT

Highly gratitude to the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia for funding this research with No. 479/UN.19.5.1.3/PT.01.03/2020. The author would like to thank the LPPM (*Lembaga Penelitian dan Pengabdian Masyarakat* – Institute for Research and Community Service) of Universitas Riau and the Kampar Regency Education Office as partners, as well as the research team for their cooperation and participation.

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