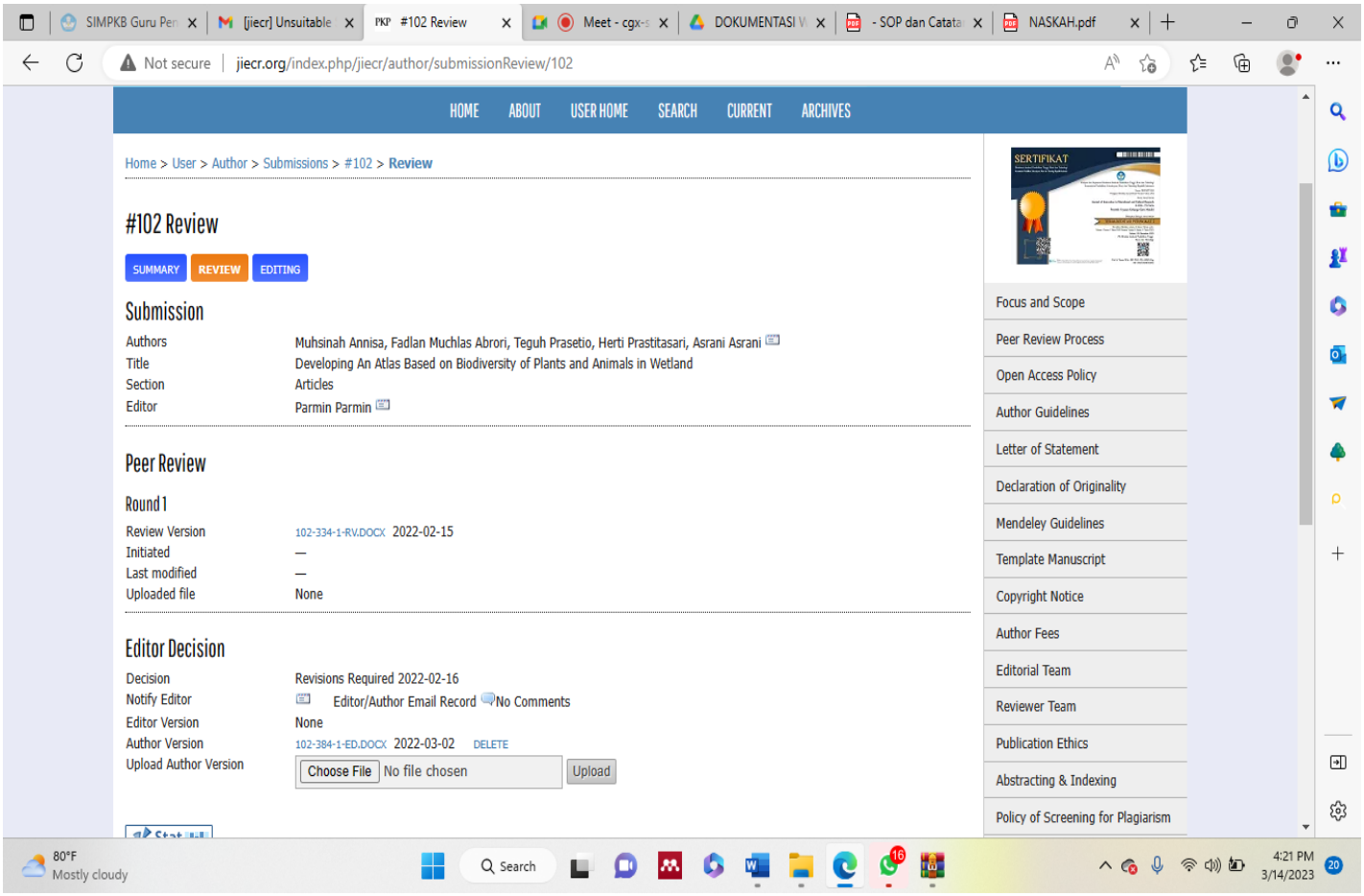
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Developing An Atlas Based on Biodiversity Of Plants And Animals In Wetland

