

Development of a supplementary book based on research of the ground kangaroo (*Dorcopsis luctuosa*) for biology students in higher education

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Abstract: This research aimed to develop a research-based supplementary book on ground kangaroos (*Dorcopsis luctuosa*) as teaching material for the Mammalogy course. The study used the Research and Development (R&D) method with the ADDIE model. The subjects were Biology Education students from the Faculty of Teacher Training and Education, University of Papua, who were taking the Mammalogy and New Guinea Biota Conservation course. The research instruments included an expert validation sheet, a student response questionnaire, and learning outcome tests (pre-test and post-test). The expert validation results showed an average percentage of 81.35%, categorized as highly valid. Student responses averaged 92.43%, categorized as highly practical. The supplementary book effectively improved students' learning outcomes from an average pre-test score of 64.55 to a post-test score of 95.58, with an N-Gain value of 0.88. Therefore, the supplementary book based on ground kangaroo (*Dorcopsis luctuosa*) research is suitable for use as supporting teaching material in the Mammalogy and New Guinea Biota Conservation course.

Keywords: Conservation biology, ground kangaroo, supplement book

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Abstrak: Penelitian ini bertujuan untuk mengembangkan buku suplemen berbasis riset tentang kanguru tanah (*Dorcopsis luctuosa*) sebagai bahan ajar pada mata kuliah Mamalogi. Penelitian menggunakan metode *Research and Development (R&D)* dengan model *ADDIE*. Subjek penelitian adalah mahasiswa Pendidikan Biologi FKIP Universitas Papua yang mengontrak mata kuliah Mamalogi dan Konservasi Biota New Guinea. Instrumen penelitian berupa lembar validasi ahli, angket respon mahasiswa, serta tes hasil belajar (pre-test dan post-test). Hasil validasi ahli menunjukkan rata-rata persentase 81,35% dengan kategori sangat valid. Respon mahasiswa memperoleh rata-rata 92,43% dengan kategori sangat praktis. Buku suplemen efektif meningkatkan hasil belajar mahasiswa dari nilai rata-rata pre-test 64,55 menjadi post-test 95,58 dengan nilai N-Gain 0.88. Dengan demikian, buku suplemen berbasis riset kanguru tanah (*Dorcopsis luctuosa*) layak digunakan sebagai bahan ajar pendukung pada mata kuliah Mamalogi dan Konservasi Biota New Guinea.

Kata kunci: Biologi konservasi, kanguru tanah, buku suplemen

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INTRODUCTION

Current higher education instruction is geared toward producing graduates capable of integrating conceptual mastery with the ability to solve real-world problems through a contextual learning approach. In line with the implementation of Outcome-Based Education (OBE) and student-centered learning, teaching materials no longer function solely as sources of information but also as a medium connecting scientific concepts with learning experiences in the surrounding environment. According to Purwati et al. (2019) and Rahman et al. (2026), contextual teaching and learning helps students construct meaning by connecting the material they learn with their daily lives. Recent research findings indicate that contextual teaching materials based on local potential can improve students' learning motivation, conceptual understanding, scientific literacy, and critical thinking

skills, because the material learned is more closely connected to their environment and culture (Mumpuni et al., 2022; Murti et al., (2024); Sirait et al., 2024; Wibawa et al., 2023).

One of the most biodiverse places on Earth, Papua is home to thousands of plant and animal species, including several New Guinean unique species. This rich biodiversity represents a potentially valuable learning resource for biology education students, particularly in the mammalogy course. Nevertheless, this potential has not been fully realized in the creation of educational resources at universities. Most textbooks are general in nature and fail to integrate local research findings or the knowledge of indigenous Papuan communities. Yet, various studies have shown that locally sourced teaching materials are more effective in improving conceptual understanding, scientific skills, and conservation awareness than conventional teaching materials (Aji & Pujiastuti, 2022; Kasim et al., 2018; Masihi & Augustyn, 2021; Souliisa et al., 2026; Wambrau et al., 2025).

