

Diversity of fish caught by fishermen at Warido Amberimasi village: Development of supplement book for animal diversity course

Yakolina Rumbruren*, Insar Damopolii, Idola Dian Yoku Nebore

Universitas Papua, Indonesia

*Corresponding author, email: yakolinarumbruren@gmail.com

Submitted:
01-05-2022

Accepted:
26-05-2022

Published:
29-05-2022

Abstract: This study aimed to analyze the validity and student responses to the supplement book developed in the animal diversity course based on the identification of fish species caught by fishermen in Warido Amberimasi Village, Biak Numfor Regency. This development research refers to the ADDIE development model; this study is limited to ADD stage. Research subjects include 4th-semester biology education students at the University of Papua. The object of research is a complementary book. The instruments used to assess the validity and practicality of teaching materials include a validity assessment sheet by expert validator one and a validity assessment sheet by expert validator two. Based on the validity of the supplement book with validity criteria with a percentage value of 81.82% (very valid) and the results of student responses to supplement books with an average response value of 86.80% included in the very good category, the supplement book developed can be used as a reference in the student learning process Biology education for 4th-semester students at the University of Papua.

Keywords: Supplement book, diversity of fish, university, response

Abstrak: Tujuan penelitian ini yaitu menganalisis validitas dan respon siswa terhadap buku suplemen yang dikembangkan dalam mata kuliah keanekaragaman hewan berbasis riset identifikasi jenis ikan hasil tangkapan Nelayan di Kampung Warido Amberimasi, Kabupaten Biak Numfor. Penelitian pengembangan ini mengacu pada model pengembangan ADDIE, dalam penelitian ini hanya sampai pada tahap ADD. Subjek penelitian meliputi mahasiswa pendidikan biologi semester 4 Universitas Papua. Objek penelitian adalah buku pelengkap. Instrumen yang digunakan untuk menilai validitas dan kepraktisan bahan ajar meliputi lembar penilaian validitas oleh validator ahli satu, lembar penilaian validitas oleh validator ahli dua. Berdasarkan validitas buku suplemen dengan kriteria validitas dengan nilai persentase 81.82% (sangat valid) dan hasil respon mahasiswa terhadap buku suplemen dengan nilai tanggapan rata-rata sebesar 86.80% termasuk dalam kategori sangat baik, sehingga buku suplemen yang dikembangkan dapat digunakan sebagai acuan dalam proses pembelajaran mahasiswa pendidikan biologi mahasiswa semester 4 Universitas Papua.

Kata kunci: Buku suplemen, keanekaragaman hewan, universitas, respon

INTRODUCTION

Student-centered learning is when learning goals are met through a learning process that puts the student's creativity, skills, personal character, and needs first and teaches the student to look for and find information on their own (Obielodan et al., 2021). Learning may be enhanced by taking use of the natural surroundings (Cundill & Rodela, 2012; Ongon et al., 2021). Not only emphasizing the realm of learning resources that came from lecturers

and provided by the environment. This is supported by Mandasari et al. (2021); Musa et al. (2021); Rengiar et al. (2018); Zannah et al. (2022) stated that a real-life-oriented learning process can facilitate students' thinking, skills, and understanding. As a result, making use of the environment as a teaching resource has the potential to increase the learning and comprehension of students (Istiani & Retnoningsih, 2015; Raub et al., 2015). In addition, learning tools that accompany instructional materials may make it simpler for students to comprehend and develop knowledge, making it more likely that the ideas taught will be stored in long-term memory (Bahtiar et al., 2018; Husain et al., 2021).

The surrounding environment provides various levels of diversity. Diversity refers to variations in shape, body structure, color, and habitat in an area. One of the courses is to study animal diversity. This course studies body structure/morphology, identification based on morphological characteristics, basic taxonomy and classification, and invertebrate and vertebrate animal habitats. One of the main topics in the diversity of vertebrate animals is the Pisces class (fish). Based on the first interviews with several students learning in the animal diversity course at the Faculty of Biology Education, the University of Papua still focuses on media in the form of PowerPoint and articles, limited textbook discussions with universal examples, and examples of animals outside Papua. This is supported by the results of the second interview with several students who did not pass the animal diversity course about the unavailability of supplementary books so that students focus on materials and examples outside the Papua region. Observing the problems faced by students in the form of unorganized learning resources and not meeting the student's learning objectives, it is necessary to create a learning resource in the natural surroundings to assist in learning, one of which is in the form of a supplement book.