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Abstract: This study aims to develop an atlas based on the wetland biodiversity of South Kalimantan. The development of the atlas in this research uses a 4-D development model, which consists of define, design, develop, and disseminate. However, the development stage only reaches the development stage. The instrument in this study consisted is Instruments at the research phase include species identification sheet, ecosystem identification sheet, and community interview sheet, and the other Instruments at the development phase include learning atlas validation sheets. The results of documentation and identification showed that there were 83 species of plants, animals, and plants, with details of 65% plant species and 35% animal species. Furthermore, related to the development of a learning atlas based on the assessment of content experts, media experts, and practitioners, scores above 90% were obtained and obtained valid criteria. Meanwhile, the assessment of linguists gets an assessment of 80 - 88% with quite valid criteria. The media atlas developed for further research can be applied to classroom learning to determine its effect on learning outcomes. Another thing that can be done is to change the atlas format in digital form so that it can be used virtually during the COVID-19 pandemic

Keywords: atlas , biodiversity, wetland,

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INTRODUCTION

Wetland island that is covered by water, either salt water, fresh water, or brackish water. swamps, ponds, lake edges, deltas, and lowlands which are always flooded, are part of the wetlands (WWF, 2019). Currently, a lot of wetland damage occurs due to the lack of attention from both the community, institutions, and government. This damage has resulted in several species extinction (Upadhyay & Chakraborty, 2016). Wetlands are divided into 3 groups: inland wetlands, coastal and marine wetlands, and artificial wetlands (Rubec, 1996, within PLBT Team, 1999). Meanwhile, based on the Ramsar Convention, wetlands are divided into the swamp, peatland, or water areas, both natural and artificial, permanent or temporary with water or flowing, fresh, brackish, or salty. It includes a deep marine area at low tide not more than 6 (six) meters (Dugan 1990).

One of the areas in Indonesia that have wetlands in South Kalimantan. The area of wetlands in South Kalimantan reaches 382,272 ha (Tavinayati, 2016). The existence of wetlands has a very important role in supporting biodiversity, water filtration, storm protection, and community social activities. The wide role of wetlands in society needs attention from various parties. (WWF, 2019; KLH, 2004). The long-term benefits of wetlands for humans are for the future security of humankind.

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Human well-being depends on the many benefits provided to them by ecosystems, some of which come from healthy wetlands (Amin, 2016). Based on this, Lambung Mangkurat University built a research center to preserve the wetlands (Dharmono, 2015).

Wetlands, as life support for various species (biodiversity hotspot), are where many species live and interact with one another. This diversity of species provides an overview of the ecological value of wetlands in communities. Farber et al. (2002) stated ecological value as a causal relationship between species in an ecosystem. For example, the Millennium Ecosystem Assessment (2003) states that on a global scale, different ecosystems and species play different roles in energy conversion, biogeochemical cycles, and evolution. Wetlands need to be analyzed the species that comprise them, as well as the species of ecosystems that are in them to determine their peculiarities with other wetlands.

Documentation of animal and plant species in wetlands needs to be introduced in the world of education, especially to students in elementary schools. The introduction of animal and plant species is a form of contextual learning. One of the most appropriate ways to introduce animals and plants to wetlands is through learning media. The use of media in the documentation of biodiversity is mainly done in both printed and digital forms. Documentation provides many benefits, especially in efforts to identify and conserve biodiversity (Vinay & Sathyaprakash, 2018).

