

Development of Biodiversity Encyclopedia Based on Flipbook to Improve Student Learning Outcomes in Senior High School 6 Samarinda

Sutiwi¹, Elsje Theodora Maasawet^{1*}, Muh. Amir Masruhim², Usman², Herliani¹, Ahmad¹

¹Master of Biology Education Study Program, Faculty of Teacher Training and Education, Universitas Mulawarman, Samarinda, Indonesia.

²Master of Chemistry Education Study Program, Faculty of Teacher Training and Education, Universitas Mulawarman, Samarinda, Indonesia.

Received: May 19, 2025

Revised: June 12, 2025

Accepted: July 25, 2025

Published: July 31, 2025

Corresponding Author:
Elsje Theodora Maasawet
emaasawet@gmail.com

DOI: [10.29303/jppipa.v11i7.11660](https://doi.org/10.29303/jppipa.v11i7.11660)

© 2025 The Authors. This open access article is distributed under a (CC-BY License)



Abstract: This study aims to develop a flipbook-based encyclopedia on the biodiversity of the Plantae kingdom for Grade X students at SMAN 6 Samarinda to enhance their learning outcomes. The research employed the ADDIE development model, which includes five stages: Analysis, Design, Development, Implementation, and Evaluation. A total of 30 students participated in the implementation stage. The effectiveness of the product was evaluated using a one-group pretest-posttest design. Data were collected through interviews, needs analysis questionnaires, expert validation sheets, teacher assessments, student response questionnaires, and pretest-posttest multiple-choice questions. The feasibility results from experts comprising material, media, and language specialists showed high validity, with scores of 91.75, 78.88, and 90% respectively, indicating the product is "very feasible" for use. Student response data also supported this, with a practicality score of 89.6%, suggesting students found the encyclopedia engaging and beneficial. Furthermore, the N-gain analysis revealed a high effectiveness category, with an average gain score of 0.81. These results suggest that the developed flipbook-based encyclopedia effectively supports improves student learning outcomes in biology, particularly in the biodiversity topic.

Keywords: ADDIE; Biodiversity; Encyclopedia book; Flipbook

Introduction

Indonesia is known as one of the megadiversity countries in the world, namely a country that has a very high level of biodiversity. Indonesia's biodiversity includes various types of flora and fauna spread across various ecosystems. This diversity not only has ecological value, but also very high economic, cultural, and educational value. Biodiversity is an ecological complex that includes all forms of life, including animals, plants, microorganisms, ecosystems, and various related ecological processes (Ramadhani et al., 2024). To maintain the sustainability of existing biodiversity, several schools have held an Adiwiyata school assessment program. Adiwiyata School is a collaborative program between the Ministry of

Environment and the Ministry of Education and Culture (Kemdikbud, 2013). However, public awareness, especially among the younger generation, of the importance of preserving biodiversity is still relatively low. One of the main causes of this problem is the lack of understanding and involvement of students in studying biodiversity contextually and meaningfully. Biodiversity learning usually focuses on material that is already in textbooks and is less able to display the richness of Indonesia's biodiversity (Putri et al., 2023).

Based on the results of the researcher's interviews with 5 Biology teachers in 5 different schools, namely SMAN 4 Samarinda, SMAN 6 Samarinda, SMAN 14 Samarinda, SMAN 17 Samarinda, and SMAN SKOI Samarinda, it can be concluded that student learning outcomes for Biology material are quite good, but from

How to Cite:

Sutiwi, S., Maasawet, E. T., Masruhim, M. A., Usman, U., Herliani, H., & Ahmad, A. (2025). Development of Biodiversity Encyclopedia Based on Flipbook to Improve Student Learning Outcomes in Senior High School 6 Samarinda. *Jurnal Penelitian Pendidikan IPA*, 11(7), 340-347. <https://doi.org/10.29303/jppipa.v11i7.11660>

the 5 schools in practice, not all students can recognize plants around them. This can be seen from the results of filling out the needs analysis questionnaire that they get to know plants in various ways beyond their abilities, namely 18% of students by looking at the internet, 4.5% of people by asking their parents, 23% of students by looking at learning resources such as books or scientific papers and 55.5% with their abilities such as seeing it and the characteristics of the plant. This shows that student learning outcomes need to be improved again. Improvements in learning activities need to be made so that student learning outcomes can improve (Hidayatullah et al., 2018).