The learning process needs to be supported by contextual learning resources developed through scientific literacy. Books are one of the most widely used sources in the learning process. Efforts are being made to build scientific literacy by developing teaching materials in the form of research-based supplement books. Books developed from research are packaged with colored covers and accompanied by pictures of research results so that the material presented is more interesting to read. Supplementary books are additional books or complementary books containing certain materials in order to strengthen the understanding of students and lecturers regarding the material being taught. The supplement book aims to strengthen the concepts in the learning objectives to be achieved (Ferdyan et al., 2022; Sulistyawati et al., 2019). Therefore, one of the learning products that researchers want to develop to improve the learning process is to develop a supplementary book for animal diversity courses.

The development of supplementary books is very necessary to keep pace with the development of science and the development of education. The development of learning resources can be developed from the potential of the surrounding environment. Fish caught by fishermen have the potential to be used as an easy and interesting learning resource

because it is close to the daily lives of students so that the learning process is not only a communication interaction between lecturers and students but also creates a direct interaction between students and the object of study. Students may find it simpler to recall information and perform better if they make use of the world around them as a learning resource (Kasim et al., 2018; Raub et al., 2015; Sinambela et al., 2021). Local wisdom as a source of education has been shown to foster meaningful learning. When attending lectures, students can dig up information to add insight to learning by using research results as examples in the learning process.

The learning process on the topic of discussion based on research results supports more independent learning. The material in the supplement book can be developed based on research on actual things that originate from the surrounding environment (Primiani et al., 2020). Supplementary books are learning resources that can facilitate students to improve their understanding (Nugroho et al., 2021). Supplementary books become additional books for students when they learn scientific information related to local wisdom that students do not know (Muhdhar et al., 2021). Students' confusion and misunderstanding of the material is due to the fact that the books designed by the teacher are not contextual (Lelasari et al., 2021; Rumalolas et al., 2021), thus requiring a supplementary book that provides contextual scientific information (Supriyatin et al., 2020). Supplementary books help introduce the diversity of an organism to support the conservation process (Alegría et al., 2018).

Numfor Island is the main producer of seawater fish in the Biak Numfor district. The existence of Numfor Island is very supportive of life and livelihoods for the surrounding population, especially fishermen, as well as a potential source of material and a provider of employment opportunities as an economical source and source of protein for the surrounding community. Based on the results of observations of the types of fish caught by fishermen, it can also be used as an effort to improve student understanding by providing teaching materials in the form of supplementary books on animal diversity courses. The development of research-based supplement books is one of the activities that can broaden and deepen the material in an applicative way (Astuti et al., 2021; Aulia et al., 2021). Based on the results of observations, it is known that the development of research-based learning resources in the lecture environment is still limited, especially on the subject of animal diversity. This study aimed to analyze the validity and student responses to the supplement book developed in the animal diversity course based on the identification of fish species caught by fishermen in Warido Amberimasi Village, Biak Numfor Regency.

METHOD

The research was carried out from April to May 2021. Data collection and fish identification took place in Warido Amberimasi Village, West Numfor District, Biak Numfor Regency. Fish species that have not been identified will then be identified at the Laboratory of the Department of Biology, Faculty of Mathematics, and Natural Sciences of the

University of Papua. The development of the supplement book took place at the Faculty of Teacher Training and Education.

The type of research used in this research is research and development (research & development). The book is developed in the form of a supplement book based on research on the identification of fish species in animal diversity. The development of the supplement book uses the ADDIE development model, only up to the ADD (Analysis, Design, Development) stage.