One of the learning media suitable for use in elementary school learning is visual media. Visual media can provide a clear picture so that students can organize concepts better, compared to non-visual media (Abrori et al., 2016). Based on this, it is necessary to have media that emphasizes more on visuals, namely in the form of learning atlases. Atlas is a learning resource that presents complete and colorful images (Widodo, 2014). Generally, the atlas is used as a supplement media in the learning process (Kusuma et al. 2018). Atlas can also be used as an identification guide for practicum and field studies because it has a high level of visual detail (Perry & Mortan, 1998). Based on these advantages, the media atlas can be developed not only as a documentation medium but also as a medium that can be used as a companion to the main media in the classroom.

Research related to the use of the atlas in learning has produced many positive results. Lestari's research (2017) states that student responses related to atlas media obtained a percentage of 82.1%, and showed a good response. Also, Insiyah (2015) added that the learning atlas has a significant effect on student learning outcomes. The use of atlas in a broad scope is also starting to be utilized in a virtual reality environment (Gloy et al., 2022). Usage is also used in deep learning (Iqbal et al., 2019). Seeing the potential for atlases that have a broad impact, whether used face-to-face or virtual, the development of atlas as a medium for documenting and recognizing biodiversity is very potential. Based on this, the researcher hopes that the development of this atlas in the long term can be used continuously in classroom learning.

Based on this background, the purpose of this research is divided into 2 objectives. The first objective of this research is to identify the types of plants and animals that live in the wetlands. The identification results are related to the second goal, namely developing an atlas based on the results of the identification that has been done. This atlas will provide a contextual description because the content in the atlas is the result of research conducted in the environment around students.

METHODS

This study used a mixed-method approach, with the type of research and development defined as an effort to develop an effective product in the form of learning materials, media, learning strategies for use in schools (Gay, 1991; Van Den Akker et al., 1999). This development research model adapted the 4-D model by Thiagarajan et al. (1974) which is composed of 4 stages, namely define, design, develop, and disseminate. However, research is only carried out at the development stage. This is due to limited access during the COVID-19 pandemic. This research consisted of 2 phases. The first phase is the identification of species in wetland areas. The second phase is the development of a learning atlas based on the results of identifying species in wetlands as a learning medium for elementary school students in South Kalimantan.

The location in the study is the wetland area on Jalan Sungai Gampa, Sungai Jingah village, Banjarmasin. Species identification begins with an inventory carried out using an exploration technique that refers to Hartini within Nasari (2012), what is meant by exploration is taking every corner of a location that can represent the species. The sample in this study used purposive sampling which refers to Lubis (2009), the sampling is based on the presence of a species that is considered to represent the place, if the same species is found more than once then the species is not taken

because it is considered representative. After the inventory is carried out, the identification process is carried out according to Woldemariam et al. (2018), Wildlife Habitat Management Institute (2001), and related books and journals.

The development of instructional media in this study uses a 4-D device model (Thiagarajan et al. 1974), and modifications are only carried out until the third stage. First, the initial stage is defining stage. The purpose of this stage is to define the needs in the development process. It begins with an objective analysis of the limitations of the material being developed by the tool. Define stage divides these stages into 5 main steps, namely front end analysis, student analysis, task analysis, concept analysis, and formulation of learning objectives. Second, design stage consists of 3 steps, namely preparation of tests, selection of media or tools, and the initial media design. Third, development stage consist of expert validation and development trials. This research was only conducted at the validation stage. Validation of learning media by experts is followed by revisions in terms of validation tests of material/content, media, language, and practitioners.

The instrument in this study consisted of two parts, namely instrument for identification of plant & animal phase and instrument for product development phase. Instruments at the research phase include species identification sheet, ecosystem identification sheet, and community interview sheet. Next, instruments at the development phase include learning atlas validation sheets. In the validation questionnaire to analyze quantitative data in the form of an assessment questionnaire score by calculating the percentage of answers. The criteria for the validity of the validator assessment questionnaire data can be viewed from the percentage results of the criteria in Table 1. If the validation results get a value of> 67.18%, the learning atlas does not need to be revised and can be used as a learning medium.