The mammalogy course not only discusses the classification and characteristics of mammals, but also aspects of adaptation, ecology, distribution, evolution, and conservation. Various studies have documented the richness of endemic Papuan mammal species, their ecological characteristics, distribution, and threats, which have the potential to be used as learning resources based on research results to enrich lecture materials while increasing biodiversity literacy and students' conservation awareness (Arobaya et al., 2026; Flannery & Jackson, 2026; Pattiselanno et al., 2020, 2022; Rumalolas et al., 2025; Vejmlka et al., 2025). However, this scientific information is still mostly presented in the form of research articles and has not been widely adapted into open materials that support the learning process in the Mammals course. Then, according to Ardiantiono et al. (2024), research in Papua is still relatively small compared to western Indonesia, so the opportunity to develop research-based learning resources is still very large. Thus, the need for research data on Papuan mammals is still greatly needed. The integration of Papuan mammal research results into teaching materials is expected to not only enrich lecture materials but also improve biodiversity literacy, scientific thinking skills, and student awareness of the importance of conserving endemic Papuan mammals.

One of Papua's endemic mammals, the kangaroo, has been documented in various studies showing its distribution and diversity patterns and finding that kangaroo populations face pressure from habitat loss and hunting. Mammal hunting practices in Papua are still influenced by food needs, culture, and socioeconomic conditions (Pattiselanno et al., 2023, 2024; Pattiselanno & Koibur, 2018). One endemic Papuan kangaroo with both ecological and sociocultural value is the ground kangaroo (*Dorcopsis luctuosa*). This animal plays a vital role in maintaining the balance of tropical forest ecosystems, but its population is increasingly threatened by hunting, habitat fragmentation, and land-use change. In South Sorong Regency, the Tehit Kna indigenous people know the ground kangaroo by its local name, Lau-lau, or Sampe, and possess traditional knowledge regarding its habitat, behavior, and uses. Although this information is invaluable as a research-based learning resource, there is currently no Mammalogy supplement book available that integrates field research findings on *Dorcopsis luctuosa* with local Papuan knowledge that not only helps students master the concept of mammalogy, but also has conservation literacy and concern for the preservation of the endemic kangaroo of Papua. This issue shows that there is a disconnect between the potential of local learning resources and how colleges use them.

Based on this situation, this study proposes a new approach in the form of developing a supplement book on mammalogy, compiled based on field research on ground kangaroos (*Dorcopsis luctuosa*) in Sira Village, Saifi District, South Sorong Regency, and enriched with local knowledge from the Tehit Kna indigenous community. This approach is expected to produce contextual, research-based teaching materials while supporting biodiversity conservation through education. Developing supplement book based on research findings is one strategy for linking scientific developments with the learning process. In biology learning, integrating biodiversity and local potential into teaching materials can provide more contextual learning because students study objects found in the surrounding environment. Various studies have shown that learning materials developed based on local potential have a high level of feasibility, improve conceptual understanding, and help students connect biological concepts with real-world conditions (Masihu & Augustyn, 2021; Ulya et al., 2022). Furthermore, integrating local potential into learning also contributes to increased biodiversity literacy, critical thinking skills, and awareness of biological resource conservation (Dini & Rini, 2024; Siregar et al., 2025). Therefore, developing supplement book based on research findings on Papuan mammal biodiversity is crucial to bridge research findings with learning needs while strengthening students' understanding of local fauna and conservation efforts.

Therefore, the development of a research-based supplement book on ground kangaroos is crucial to support the implementation of contextual learning in the Mammology course in the Biology Education Study Program at the University of Papua. This teaching material is expected to narrow the gap between theory and real-world conditions, strengthen the implementation of research-based learning, and enhance students' understanding of the diversity of endemic Papuan mammals. Therefore, the purpose of this study was to develop and test the feasibility of a research-based supplement book on ground kangaroos (*Dorcopsis luctuosa*) in Sira Village, Saifi District, South Sorong Regency, as a valid, practical, and relevant learning resource to support Mammology and Conservation of New Guinea Biota learning.

METHOD

This research is Research and Development which aims to develop a supplement book based on the research results of ground kangaroos (*Dorcopsis luctuosa*) as teaching materials for mammalogy courses. Product development uses the ADDIE (Analysis, Design, Development, Implementation and Evaluation) model developed by (Branch & Varank, 2009). The research was carried out in February 2025–January 2026. Field data collection regarding land kangaroos was carried out in Sira Village, Saifi District, South Sorong Regency, Southwest Papua, while the process of developing and testing supplement books was carried out at the Biology Education Study Program, Faculty of Teacher Training and Education, University of Papua. The research subjects included students taking courses in Mammalogy and Conservation of New Guinea Biota, while the research informants consisted of lecturers who taught the course and the indigenous people of Sira Village who had knowledge about land kangaroos.