The procedure in this research consists of field research for fish data collection and the development of a supplement book that utilizes fish identification research data using the ADD development model (analysis, design, development), described as follows; Analysis is conducting research to collect identification data on fish species caught by fishermen using fish identification books (Allen et al., 2003), related journals (Ohee, 2018) and Fishbase applications. The results of this fish identification research can be used as data for the development of a supplement book. In the design stage, the design development can be described in two stages, namely based on interviews with fishermen and preparing a plan to identify the type of fish after the researchers collect the materials needed. In the development stage, in the development stage, the researcher develops a supplement book to identify the types of fish caught by fishermen. This stage aims to produce supplementary books that are suitable for use in the learning process.

Supplement book validation analysis to determine the level of validation and attractiveness of supplement book products was carried out by trial. This data analysis technique is used by using information from quantitative and qualitative data in the form of responses and suggestions for improvement from material expert validation on three main components, namely content feasibility, presentation feasibility, and fish species components and media expert validation, including size, cover, and design. Supplement book content. Limited trial, to determine student responses to fish supplement books.

RESULTS AND DISCUSSION

This research resulted in a product in the form of a supplement book for animal diversity courses entitled "Diversity of Fish Captured by Fishermen in Warido Ambermasi Village, Biak Numfor Regency". The researcher conducted interviews with lecturers who were involved in animal diversity courses before conducting field research. The interview was guided by nine questions to survey the need for supplement books. The following data from interviews with lecturers in animal diversity courses via google form can be seen in each item in Table 1.

Researchers observed and identified the types of fish caught by fishermen directly on the spot/fishing boat. The observations made by this researcher are not only limited to researching and identifying the types of fish caught by the fishermen, but the researchers have also prepared questionnaires for interviews with the fishermen.

Table 1. Results of interviews with lecturers of subjects

| No. | Question | Answer |
|-----|---|---|
| 1. | What learning resources have been used in learning so far? | • Books, Videos, Slides, and Environments. |
| 2. | Are learning resources effective in helping learning activities? | • Yes. |
| 3. | What are the limitations of the learning resources used so far? | • Books are still limited in terms of quantity and updating. |
| 4. | Have students ever been invited to make direct observations? | • Yes. |
| 5. | What are the average student learning outcomes? | • Enough (>60). |
| 6. | What do students find difficult in studying animal diversity? | • Studying animals that have never been seen directly (e.g., Porifera) as well as distinguishing sub-phyla in the Chordata animals. |
| 7. | Have you ever made research-based teaching materials independently for biology learning in class based on potential in the environment? | • Never |
| 8. | What teaching materials do students need? | • Teaching materials in accordance with the potential in the surrounding environment. |
| 9. | How about using a research-based supplement book to support animal diversity lectures in the classroom? | • Research-based supplement books are very promising to be used as learning resources, especially if the research is related to the surrounding environment |

The interview was guided by twenty-one questions to survey research sites and product development needs in the form of supplement books. The following data are interviewed by researchers to fishermen, the interviews were carried out face-to-face with local fishermen. The author also collects data through documentation, in the form of pictures that the authors document directly from the research site. The following is a table of questions for interviews with local fishermen that will be conducted by researchers.

Table 2. Results of interviews with fishermen

| No. | Question | Answer |
|-----|-------------------------------------|---|
| 1. | What time is the tide on the beach? | • The tides on the beach are erratic but for some days the high tide in the morning starts until around 10 am to 3 pm low tide. |
| 2. | What fish do fishermen catch? | • Many types |