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Table 1. Validity Criteria for Assessment Questionnaire Data

Value Scale	Description
85.94-100%	Valid (not revised)
67.18-85.93%	Quite valid (not revised)
48.44-67.17%	Less valid (revised)
25-48.43%	Invalid (revised)

Source: Suryabrata, 2014

RESULT AND DISCUSSION

Species of Plants and Animals in Wetlands

The wetlands on Jalan Sungai Gampa, Sungai Jingah village, Banjarmasin, are found several species of plants and animals. Overall, the diversity of animals and plants found and identified in wetlands was 83 species. The percentage distribution of plants and animals is presented in Fig 1.

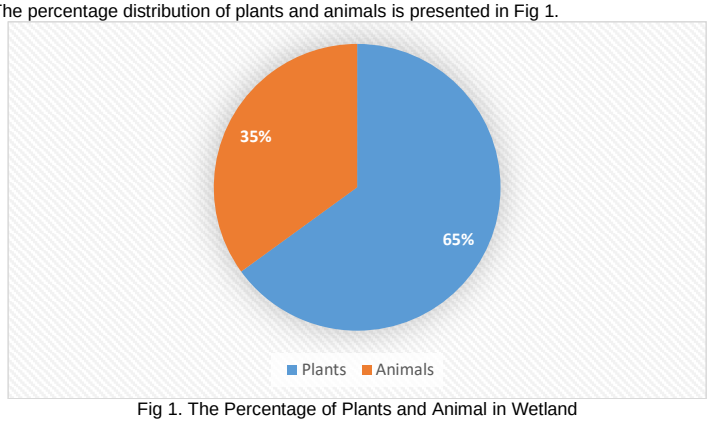


Fig 1. The Percentage of Plants and Animal in Wetland

From these data, it can be concluded that the species of plants found are more than the species of animal. 65% of plant species identified were at least 37 families. Plants are dominated by the family Poaceae, Convolvulaceae, Asteraceae, Arecaceae, and Araceae each of 3 species. On the other hand, from 35% species

of animals, data were obtained as many as 25 identified families. The dominant animals are 2 species of Cyprinidae (alum fish family), 3 species of Bovidae (split-toed animals), and 2 species of Apidae (honey bee) (Table 2).

Table 2. Diversity and Uniqueness of Plants and Animals in Wetland

1	Diversity	Plants diversity	5.5% of plants are Pteridophyta (ferns), and 94.5% are Spermatophyta (Plant with seeds)
		Animals diversity	37.93% of animals are Insects, 3.45% Molluscs, 13.79% Aves, 17.24% Mammals, 3.45% Amphibians, 10.34% Pisces, and 13.79% Reptiles
2	Uniqueness	Endemic plants	44.4% are endemic plants (Southeast Asia or Borneo), and the others are non-endemic plants
		Endemic animals	68,9% merupakan animals endemik, dan 31,1% merupakan animals non-endemik

Wetlands are a natural resource of global importance. As a place with high biodiversity, wetlands are protected and supported by the international agreement between the Ramsar Convention and the International Convention of Biology Diversity. Wetlands are one of the biodiversity hotspots for both plants and animals. This can be seen from the diversity of families of plant species found in the wetlands of Jalan Sungai Gampa, Sungai Jingah village, Banjarmasin. As an area that has been occupied by humans, the biodiversity in the research location is still very high. Based on the identification results of plants and animals, there were at least 83 species of plants and animals. The high number of species of plants and animals in wetlands is because wetlands are a place of transition of land and water. Bobbink et al. (2006) stated that wetlands contain abundant reserves of clean water used by plants and animals. Also, he added that wetlands as carbon dioxide sinks play an important role in supporting biodiversity.

The diversity of plants in wetlands can also be seen from the diversity of plants and animal families. At least from the grouping of 54 species of plants in wetlands, it is classified into 37 families. Most family species are Poaceae, Convolvulaceae, Asteraceae, Arecaceae, and Araceae. The five families that dominate are families whose use varies widely in society.

