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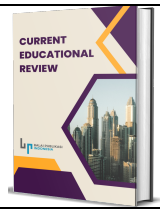

Research Trends in the Development of an E-booklet on Butterfly Species Diversity in Kerandangan Nature Park to Improve Science Literacy of High School Students: A Systematic Review

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Abstract: A Learning is an integral part of human life, enabling individuals to develop their potential and fulfil their needs through four pillars: learning to know, to work, to live together and to develop as a whole. Learning resources, which include everything that supports learning, play an important role in improving teaching effectiveness and enabling students to learn independently. This research examines the development of an Android-based butterfly diversity e-book as a learning resource to improve student learning outcomes and science literacy. The method used was descriptive analytical by analyzing 1,000 documents indexed in Google Scholar between 2015 and 2024. Results showed a significant upward trend in e-book-related publications after 2017, with some peaks in previous years. The data also shows that a large category of research is in the form of articles, with leading journals being the main source of publications. This research highlights the importance of developing innovative learning resources to support biodiversity learning, especially in the context of school teaching.

Keywords: Butterfly; E-book; Innovative learning

Introduction

Learning is an activity that cannot be separated from human life. Through the learning process, individuals can develop the potential they have from birth and adjust to fulfil their needs. There are four pillars in learning: learning to know, learning to do, learning to live together, and learning to develop as a whole (learning to be). When linked to the National Education Standards, these four pillars are aligned with the Education Process Standards (Susanto, 2021).

Learning resources are all things that can support the learning process (Karwono et al., 2018). Daryanto (2016) states that learning resources include everything around the learning environment, both designed and which can be directly used to improve the learning process and results. For educators, learning resources have many benefits, such as saving time in teaching, changing the role of educators to facilitators, and increasing the effectiveness and interactivity of the learning process. In addition, learning resources also serve as guidelines in teaching and tools to evaluate learning outcomes.

For learners, learning resources allow them to learn independently, anywhere and anytime, at a pace and sequence that suits their individual needs. It also helps them become more independent and provides guidance in the learning process (Prastowo, 2018). Learning resources have a very important role in learning activities. Some of its benefits include supporting learning activities, as well as adding and expanding material that may not be covered in the package book. The availability of learning resources is expected to

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overcome the problem of the breadth of subject coverage and limited learning time in schools.

Biodiversity includes all forms of life on earth, including plants, animals, fungi, microorganisms, and the various genetic materials they contain. In addition, this diversity also involves variations in the ecological systems in which these organisms live, which include variations and relative genetic variations of organisms that exist in various habitats, whether land, sea, or other waters. Biodiversity serves as an important resource that fulfils various human needs and determines the stability of ecosystems. Therefore, it is important for people, especially students, to understand the concept of biodiversity well. There are three levels of biodiversity, namely genetic diversity, species diversity, and ecosystem diversity (Khalimah et al., 2019).

The delivery of material on biodiversity, such as butterflies, through direct observation in nature is very important. However, there are several factors to consider, such as time and cost constraints. To overcome this, teachers can develop learning resources that focus on the surrounding environment (Siregar et al., 2017). Teachers need to create creative and innovative learning resources to attract students' interest and motivation, so that the material can be absorbed well. One solution that can be applied is to create an android-based butterfly field guide e-book, which can support the scientific learning process. Field guide books play an important role in the biodiversity learning process. With this book, it is expected that students can more easily identify various types of butterflies in the surrounding environment, so as to increase their interest and learning outcomes. Research by Pradana (2013) showed that field guide books are effective in helping students learn biodiversity material. In addition, this guidebook is an invaluable learning resource for students to identify certain species.

Method

This research method is descriptive analytical, which aims to understand and describe research trends regarding the development of android-based Butterfly Diversity E-books to improve student learning outcomes and science literacy. The data used in this study were obtained from information sources indexed by Google Scholar using analysis tools such as Publish or Perish and Dimension.ai. To conduct a search on Google Scholar, keywords related to research trends regarding development, E-books, Butterfly Diversity, and Science literacy. In this study, 1,000 documents indexed in Google Scholar between 2015 and 2024 were analysed. Google Scholar was chosen as the source of document searches because it applies consistent selection standards in indexing documents, and displays more documents than other leading databases, especially in education.