| | | |
|-----|--|---|
| 3. | What fish are characteristic of this area? | • The fish that characterizes this area is the baronan fish. |
| 4. | What factors affect the type of fish caught? | • Fishing gear, size of fishing gear, distance to fishing location. |
| 5. | What types of fishing gear do fishermen use to catch fish? | • Nets |
| 6. | What type of boat is used to operate? | • Most rowboats. |
| 7. | What types of fish are caught based on the highest harvest season? | • No harvest season. |
| 8. | Are there certain types of fish that are prohibited from being caught? | • There is no prohibition to catch fish, to catch the type of fish depends on the fishermen. |
| 9. | Is there a sasisen/ban on marine life? | • Yes |
| | If yes. When is the chassis done? | • Uncertain depending on the awareness of the fishermen. |
| 10. | How far is it to get fish from the shore? | • Distance between 50-100 m to get a shallow place. |
| 11. | When is the fisherman's operation time to catch fish? | • Uncertain sometimes at night, sometimes during the day, or in the afternoon. |
| 12. | How to determine the location of the capture? | • The fishing grounds are wide and fishermen are more likely to catch fish in areas where there is no estuarine current. The reason is that if the nets are anchored in a place with strong currents, the nets will drift or get caught in the coral reefs. |
| 13. | How long does it take for one capture? | • Time to catch fish is uncertain, if fish are caught for consumption, it doesn't take too long for fishermen to look for at least 2-3 hours, but if fish are produced, it takes a maximum of 3-6 hours for fishermen to catch fish. |
| 14. | Does distance affect the type of fish caught? | • Yes, the distance is about 30-60 m, the size is rather small, while the distance is 70-100 meters, 150 meters and the fish species are medium – large species. |
| 15. | At what distance is the most fishing? | • Uncertain |
| 19. | Do the rainy season and dry season affect fishing? | • Not very influential. |
| 20. | Can high and low waves affect the number of fish caught? | • It has no effect, because the location is an estuary, while in the sea it is crossed by an island so that the waves cannot affect the location of the fishermen's livelihood. |
| 21. | How many times does each fisherman operate during one month? | • Uncertain |

Based on the first question item in Table 2 and observations and identification of the types of fish caught by fishermen, the researchers combined them in the form of a supplement book for animal diversity courses which aims to attract students' interest, to study harder and introduce them to fourth semester students.

Based on the results of research and data collection of fish species identification using books and journals (Adrim, 2008; Allen et al., 2007; Allen et al., 2003; Allen, 1999; Kuiter & Tono-zuka, 2001a, 2001b, 2001c; Kuiter & Debelius, 2006; Ohee, 2018; Sulistiono et al., 2016; White et al., 2013), it is known that there are 15 species of fish caught by fishermen from 5 orders and 13 families, namely Acanthuridae (1 species), Belonidae (1 species), Mugilidae (1 species), Terapontidae (1 species), Mullidae (2 species), Lutjanidae (1 species), Scaridae (2 species), Epinephelidae (1 species), Haemulidae (1 species), Lethrinidae (1 species), Siganidae (1 species), Gerreidae (1 species), Stromateidae (1 species), are presented in Table 3.

Table 3. Types of fish captured by fishermen

| No | Order | Family | Genus | Species |
|-----|-----------------|---------------|----------------------|---------------------------------|
| 1. | Acanthuriformes | Acanthuridae | <i>Naso</i> | <i>Naso</i> spp. |
| 2. | Beloniformes | Belonidae | <i>Tylosurus</i> | <i>Tylosurus crocodilus</i> |
| 3. | Mugiliformes | Mugilidae | <i>Mugil</i> | <i>Mugil</i> sp. |
| 4. | Perciformes | Terapontidae | <i>Terapon</i> | <i>Terapon jarbua</i> |
| 5. | Perciformes | Mullidae | <i>Upeneus</i> | <i>Upeneus</i> sp. |
| 6. | Perciformes | | <i>Upeneus</i> | <i>Upeneus moluccensis</i> |
| 7. | Perciformes | Lutjanidae | <i>Lutjanus</i> | <i>Lutjanus</i> sp. |
| 8. | Perciformes | Scaridae | <i>Scarus</i> | <i>Scarus</i> sp. |
| 9. | Perciformes | | <i>Scarus</i> | <i>Cetoscarus ocelatus</i> |
| 10. | Perciformes | Haemulidae | <i>Plectorhincus</i> | <i>Plectorhincus</i> sp. |
| 11. | Perciformes | Gerreidae | <i>Geres</i> | <i>Geres punctatus</i> |
| 12. | Perciformes | Epinephelidae | <i>Epinephelus</i> | <i>Epinephelus multinotatus</i> |
| 13. | Perciformes | Lethrinidae | <i>Lethrinus</i> | <i>Lethrinus barak</i> |
| 14. | Perciformes | Siganidae | <i>Siganus</i> | <i>Siganus canaliculatus</i> |
| 15. | Perciformes | Stromateidae | <i>Pampus</i> | <i>Pampus argenteus</i> |

From the research data, it was then developed into a supplement book for animal diversity courses. The supplement book that was developed was then validated by two (2) experts/validators, namely validator one and validator two. The purpose of product validation is to determine the validity of the developed supplement book. Based on the results of the assessment of validator one and validator two, it shows that the supplementary book developed can be used with several revisions.