First, the Poaceae family is a family that is widely used as food and animal feed. Rice (*Oryza sativa*) is a type of the Poaceae family that is widely used as food and has been domesticated by the local community as an agricultural crop. As an important foodstuff, rice has been cultivated in Kalimantan as a swamp cultivation plant (Zohary & Hopf, 2000; Garris, 2004). Another type in the Poaceae family is Cogongrass (*Imperata cylindrical*). Weeds are widely used by the community as animal feed. Weeds as one of the most widely distributed grasses in Indonesia are used as animal feed, usually combined with Cipher grass (Family Cyperaceae) and legumes (Family Fabaceae) (Nurlaha et al., 2014). The last species of the Poaceae family that is used by the community is Lemon Grass (Cymbopogon citratus). Broadly, this plant is one of the important ingredients of Indonesian cuisine. This plant is not only used as a spice, but several communities in Asia use this plant as medicine (Rodrigues & Carlini, 2006).

Second, the family is mostly found in the Convolvulaceae family. Most of these plants are used as food plants by the community, except for Morning Glory (*Ipomoea Obscura*). Meanwhile, 2 other species of water spinach (*Ipomoea aquatic*) and Sweet Potatoes (*Ipomoea batatas*) are used by the community as food. Apart from being a foodstuff, widely the species in this family have been used by the community as a laxative (to facilitate defecation) (Van Valkenburgh & Bunyapraphatsara 2001). However, consuming too much of this plant will cause headaches, drowsiness, and falling asleep (Naples, 2005).

Third, the next largest family is Asteraceae. Several species such as False Daisy (*Eclipta prostrate*) are used as herbal medicines. False Daisy itself is used by the community as hair fertilizer. Not only in Indonesia, in Southeast Asia, but False Daisy is also widely used as a hair medicine (Sittichai & Chayan, 2014). False Daisy contains many important phytochemical compounds, coumestans, polypeptides, polyacetylene, thiophene, derivatives, steroids, sterols, triterpenes, and flavonoids (Chung et al., 2017). Other species of Asteraceae are used as insect repellent such as the Billygoat-weed (Ageratum conyzoides) plant. This plant contains pyrrolizidine alkaloids, lycopsaminw, and echinatine. These compounds are used to eradicate insects or insect pests (Ming, 1999; Panda & Luyten, 2018). The last species of Asteraceae is Wedelia (Sphagneticola trilobata) which is widely used by the community to cover land to avoid landslides.

Fourth, the next family is the coconut family or known as Arecaceae. Most of this family, such as coconut (*Cocos nucifera*) and sago palm (*Metroxylon sagu*), are used by the community as important food ingredients. Arecaceae is widely used in medicine and traditional ceremonies. As one of the important families in the plant world, the Arecaceae family has been widely used by humans from thousands of years ago, even today all parts of this plant can be used, including leaves, stems, and roots (Johnson, 1996).

The last family most commonly found is Araceae (taro family). This family is widely used by the community as ornamental plants. Of the 3 species found, all were ornamental plants. This plant is currently widely cultivated as an ornamental plant because it has a variety of patterns and shapes on its leaves. In addition to various patterns and shapes, the color of the leaves in this plant also varies. Not only is the green color distinctive on the leaves, but there are also several other colors such as white, pink, and other bright colors (Maretni et al., 2017). For example, the taro plant found is the Wayang Taro (Caladium sp.) Which has green leaves and white and pink hues.

The animals found in wetlands are dominated by 3 families, including 2 species of Cyprinidae (alum fish family), 3 species of Bovidae (split-toed animals), and 2 species of Apidae (honey bee). Cyprinidae is an important animal in wetlands. This family is a type of fish that is consumed in most parts of Eurasia. Many uses of this fish as dried fish or in fresh form (Nelson et al., 2016). Even some of these fish are the target of the community in fishing activities.