One of alternative that can be used is the development of learning media in the form of a digital flipbook-based biodiversity encyclopedia. Flipbooks are interactive technology-based teaching materials that contain text, sound, video, and animation and can encourage student activity in the learning process (Cahya & Bektiningsih, 2024). Flipbooks are a digital version of a book, but the presentation is more attractive because of their colorful design and sound effects when turning pages (Jayanti & Setyasto, 2024). Flipbooks can be used as teaching materials for students individually or in groups, and flipbooks are practical and can increase student enthusiasm and interest (Hardiansyah & Mulyadi, 2022; Kusumasari et al., 2022; Nugraha & Rachmadiarti, 2022; Lestari et al., 2024; Rahmawati & Sunarso, 2024; Sari et al., 2025). The advantages of flipbook learning media are that they can convey learning topics briefly, can be used anywhere, are practical, and can increase students' enthusiasm and interest in learning (Wilujeng & Hidayatullah, 2021; Rida et al., 2025). Flipbooks can improve learning outcomes and strengthen character.

Teachers at the school have never used digital books as a learning support, so that a balance is obtained in the form of learning resources from books, teachers, and the environment around students to improve student learning outcomes. Flipbook is a multimedia resembling an e-book that can display books like real forms with additional sound effects, videos, and pages that can be opened like reading a book on the screen, so that it is more interactive and can be accessed via smartphones and computers (Sumarmi et al., 2021; Talitha et al., 2023). The results of interviews and needs analysis show that students have never studied using encyclopedia books. Encyclopedia books already exist, but at SMA Negeri 6 Samarinda, the books are located in the library and have not been fully used in Biology learning, especially the biodiversity material, because the scope is too broad. So, the development of flipbook-based encyclopedia books on biodiversity material is very much needed.

Based on these problems, this research has a novelty in the development of learning media in the form of an

interactive digital flipbook-based biodiversity encyclopedia, specifically designed to improve student learning outcomes in the Kingdom Plantae material. This media was developed using the ADDIE model and validated by experts from three fields materials, media, and language thus ensuring the appropriateness of the content and its usability in the learning process. Another novelty lies in the combination of visual literacy with a lightweight digital approach to facilitate students' understanding of complex and often boring biology material in conventional text form. This study also explicitly measures the impact of media on student learning outcomes using a one-group pretest-posttest design and N-gain analysis, which is rarely done in the development of similar media. In addition, this study contributes to enriching the literature on the development of contextual learning media, especially in the East Kalimantan region, where studies on the integration of locally based digital technology are still limited.

Method

The type of research used in this study is Research and Development (R&D). This research and development are a systematic procedure used to develop certain products, test certain products, and the end of this research is to produce a certain product (Sugiyono, 2019). This development research uses the ADDIE model. The ADDIE model consists of 5 stages, according to its name, namely analysis, design, development, implementation, and evaluation stages (Kiswandini et al., 2023).

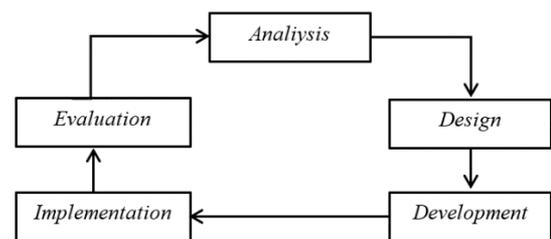


Figure 1. ADDIE model stages

The trial design in this study is divided into two stages, namely validity testing and product testing. Validation testing in this study will be carried out by expert validators, including Biology material experts, media experts, and language experts, through validity instrument sheets. While the product trials in this study are two, namely, small groups and large groups. The instruments used to collect research data are in the form of student needs questionnaire sheets, interview sheets, validation sheets, student response questionnaires for product practicality, and pretest and posttest questions. Analysis of research data using quantitative descriptive and N-Gain Test.