Table 4. Examples of validation and revision results



| Before | After Revision | Validator Comments |
|---|---|---|
|  |  | All orders are written in the order of 15 species |

Table 5. Validator assessment results

| No. | Aspect | (%) | Criteria |
|---------|--|-------|-------------|
| 1. | The contents of the book include competencies regarding the identification of types of fish caught by fishermen. | 75 | Valid |
| 2. | The content of the material presented is in accordance with the material for the vertebrate sub-phylum: Pisces class in animal diversity course. | 100 | Very Valid |
| 3. | The truth of the content of the material presented is in accordance with what happened. | 75 | Valid |
| 4. | The language used is in accordance with the students' thinking level, so that the flow of the material is easily understood by students. | 87.5 | Very Valid |
| 5. | The terms found in the supplement book are used correctly | 87.5 | Very Valid |
| 6. | Accuracy in the use of punctuation, for example the use of a period at the end of each sentence. | 75 | Valid |
| 7. | The unity and accuracy of writing sentences according to Indonesian spelling | 87.5 | Very Valid |
| 8. | The presentation of the image is attractive and proportional, not excessive in presenting the image. | 75 | Valid |
| 9. | The preparation of the supplement book starting from the cover, introduction, content and summary is presented in a coherent manner. | 87.5 | Very Valid |
| 10. | Selection of type and size of letters according to the age of the student. | 62.5 | Quite Valid |
| 11. | The images presented are related to the content of the material presented. | 87.5 | Very Valid |
| Average | | 81.82 | Very Valid |

Learning tools or supplementary books that have been designed are then validated by experts/validators. The validity of the developed supplement book is known based on the assessment of validator one and validator two. Based on the assessment of validator one in terms of competence or sub-competency aspects, the discussion of correct substance, level of language difficulty and coherent and complete systematics obtained an overall average result of 81.82% with very valid criteria. Supplementary books that are declared valid can be used in lectures (Masrur et al., 2017). Thus the supplement book that has been developed in terms of the assessment of validator one and validator two is classified as "valid" or it can be said that this supplement book is "fit" to be used with revision.

The results of the product feasibility test were measured from student responses to supplement books through a questionnaire with a Likert scale on google form which was distributed and collected from 36 student respondents. The results of this analysis show a positive response to the use of a research-based Animal Diversity course supplement book with the title: "Animal Diversity: Types of Fish Captured by Fishermen in Warido Amberimasi Village, Biak Numfor Regency", presented in Table 6.

Table 6. Feasibility analysis results based on student responses

| No. | Statement | (%) | Category |
|---------|---|-------|-----------|
| 1. | I can understand the content of the material well because the language used is light. | 81.94 | Very Good |
| 2. | I can understand the terms contained in the supplement book well because it is equipped with pictures and descriptions. | 88.88 | Very Good |
| 3. | The size and typeface in the supplement book are self-explanatory and easy to read. | 86.11 | Very Good |
| 4. | The pictures in the supplement book are clear and attractive. | 87.50 | Very Good |
| 5. | This supplement book makes it easier for me to learn and know the morphology of fish. | 89.58 | Very Good |
| 6. | I can know and understand how to measure fish (morphometric and meristic). | 84.02 | Very Good |
| 7. | I can understand foreign terms easily because of the glossary provided. | 81.94 | Very Good |
| 8. | Supplementary books according to student needs. | 84.02 | Very Good |
| 9. | I understand better when I read because there are pictures to explain the material. | 91.66 | Very Good |
| 10. | This supplement book can help me in studying the material, sub-phylum Chordata, Pisces Class on Animal Diversity Course | 92.36 | Very Good |
| Average | | 86.80 | Very Good |