The next family that is mostly found is Bovidae or animals with split hooves. This animal has been domesticated by many local people like livestock. Cow (*Bos Taurus*), goat (*Capra aegagrus hircus*), and buffalo (*Bubalus bubalis*) are important families that are widely used as food for residents. The domestication of Bovidae has contributed to changing human activities from original hunter-gatherers to farmer-breeders. Bovidae is the largest herbivore species domesticated. Originally originated from Eurasia and has now been found all over the world (Feldhamer, 2007).

The last common animal family found is the Apidae (honey bee) family. There are 2 species of honey bees found, namely Apis cerana and Apis mellifera. These two species are the species of domestic honey bees whose honey is often used. In Asia, these two species are the largest species that are widely kept. In fact, besides being used for honey bees, this also helps farmers in the process of pollinating plants (Genersch, 2010).

Regarding the diversity of plants and animals in wetlands, very diverse data are obtained. Based on the research results obtained data of 54 species of plants and 29 species of animals. Based on the large grouping for plant species divided into 2, namely Pterydophyta (ferns) as much as 5.5% and the rest Spermatophyta (seed plants) as much as 94.5%. Actually, from Spermatophyta, it can be further reduced to Gymnosperms (open-seed plants) by 1.96%, and the remaining 98.04% are Angiosperms (closed-seed plants). Angiosperms can be separated again into dicotyle plants as much as 86%, and monocotyle as much as 14%.

Regarding animals, the data obtained were also very diverse, with details of 37.93% Insects, 3.45% Molluscs, 13.79% Aves, 17.24% Mammals, 3.45% Amphibians, 10.34% Pisces, and 13. 79% Reptiles. The high percentage of insect species in wetlands is because insect groups are the most common species in the world. The estimated number of insects in the world that have been identified is around 1 million species, where this number is 50% of eukaryotic (Stork, 2018). Several species of insects are important as an indicator that the area is still not polluted by pollution. For example, at the research location, 3 species of dragonflies were found, namely: Darner Dragonfly (Anax Junius), Needle Dragonfly (Agriocnemis Femina), and Red Dragonfly (Sympetrum fonscolombii). Dragonflies are an indicator of clean water cleanliness because, in the pupal phase, dragonflies can only live in clean water (Virgiawan, 2016).

On the criteria for the uniqueness of wetlands, the endemic plants obtained are around 44.4%. Endemic plants are grouped based on plants typical of Indonesia and Southeast Asia. Of the 44.4%, only one plant is truly a typical Kalimantan plant, and its origin is from Kalimantan. The plant is Rambutan (*Nephelium lappaceum*). Based on some data, the center of Rambutan genetic diversity is in Kalimantan, this can be indicated that the origin of this plant came from the Kalimantan area (Tindal et al., 1994; Windarsih & Efendi, 2019).

In contrast to the endemic animals which is less than 50%, the more endemic animals are around 55.6%. However, none of them characterize Kalimantan. Most of the animals are endemic to Indonesia or Southeast Asia. Some of the animals found are domesticated animals that have been raised or kept in Indonesia for a long time, such as cattle (*Bos taurus*), goats (*Capra aegagrus*

hircus), buffalo (*Bubalus bubalis*), duck (*Cairina moschata*), chicken (*Gallus gallus domesticus*), cats (*Felis catus*), honey bees (*Apis cerana* and *Apis mellifera*), doves (*Columba livia domestic*), and dogs (*Canis lupus familiaris*) (Smith et al., 2000; Whitfield et al., 2006; Bollongino et al. al., 2012; Naderi et al., 2008; Cockrill, 1977; Driscoll et al., 2007; Xiang et al., 2014)

Development Atlas

The development of learning atlas products is arranged based on several main topics as a means of introducing wetlands to elementary school students. There are 5 main topics arranged in the learning atlas which consist of the introduction of wetlands, interactions of living things in wetlands, domesticated plants and animals in wetlands, wild plants and animals in wetlands, and humans and wetlands. An example of a design from a learning atlas can be seen in Fig 2 to Fig 7.