Result and Discussion

Result

This study is research on the development of a flipbook-based biodiversity encyclopedia book at SMA Negeri 6 Samarinda. In the initial stage (analysis), interviews were conducted with Biology teachers from five senior high schools or equivalent in the Samarinda area. The results of the interviews showed that biodiversity flipbook learning media had never been developed and implemented. Most of the media used were textbooks and materials from Google (internet). In addition, data at the analysis stage were obtained by filling out a needs analysis questionnaire by students from the five schools. The needs analysis questionnaire was given in the form of a Google form and filled out by 203 students. The data from filling out the questionnaire showed that students were bored with the existing learning media (textbooks). When asked about flipbooks, all students knew about it, and when the concept of flipbook media was explained, almost all students were interested in the biodiversity flipbook media. Therefore, this analysis stage is used to analyze three parts, so that the reasons for making the product are very strong, including analysis of student characteristics, curriculum analysis, and analysis of technological developments.

In the second stage (design), a follow-up is carried out from the results of the analysis stage. Activities at this stage are based on the results of filling out the needs analysis questionnaire, teacher interviews, and needs analysis. Before designing the biodiversity flipbook media, data collection and grouping of all plants in the school environment were also carried out. Furthermore, a media framework or systematic writing of the book to be developed was made, namely, making a flowchart to make it easier for researchers to compile media in the form of a flipbook-based encyclopedia book. The format chosen in compiling the book follows the rules for compiling an encyclopedia. Information in the encyclopedia is presented in various articles or subjects arranged alphabetically in the alphabet A-Z (Nuryanti et al., 2019). The initial format of the encyclopedia in full is the cover page, foreword, table of contents, morphology and benefits of plants from the alphabet A-Z, bibliography, and back cover page.

Next is the development stage, which includes several activities, namely making a product prototype, testing the feasibility with material experts, media experts, language experts, and teacher assessment tests. The first step in this stage is to change the background of the book's contents, which are still plain, with the results of the page background design that the researcher has designed in the Microsoft Word Application. The use of page backgrounds on the

contents of the book is to beautify the appearance so that readers do not get bored and attract readers' interest. After that, combine the front and back covers with the contents of the book, which are then saved in PDF format so that when the PDF file is converted into a flipbook, it is not messy. The process of changing the results of making a biodiversity encyclopedia book, which is still in PDF format, to flipbook format utilizes the website on FlipHTML5. The results of the biodiversity flipbook are as shown in the following image.



Figure 2. Flipbook interface

After the editing process of the PDF file on the FlipHTML5 website has been completed, so that the design results can be seen and used by others, the steps that must be taken are to use the share feature on the website, then select copy link or download the QR code from the editing results. Furthermore, a feasibility test is carried out by material experts, media experts, and language experts. The results of the feasibility test are shown in Table 1.

Table 1. Results of the material expert feasibility test

Aspect	Indicator	Percentage (%)	Category
Material	Curriculum	91.75	Very feasible
	Material		
	Content Suitability		
Media	Language	78.88	Feasible
	Media Presentation		
	Graphics		
	Display		
	Navigation		
Language	Utility	90.00	Very feasible
	Communication		
	Dialogic and interactive		
	Straightforward Use of terms and symbols		

After the flipbook media is validated, the next stage is product implementation. This implementation stage is divided into two tests, namely a practicality trial to determine the response of students and a product effectiveness test for students to determine the level of

product effectiveness in improving students' learning outcomes. This practical trial was conducted in class X-H with an attendance of 30 students. Students were given a flipbook link to the Kingdom Plantae biodiversity book. Then, students were asked to try and read the contents of the flipbook. Furthermore, students were given a response questionnaire to the product being developed. They were invited to fill out the questionnaire while trying the product. The practicality test results data are presented in Table 2.