The results of student responses to supplement books with an average total response value of 86.80 percent are included in the "very good" category, as shown in Table 6. The

findings of student responses to supplementary books with an average total response value of 86.80 percent are categorized as "very good." The percentage of these responses shows a positive response from students in understanding the contents of the supplement book independently. A good response from students shows that the supplement book is feasible to use (Peryana et al., 2021). The supplement book in this research was designed contextually, namely the catch of fishermen in Warido village. Learning that adapts to contextual problems makes students interested in learning and makes it easier for them to understand the material (Bhure et al., 2021; Ruto et al., 2021; Welerubun et al., 2022). The supplement book that was developed received a good response from students.

CONCLUSION

Based on the results of the study, it can be concluded that the supplement book for the Animal Diversity Course based on research on the identification of fish species caught by fishermen in Warido Amberimasi Village, Biak Numfor Regency, meets the criteria for the validity of the supplement book with a percentage value of 81.82 (very valid) and the results of student responses to the supplement book with a score of 81.82 (very valid). The average response of 86.80% is included in the very good category, so that the supplement book developed can be used in the learning process, especially animal diversity courses.

REFERENCES

- Adrim, M. (2008). Aspek biologi ikan kakatua (Suku Scaridae). *Jurnal Oseana*, 33(1), 41–50.
- Alegría, J. M. I., García, F. M., Saiz, J. C. M., & Mendías, C. S. (2018, May 24). A new Red Book supplement prepared by the Spanish Plant Conservation Society. *Proceedings of the 5th European Congress of Conservation Biology*. <https://doi.org/10.17011/conference/eccb2018/107808>
- Allen, G. R., Steene, R., Humann, P., & Deloach, N. (2003). *Reef fish identification: tropical Pacific*. New World Publications Incorporated.
- Allen, G., Steene, R., Human, P., & Deloach, N. (2007). *Reef Fish, Indentication*. Tropical Pacific. New World Publication, Inc.
- Allen, Gerry. (1999). *Marine Fishes of South-East Asia: A field guide for anglers and divers*. Periplus Editions.
- Astuti, Y., Zaini, M., & Putra, A. P. (2021). Development of Popular Scientific Book on the Type of Shrimp in Coastal Waters of Tabanio for Enhancing Critical Thinking Skills of Senior High School Students. *BIO-INOVED : Jurnal Biologi-Inovasi Pendidikan*, 3(1), 44. <https://doi.org/10.20527/bino.v3i1.9555>
- Aulia, I., Susanti, R., & Rusilowati, A. (2021). Development of Digital Encyclopedia Fish Diversity in The Auction of Tuban Fish As A Contextual Based Teaching Material Supplement. *Journal of Innovative Science Education*, 10(3), 319–324. <https://doi.org/10.15294/JISE.V10I1.45421>