The atlas assessment is carried out by 3 experts who will each assess 3 important aspects in the atlas. These important aspects consist of content, media, and language. The assessment of the contents of the atlas includes 2 types of criteria, namely content feasibility, and presentation feasibility. Furthermore, in the media assessment, there are 3 criteria assessed including book size, cover design, and content design. The final assessment of the language aspect includes 2 criteria related to language use and language accuracy. Overall, the results of the assessment of the 3 experts can be seen in Table 3, Table 4, and Table 5.

Table 3. Percentage of Ratings by a content expert

No	Criteria	Percentage (%)
1	Content feasibility	94.54
2	Presentation feasibility	90

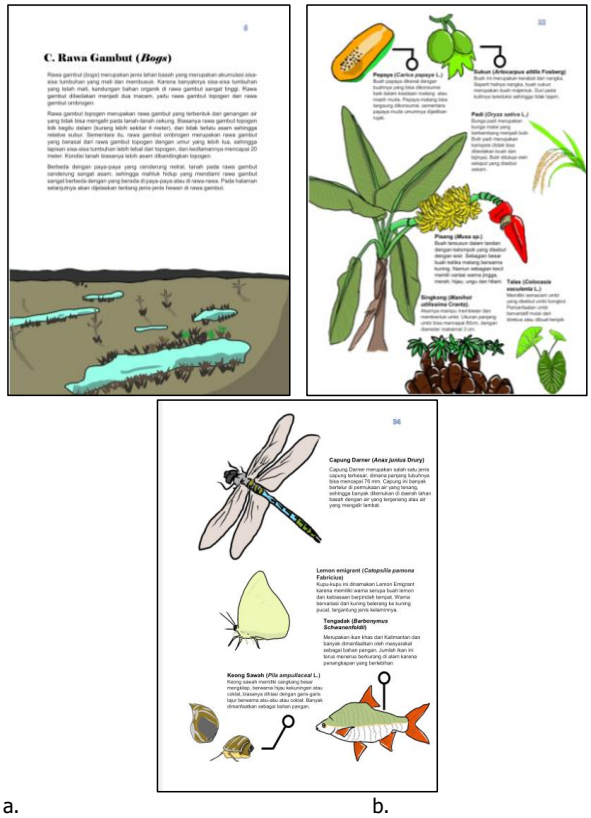
Table 4. Percentage of Ratings by media expert

No	Criteria	Percentage (%)
1	Book size	100
2	Cover design	91.11
3	Content design	95.71

Tabel 5. Percentage of Ratings by a language expert

No	Criteria	Percentage (%)
1	Language use	80
2	Language accuracy	88

Based on the assessment of content experts for the appropriateness of content and presentation, we get a data value of 90%. The appropriateness of the content can be seen from the relationship between concepts in the learning atlas. The concepts presented are also accompanied by illustrative images that are directly related to the concepts described in a section. The relationship between these concepts is important in a learning atlas. Schewendimann (2014) states that the relationship between concepts is very important in a science-related learning medium. To link concepts, it is necessary to start with an introduction first to take students to the core concepts that are the main part of an atlas. For example, in the learning atlas that was developed before describing the diversity of plants and animals, the first section of the atlas contains wetland types. After that, explain the types of plants and animals found in some of these wetlands (Fig 1).



a. b. c.

Fig 1. The contents of the Atlas: a) introduction of wetland types; b) plant species in wetlands; and c) types of animals in wetlands

An important element in the content that becomes an indicator of the feasibility of the content is the accuracy of the illustrations. The illustration is an important part as a supportive element that describes the text (Bland, 2010). Because of the importance of an illustration, the media that lacks illustrations in a text will affect students' motivation in enjoying the media (Bland, 2010; Bianquin & Sacchi, 2017). Atlas as a medium that emphasizes illustration has an advantage in this section. Illustrations that always accompany the text make the atlas emphasize more the important role of an illustration in attracting students' interest.