The analysis stage is carried out through identifying the need for teaching materials by analyzing course learning outcomes, student characteristics, availability of learning resources, and local potential related to land kangaroos. Data was obtained through field

observations, semi-structured interviews with lecturers and indigenous communities, as well as documentation of the habitat, morphology and characteristics of land kangaroos. The design stage focuses on preparing a supplementary book framework which includes learning outcomes, materials, illustrations of research results, species pictures, exercises, and learning evaluation. Next, at the development stage, supplement books are prepared based on the results of field research and relevant scientific literature, then validated by material experts and media experts as validators. Input from validators is used as a basis for revisions until the product is declared valid and suitable for implementation.

The implementation phase was carried out through a real class with Biology Education Study Program students who attended the Mamalogy and Conservation of New Guinea Biota course to obtain information regarding the practicality and effectiveness of using supplement books in learning. The evaluation stage is conducted throughout each development step, incorporating adjustments informed by expert validation findings, student feedback, and implementation outcomes to ensure the final product meets standards of validity, practicality, and effectiveness. The data collection process included observation and expert-validation sheets, semi-structured interview frameworks, documentation, student response questionnaires, and evaluations of learning outcomes using pretests and posttests.

Descriptive, quantitative, and qualitative analyses were implemented to evaluate the research data. Qualitative data, including input and suggestions from students and validators, serve as the foundation for product enhancement. In the interim, quantitative data were collected from expert validation results, student response questionnaires, and learning outcomes. The percentage of scores obtained relative to the maximum score is used to determine the level of validity and practicality, which is then interpreted according to the validity and practicality categories. By comparing pretest and posttest results, the suitability of supplement books as teaching resources for the Mamalogy and Conservation of New Guinea Biota courses is evaluated in order to ascertain their value in improving student learning outcomes. The pretest, posttest, and Normalized Gain (N-Gain) results were used to analyze the supplement book's improved learning outcomes. N-gain analysis employing the formula from (Hake, 1998).

Calculating the validity of supplement book using a formula:

$$\text{Percentage} = \frac{\text{Score}}{\text{Total score}} \times 100 \quad (1)$$

Calculating practicality with formula:

$$\text{Percentage} = \frac{\text{Total score for each statement}}{\text{Number of respondents}} \times 100 \quad (2)$$

Table 1. Validity level category (Akbar, 2013)

Percentage (%)	Validity Category
85-100	Valid (without revision)
70-84	Valid (minor revision)
50-69	Valid (significant revision)
<50	Invalid

Table 2. Practicality level category (Nunaki et al., 2019)

Percentage (%)	Practicality Category
85 – 100	Very Good
70 – 84	Good
55 – 69	Enough
40 – 54	Less
< 40	Very Less

RESULTS AND DISCUSSION

The analysis phase was conducted to identify the need for developing a research-based supplement book for the Mammalogy course. Interviews with lecturers revealed that the teaching materials currently used are still dominated by general textbooks and do not include information on endemic Papuan mammals obtained from field research. As a result, students have difficulty integrating mammal concepts with real-world conditions in Papua.

Analysis of the Semester Lesson Plans indicated that material on mammal characteristics, classification, distribution in Indonesia, and endemic Papuan mammals requires more contextual learning resources. Field observations in Sira Village, Saifi District, South Sorong Regency, indicated that the ground kangaroo (*Dorcopsis luctuosa*) is an endemic species with potential for development as a learning resource. In addition to data on the animal's morphology, habitat, and behavior, information was also obtained on local names (Lau-lau/Sampe), food types, and utilization based on the knowledge of the Tehit Kna indigenous community. These findings formed the basis for developing a research-based supplement book. This research supports the findings of Sirait et al. (2024) stated that teaching materials based on local potential can enhance the connection between biology concepts and students' environment, thus making learning more meaningful.

Based on the results of the needs analysis, a research-based supplement book was designed and developed. The book is structured according to the learning outcomes of the Mammalogy course and consists of an introduction, material on *Dorcopsis luctuosa*, field research results, species documentation, exercises, a summary, a glossary, and a bibliography. The material is compiled by integrating field observations, research documentation, interviews with indigenous communities, and the latest scientific references.



Fig. 1. Cover and preface of supplement book

The book's design takes into account aspects of content, language, presentation, and graphics, resulting in open-ended material that is engaging and easy for students to understand. The integration of photographs from field research is one of the advantages of the supplement book, providing a more authentic learning experience compared to using illustrations from secondary sources. The product's validity was assessed by two validators, both lecturers from the Biology Education Study Program. The assessment covered aspects of content suitability, language, presentation, and graphics. Validation results are shown in Table 3.