- Bahtiar, W. A., Nunaki, J. H., & Iwan, I. I. (2018). Development of Biology Interactive Learning Multimedia on Animal Tissue Topic in The Class XI IPA in SMA Yapis Manokwari. *Inornatus: Biology Education Journal*, 1(1), 42–58. <https://doi.org/10.30862/inornatus.v1i1.26>
- Bhure, M., Welu, F., See, S., & Ota, M. K. (2021). The effort to enhance pupils cognitive learning achievement using contextual teaching and learning approach. *Journal of Research in Instructional*, 1(1), 13–22. <https://doi.org/10.30862/jri.v1i1.3>
- Cundill, G., & Rodela, R. (2012). A review of assertions about the processes and outcomes of social learning in natural resource management. *Journal of Environmental Management*, 113, 7–14. <https://doi.org/10.1016/j.jenvman.2012.08.021>
- Ferdyan, R., Arsih, F., Fadilah, M., Putri, D. H., & Razak, A. (2022). Validity of Digital-Based COVID-19 Preventive Supplement Book to Empower Scientific Literacy and Critical Thinking Skills of Senior High School Students. *International Journal on Integrated Education*, 5(3), 76–82. <https://journals.researchparks.org/index.php/IJIE/article/view/2811>
- Husain, B., Suhernita, S., Abasa, Z., & Djaguna, F. (2021). Task-based language teaching methods integrated with local wisdom: The impact on students' writing skills. *Journal of Research in Instructional*, 1(2), 123–132. <https://doi.org/10.30862/jri.v1i2.22>
- Istiani, R. M., & Retnoningsih, A. (2015). Pemanfaatan lingkungan sekolah sebagai sumber belajar menggunakan metode post to post pada materi klasifikasi makhluk hidup. *Journal of Biology Education*, 4(1), 70–80. <https://doi.org/10.15294/jbe.v4i1.5237>
- Kasim, Y., Katili, A. S., & Nusantara, E. (2018). Student book based on Coastal natural resources: A development research to raise student pro-environmental character. *Inornatus: Biology Education Journal*, 1(2), 75–80. <https://doi.org/10.30862/inornatus.v1i2.252>
- Kuiter, R. H., & Tono-zuka, T. (2001a). Pictorial guide to Indonesian reef fishes. Part 1 eels-snappers, Muraenidae-Lutjanidae. Zoonetics Australia.
- Kuiter, R. H., & Tono-zuka, T. (2001b). Pictorial guide to Indonesian reef fishes. Part 2, Fusiliers-dragonets, Caesionidae- Callionymidae. Zoonetics Australia.
- Kuiter, R. H., & Tono-zuka, T. (2001c). Pictorial guide to Indonesian reef fishes. Part 3, Jawfishes-sunfishes, Muracinidae-Lutjanidae). Zoonetics Australia.
- Kuiter, Rudie H., & Debelius, H. (2006). *World Atlas of Marine Fishes*. Hollywood Import & Export, Inc.
- Lelasari, T., Yohanita, A. M., & Damopolii, I. (2021). Effect of inquiry science learning on students' metacognitive skill. *Journal of Research in Instructional*, 1(1), 53–60. <https://doi.org/10.30862/jri.v1i1.12>
- Mandasari, F., Iwan, I., & Damopolii, I. (2021). The relationship between science process skills and biology learning outcome. *Journal of Research in Instructional*, 1(1), 23–32. <https://doi.org/10.30862/jri.v1i1.9>

- Masrur, H., Corebima, A. D., & Ghofur, A. (2017). Pengembangan buku suplemen mutasi gen pada mata kuliah genetika. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, 2(9), 1160–1167. <https://doi.org/10.17977/jptpp.v2i9.9925>
- Muhdhar, M. H. I. Al, Setyawan, D., Sari, M. S., Mardiyanti, L., & Minarno, E. B. (2021). Influence of supplement book implementation with project-based learning model on student communication skills in ethnobotanical courses. *AIP Conference Proceedings*, 030004. <https://doi.org/10.1063/5.0043108>
- Musa, J. H., Achor, E. E., & Ellah, B. O. (2021). Fostering achievement and retention in basic science using simulation and demonstration strategies. *Journal of Research in Instructional*, 1(2), 95–108. <https://doi.org/10.30862/jri.v1i2.19>
- Nugroho, A. S., Munzil, & Hamimi, E. (2021). Development of supplementary books for human respiratory system based augmented reality technology. *AIP Conference Proceedings*, 060001. <https://doi.org/10.1063/5.0043269>
- Obielodan, O. O., Onojah, A. O., Onojah, A. A., Alabi, O. S., & Alimi, E. A. (2021). The teachers' extent of utilizing teaching methods for teaching basic technology. *Journal of Research in Instructional*, 1(2), 61–70. <https://doi.org/10.30862/jri.v1i2.14>
- Ohee, H. L. (2018). Keanekaragaman Ikan di Selatan Papua. *Jurnal Biologi Papua*, 9(2), 74–83. <https://doi.org/10.31957/jbp.117>
- Ongon, S., Wongchantra, P., & Bunnaen, W. (2021). The Effect of Integrated Instructional Activities of Environmental Education by Using Community - Based Learning and Active Learning. *Journal of Curriculum and Teaching*, 10(2), 42–57. <https://doi.org/10.5430/jct.v10n2p42>
- Peryana, R., Anggraito, Y. U., & Widiatningrum, T. (2021). The Development of Supplement Book on Biodiversity Chapter Based on Dragonfly Diversity in Lusi Watershed. *Journal of Biology Education*, 10(1), 52–62. <https://doi.org/10.15294/jbe.v10i1.43414>
- Primiani, C. N., Prayitno, T. A., & Dinka, E. (2020). Developing of fish anatomy learning module based on local wisdom in Ngebel Lake, Ponorogo, East Java. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 6(2), 283–292. <https://doi.org/10.22219/jpbi.v6i2.11813>
- Raub, L. A., Shukor, N. A., Arshad, M. Y., & Rosli, M. S. (2015). An Integrated Model to Implement Contextual Learning with Virtual Learning Environment for Promoting Higher Order Thinking Skills in Malaysian Secondary Schools. *International Education Studies*, 8(13), 41–46. <https://doi.org/10.5539/ies.v8n13p41>
- Rengiar, J. A., Budirianto, H. J., & Krey, K. (2018). Team assisted individualization (TAI): The effect on students' cognitive learning outcomes. *Inornatus: Biology Education Journal*, 1(2), 95–101. <https://doi.org/10.30862/inornatus.v1i2.255>
- Rumalolas, N., Rosely, M. S. Y., Nunaki, J. H., Damopolii, I., & Kandowangko, N. Y. (2021). The inquiry-based student book integrated with local resources: The impact on