Regarding the feasibility of presenting, several very important things are the introduction of a learning medium. In this media atlas, the foreword is presented in the form of how to use the atlas (Fig 2). This is very important because there are several scientific terms in the naming of animals or plants that use Latin. This method of use also explains how to use the atlas, including looking at illustrated descriptions on each page, and other important information.

Fig 2. Introduction to the contents of the atlas (How to use the atlas)

The feasibility of presenting is also evident from the quality of the illustrations presented in the learning atlas. To ensure the quality of the illustrated images in the atlas, the images are developed independently so that they match the contents of the atlas. The image adapts the cartoon image to match the target of the media, namely elementary school students. The highlighting of images compared to text in the atlas adjusts to the characteristics of the atlas itself, where the image aspects in the atlas are more than the text (Abrori & Adhani, 2017).

Regarding the assessment from the media aspect. All aspects of the assessment place more emphasis on the appearance and design of the atlas. Similar to content assessments, assessments on the media aspect score above 90%. The appearance and design in a media are closely related to the visual attributes that will later describe the writer's themes and thoughts (Rao, 1974). Appearance and design are very important aspects in a media because the appearance and layout design of a media will affect the psychology of the reader (Gibson, 1989). Although there are no standard rules for design, there are certain conversions in making designs, especially atlases. In the design atlas, more emphasis is placed on the image. The design includes a wide range of meanings starting from the arrangement of writing blocks, fonts, cover images, and other sections in the layout of the book content (Bricker, 2011).

Assessment of the language aspect is another important thing after the assessment of content and media. Language plays an important role in conveying information in media. Assessment of language aspects includes language use and language accuracy. Overall the value of the language aspect of language use is 80%, and language accuracy is 88%. Moschonas (2018) states that the language in a media needs to be adapted to the target media. The media atlas developed uses simple communicative language that can be understood by elementary school students. Several scientific terms are used in the atlas, but at the end of each chapter, the meaning of these foreign terms is always explained so that the reader knows their meaning.

After the expert's assessment is carried out, the next judgment is from the practitioner. The practitioner's assessment is very important because the practitioner is the person who will later use the learning media. The practitioner's assessment includes 3 assessment criteria, namely easiness, attractiveness, and understanding (Table 6).

Tabel 6. Percentage of Ratings by the practitioner

No	Criteria	Percentage (%)
1	Easiness	93.84
2	Attractiveness	100
3	Understandable	100

In general, easiness and attractiveness are closely related to assessments from the media and language side. Meanwhile, understandable is more about content and language. This assessment is very important to help get direct input in the form of suggestions from practitioners who teach material related to the developed media daily. Overall, the practitioner's assessment is

in the range of 93.84 - 100% which means that the media developed has a very valid value based on 3 aspects.

CONCLUSION

Biodiversity diversity is very important to introduce in classroom learning, especially science learning. One of the potentials in the South Kalimantan area is the diversity of plant and animal biodiversity in wetlands. The introduction of biodiversity in this study was carried out through the development of a learning atlas. The results of documentation and identification of biodiversity in wetlands found at least 83 species of plants and animals with details of 65% plant species and the rest animal species. These results are then developed into a learning atlas, which are then assessed by experts including content experts, media experts, and linguists. Percentage of ratings for content and media get a valid value with a percentage above 90%. Meanwhile, for the assessment of linguists, the score is quite valid with a percentage of 80% and above. Apart from expert assessments also carried out by practitioners. The practitioners' scores get valid criteria with a percentage above 90%. The media atlas that has been developed for further research can be applied to classroom learning to determine its effect on learning outcomes. Besides, this learning atlas media can also be developed in digital form by changing the format of images and text, so that it can be used in the online learning process during the COVID-19 pandemic.

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