Result and Discussion

This study aims to describe the research trend on the development of butterfly diversity e-books to improve student learning outcomes conducted in 2015 to 2024. Figure 1 shows that the research trend on the development of e-books has increased from 2015 to 2016, but in 2017 research on the development of butterfly diversity e-books decreased significantly from 533 publications in 2017 to 396 publications. After 2017, there was the highest increase throughout 2015-2024, namely 1,665 publications. In 2019, there was also a drastic decrease, namely 374 publications. In 2020, there was another increase, namely 1,375 publications. In 2021, there was a decrease to 537 publications until 2023, it continued to increase.

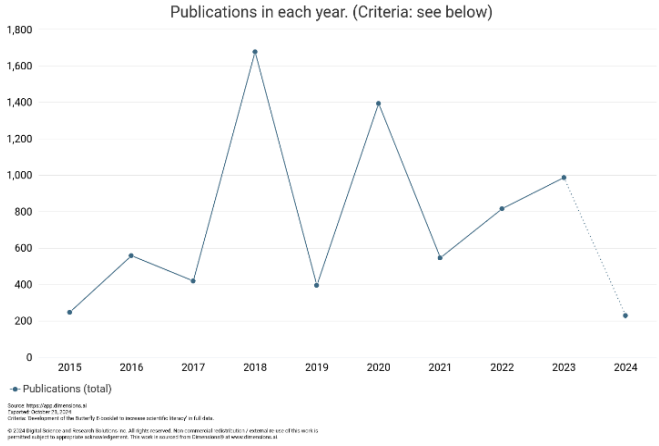

Figure 1. E-book development research trends

Table 1. Diversity Ebook Trends to Improve Science Literacy

Publications Type	Publications
Article	3.205
Monograph	8.523

Table 1 Research categories there are 2 categories found including education with a total of 11,728 publications, with articles 3,205 publications and monographs 8,523 publications. Many butterfly diversity E-book research trends are found in the form of articles. The development of biology learning resources is a must in an increasingly rapidly growing learning system. This is due to the increasing needs of students in line with scientific progress (Suhardi, 2012). Biology learning materials have dense characteristics, which require students to learn independently outside of face-to-face hours at school (Azrai et al., 2020). Therefore, it is important to pay attention to the development of biology learning resources so that the learning process can take place effectively and efficiently. Unfortunately, many teachers still rely on textbooks (Musniar et al., 2025; Pantiwati et al., 2024; Setianingrum et al., 2022).

Table 2 presents that the most published research sources regarding the development of e-books to improve students' science literacy.

Table 2. Top 8 Sources of E-Book Title Development on Butterfly Diversity to Improve Science Literacy

Name	Publications	Citation	Citations Means
Jurnal Penelitian Kualitatif dan Pendidikan	9	21	2.33
Inovasoi dalam pendidikan sains dan teknologi	4	111	27.75
Kegiatan Sains	3		
Metodelogi pengukuran dan penilaian pendidikan	3	71	23.67
Seri inovasi Pendidikan	3	8	2.67
Jurnal Ilmu Pembelajaran	2	2.369	1184.50
Jurnal pendidikan biologi	1		
Jurnal penelitian pendidipan IPA	1		

Table 2 shows that the most publication sources are in the Journal of Qualitative Research and Education. With 9 publications and 21 citations with an average citation of 2.33. as for the journal of qualitative research and education is a leading journal that focuses on qualitative research in education called the 'International Journal of Qualitative Studies in Education', often abbreviated as 'QSE', which publishes research using various qualitative methods to improve understanding and practice of qualitative research in education. The focus of the journal is to examine qualitative research methods in education, including ethnography, grounded theory, case studies, narrative analysis, and more. The journal also covers a range of educational contexts, including school and non-school environments.