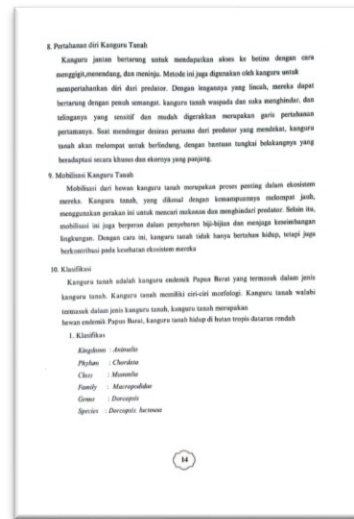
Table 3. Supplement book validation results

Validator	Percentage (%)	Category
Material validator	89.80	Valid
Media validator	72.90	Valid
Average	81.35	Valid

Validation results showed that the supplement book received an average score of 81.35%, categorized as highly valid as shown in Table 3. Some validator suggestions included improving the layout, consistency in writing scientific names, refining species classification, and improving the language. All of this input was accommodated through a revision process before the book was implemented with students. The high validity score indicates that the supplement book meets the standards for suitable teaching materials. These results align with research by Aji and Pujiastuti (2022) and Sirait et al. (2024), which reported that locally-based teaching materials have a high level of validity because they are developed based on learning needs and regional characteristics.



(a)



(b)

Fig. 2. One of the revised contents of the supplementary book related to classification: (a) before the revision there were several *Dorcopsis* species; (b) after the revision only the *Dorcopsis luctuosa* species.

The quality of the supplementary books in this study was not only indicated by the high validity scores, but also by the improvement process carried out systematically based on the recommendations of the validators as part of collecting evidence of product validity (Peeters & Martin, 2017). The validator's comments and revisions made of the supplementary book are summarized in the Table. 4.

Table 4. Validator's Comments and Revisions Made

No	Validator's Comments	Revisions Made
1	The cognitive level of the questions in the supplementary book is too low	Change the questions to raise the cognitive level
2	There are still many typos in the supplement book	Double-check the writing from the beginning to the end of the supplementary book to ensure it complies with Enhanced Spelling
3	Figure 1.1 in the supplementary book should include the source	Citing sources in Figure 1.1
4	Image of ground kangaroos can be added if possible.	Added ground kangaroo image

A post-learning student feedback questionnaire was used to gauge the supplement book's usefulness after it was deemed legitimate. Four students from the Mammalogy course and thirty students from the Conservation of New Guinea Biota course made up the 34 responders.

Table 5. Practicality test results

Respondents	Percentage	Category
College student	92.43	Very good

As shown in Table 5, supplement book is very good or highly practical. The practicality of supplementary book includes several things, namely ease of understanding the material, clarity of presentation, visual quality of the book, suitability of content to learning needs, addition of local knowledge, and understanding of scientific concepts. Students responded very positively to the use of supplement books. Aspects that received high ratings include ease of understanding the material, image quality, systematic presentation, and the relevance of the material to real conditions in Papua. Students also stated that documenting the results of field research made the material easier to understand compared to the textbooks used previously. These findings support the research of Damopolii et al., (2026), Mumpuni et al. (2022) and Wibawa et al. (2023) which shows that learning resources based on local potential are able to increase learning motivation, student involvement and learning independence.



Figure 3. Implementation of supplement books

Table 6. Improving learning outcomes of supplement book

Indicator	Value
Pretest Average	64,55
Posttest Average	95,58
Score Improvement	31,03
N-Gain	0,88
Category	High

The average pretest score of 64.55 increased to 95.58 in the posttest, representing a 31.03-point increase. The N-Gain calculation of 0.88 indicates a high category, suggesting that the supplementary book can enhance student learning results.

The deployment of the supplement book improved students' conceptual comprehension in the Mammalogy and Conservation of New Guinea Biota course, as evidenced by the fact that students' post-test scores were higher than their pre-test scores. This improvement not only demonstrates the effectiveness of the teaching materials in conveying information but also reflects the material's ability to help students develop a more meaningful conceptual understanding. Before using the supplement book, most students were only familiar with Papuan mammals through general explanations found in national textbooks, resulting in limited knowledge of local species. After using the supplement book, students gained more comprehensive information about Papuan mammal diversity, morphological characteristics, habitats, distribution, conservation status, and threats facing each species. This information broadened students' knowledge and made it easier for them to connect mammalogy concepts to real-world conditions in their surroundings. Learning that connects scientific concepts with local contexts is known to enhance conceptual understanding because students study subjects close to their own experiences, making the learning process more meaningful (Dwita et al., 2024; Masihu & Augustyn, 2021; Nurhidayati, 2024; Silahooy et al., 2024).