- student science process skill. *Journal of Research in Instructional*, 1(2), 133–146.
<https://doi.org/10.30862/jri.v1i2.17>
- Ruto, R., Mema, A., Nduru, M. P., & Ota, M. K. (2021). Contextual teaching and learning approach in social science: its role to encourage pupils' cognitive learning achievement. *Journal of Research in Instructional*, 1(1), 43–52.
<https://doi.org/10.30862/jri.v1i1.11>
- Sinambela, C., Sirait, S. H. K. N., Nasir, I. R. F., & Damopolii, I. (2021). Enhancing student achievement using the fungi learning media supported by Numbered Head Together learning. *Journal of Physics: Conference Series*, 1918(5), 052053.
<https://doi.org/10.1088/1742-6596/1918/5/052053>
- Sulistiono, Hestirianoto, T., Baksir, A., & Zahid, A. (2016). *Buku Saku Pengenalan Ikan Pulau Gebe - Maluku Utara*. PT Antam (Persero) Tbk.
- Sulistiyawati, A., Indriyanti, D. R., & Yuniastuti, A. (2019). Development of Research-Based Flowering Plants Catalog as a Supplement of Biology Teaching Materials in High School. *Journal of Innovative Science Education*, 8(2), 173–182.
<https://doi.org/10.15294/JISE.V0I0.27288>
- Supriyatin, S., Aulya, N. R., Ichsan, I. Z., Rahman, M. M., & Gomes, P. W. P. (2020). HOTS Analysis to Develop E-Supplement Book Based on Plant Physiology Research. *Universal Journal of Educational Research*, 8(12B), 8461–8466.
<https://doi.org/10.13189/ujer.2020.082654>
- Welerubun, R. C., Wambrauw, H. L., Jeni, J., Wolo, D., & Damopolii, I. (2022). Contextual teaching and learning in learning environmental pollution: the effect on student learning outcomes. *Prima Magistra: Jurnal Ilmiah Kependidikan*, 3(1), 106–115.
<https://doi.org/10.37478/jpm.v3i1.1487>
- White, W. T., Last, P. R., Dharmadi, Faizah, R., Chodrijah, U., Prisantoso, B. I., Pogonoski, J. J., Puckridge, M., & Blaber, S. J. M. (2013). *Market Fishes of Indonesia*. Australian Centre for International Agricultural Research (ACIAR) 2.
- Zannah, N. L., Damopolii, I., Iwan, I., & Rahman, S. R. (2022). Examining student learning outcomes on the topic of invertebrates through problem-based learning. *Inornatus: Biology Education Journal*, 1(2), 69–74.
<https://doi.org/10.30862/inornatus.v1i2.251>