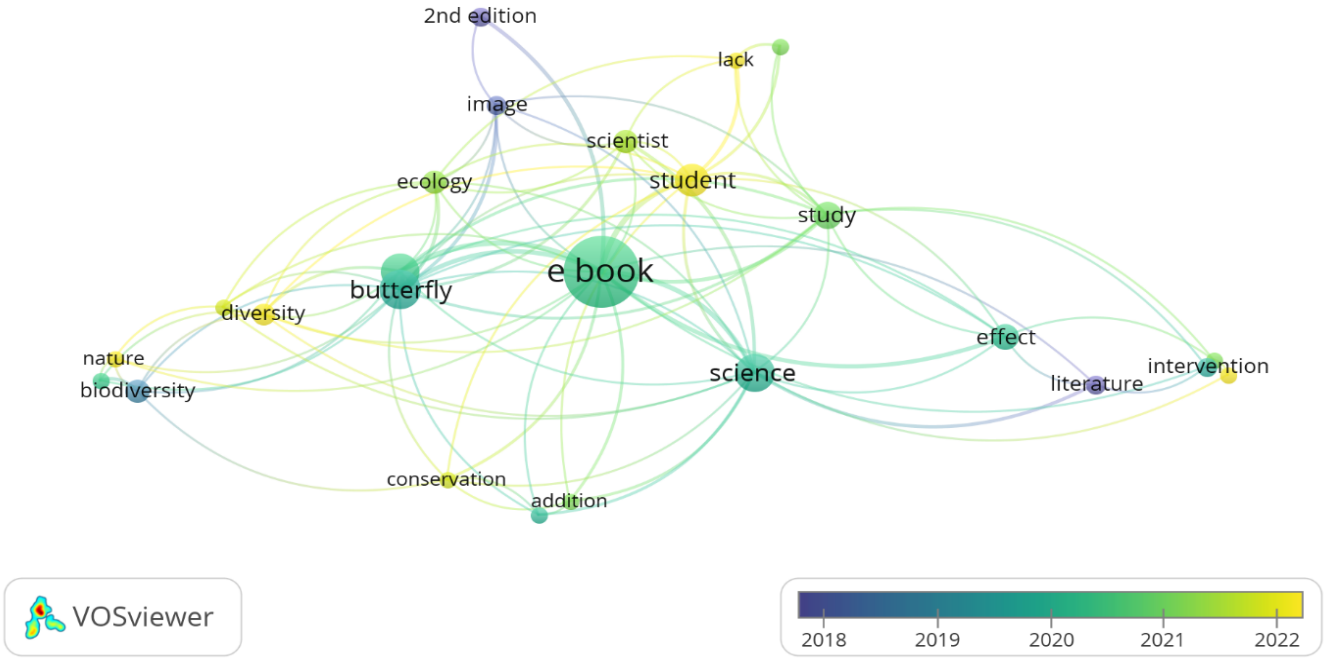

Figure 2. Visualization of e-book development network to improve science literacy

Figure 2 shows the network visualisation which shows the network between the terms being visualised. The keywords classified into 3 clusters are arranged in a variety of colours indicating interconnected divisions. Each keyword is marked with a circle, the size of the circle is positively related to the appearance of the keyword in the title and abstract (Husaeni et al., 2022). Therefore, the size of the circle is determined by the frequency of occurrence, the more often the keyword is used, the larger the circle will be (Hufiah et al., 2021).

Conclusion

This study successfully described the trend of butterfly diversity e-book development in the context of improving student learning outcomes from 2015 to 2024. It was found that although a thickness occurred in the number of publications, the overall trend showed a significant increase after 2017, peaking with 1,665 publications. The research category was dominated by articles, and the main source of publications came from leading journals in the field of education. These findings

emphasise the importance of developing learning resources, such as e-books, in supporting biology learning, especially in meeting the increasing needs of students along with scientific advances. Therefore, the development of creative and innovative learning resources is needed to improve the effectiveness and efficiency of the learning process.

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