The characteristics of the supplement book were also important factors supporting improved student learning outcomes. The book not only presents theoretical explanations of mammal classification but also integrates field research findings on West Papuan mammals, which have not been widely available in lecture learning resources. The presentation of original photographs from field documentation, descriptions of the diagnostic characteristics of each species, distribution maps, ecological information, conservation status, and their relevance to local communities provides a more authentic learning experience than using a general textbook. The presence of these real-life examples helps students reduce the abstract nature of mammalogy material, making the concepts learned easier to understand and remember. Furthermore, students can identify mammal species they might encounter in Papua, making learning more contextual and fostering a sense of ownership of their region's rich biodiversity. This local-potential-based learning approach has been proven to increase learning motivation, student engagement, and learning outcomes because the material learned is directly relevant to the environment in which students live (Batigin et al., 2024; Damopolii et al., 2024; Purnama et al., 2025).

The results of this research suggest that integrating local potential into learning resources enhances students' capacity to relate mammalogy concepts to conservation issues. The supplement book provides information on Papuan endemic species, their protected status, threats from hunting and habitat change, and the importance of community-based conservation efforts. This presentation of material encourages students to not only memorize mammal characteristics but also understand the scientific reasons why these species need to be preserved. Thus, learning does not stop at the cognitive aspect, but begins to build conservation awareness as part of the competencies of prospective biology teachers. These results align with research showing that teaching materials based on local wisdom and biodiversity can increase knowledge and foster

conservation awareness because students study species native to their own environment (Damopolii et al., 2024; Jannah et al., 2026).

Theoretically, the improved learning outcomes in this study can be explained through the principle of contextual learning, which states that knowledge is more readily comprehensible when linked to students' authentic experiences. Students no longer study mammals merely as objects of classification, but as part of the Papuan ecosystem with ecological, scientific, and conservation value. This allows for deeper knowledge construction as students connect new information with their prior knowledge of their surroundings. Therefore, the use of supplement bookbased on research findings and local potential not only effectively improves learning outcomes but also strengthens the relevance of mammalogy learning to Papua's biodiversity, making the learning process more meaningful and applicable (Dwita et al., 2024; Hanida & Husna, 2023; Nurhidayati, 2024).



Figure 4. Post-test data collection

The improved learning outcomes indicate that the supplement book is able to help students understand the concept of endemic Papuan mammals by integrating field research findings with lecture material. Learning using real-world objects from the surrounding environment provides a more meaningful learning experience, making it easier for students to connect theory with field conditions. These results are consistent with the theory of contextual learning (Welerubun et al., 2022), which posits that learning is more effective when students engage with real-world experiences and correlate academic concepts.

The findings of this study also support the research of Damopolii et al. (2019), Rumbruren et al. (2022), and Sirait et al. (2024), which states that locally developed teaching resources enhance students' conceptual knowledge as well as their science process abilities, learning objectives, and concern for the preservation of local biodiversity. Thus, the supplement book based on ground kangaroo research is suitable for use as supplemental teaching material in the Mammalogy and Conservation of New Guinea Biota course because it satisfies the three primary indicators of development research, which are valid, practical, and effective.

CONCLUSION

This study successfully developed a research-based supplement book on ground kangaroos (*Dorcopsis luctuosa*) as teaching material for the Mammalogy and Conservation of New Guinea Biota course using the ADDIE model. The supplement book integrated field research findings, local Papuan potential, and indigenous knowledge, resulting in a

contextual learning resource. The results showed that the supplement book met the criteria of being highly valid, highly practical, and capable of improving student learning outcomes, with an N-Gaiin in the n high category. Utilizing local biodiversity research as teaching material can improve the quality of learning and support the implementation of research-based learning in higher education. In addition to contributing to strengthening Mammology learning, this supplement book also supports efforts to conserve endemic Papuan mammals through education. Future research is recommended to test the implementation of the supplement book on a broader scale and evaluate its impact on students' conservation literacy and scientific thinking skills.

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