Table 2. Data and results of practicality trials

Aspect	Percentage (%)	Category
Media Presentation	90.20	Very feasible
Graphics	88.60	Very feasible
Usefulness	90.10	Very feasible
Average	89.60	Very feasible

Effectiveness test was conducted using a large group. The research instruments used in this test were pretest and posttest questions. This test was conducted in class X-G SMAN 6 Samarinda, which was attended by 30 students. The implementation of the effectiveness test began with the provision of a pretest before students were given learning treatment with the flipbook learning resource "Encyclopedia of Diversity of Kingdom Plantae at SMAN 6 Samarinda". After the pretest was completed, students were taught using the flipbook resource that had been developed, and after the learning was completed, they were given posttest questions to see the effectiveness of the product in student learning outcomes. The next step is the pretest and posttest value data is analyzed using the N-Gain test to determine the increase student learning outcomes. The N-gain calculation uses Microsoft Excel to minimize calculation errors. The results of the N-gain test calculation can be seen in the following graph.

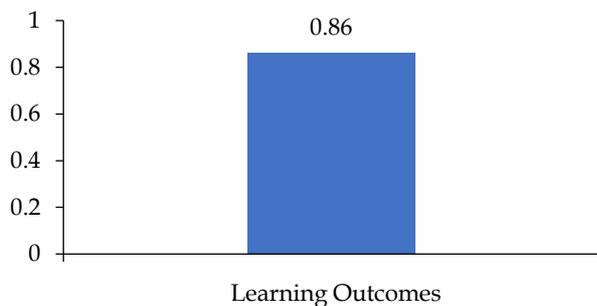


Figure 3. Gain score

So, the N-gain value 0.86 for improving learning outcomes. So, it can be concluded that the flipbook encyclopedia of biodiversity of the kingdom plantae at SMAN 6 Samarinda is effective in improving learning

outcomes with a high category. The final stage related to product evaluation applied to the research and development process is formative evaluation, namely, evaluation carried out from the analysis stage to implementation, so that if there is an error, it will be revised immediately. This summative evaluation is used to evaluate the product as a whole against the development process carried out and the impact resulting from the use of the product on student learning outcomes.

Discussion

The development of Science and Technology has spread to various fields, one of which is education. The development of science and technology is inseparable from the era of the industrial revolution 4.0, which is currently testing the era of society 0.5, which can realize a better human life. Responding to the era of society 5.0 requires a change in perspective on basic education, its application also requires strengthening educational promotion policies in the eight national education standards. Education is one of the important issues in developing the quality of human resources, and currently, education in Indonesia is entering the 4.0 era. This can be seen from the use of technology such as computers, laptops, smartphones, all of which use internet access (Hanjowo et al., 2023). However, in the teaching and learning process, the use of books still exists as a learning resource. This is based on the results of interviews with five high school teachers in Samarinda.

In this regard, there needs to be innovation from teachers to preserve the use of books as a source of student learning, but still accompanied by the use of digital intelligence, such as smartphones. The use of smartphones can also motivate students to be enthusiastic about learning, even though they must still be accompanied and supervised periodically by teachers or parents. This opinion is in line with research of Rahma & Sandika (2022), which shows that the use of smartphones in the learning process can motivate students to learn.

Next, the researcher prepared a plan that became the forerunner of a flipbook-based book. In preparing the design, the researcher was guided by the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). The researcher conducted the Analysis stage to explore the root of the problem, so that the idea of developing a product emerged as a solution to the problems obtained. The analysis stage carried out included analysis of student characteristics, curriculum analysis, and analysis of technological developments in schools to determine students' basic insights regarding biodiversity, learning conditions, the curriculum in force in schools, and the

use of technology in the teaching and learning process in schools through observation, interviews with five Biology teachers at SMAN 4 Samarinda, SMAN 6 Samarinda, SMAN 14 Samarinda, SMAN 17 Samarinda, and SMAN SKOI Samarinda, and distribution of student needs questionnaires to these schools. Based on the results of this analysis stage, students know the level of biodiversity, but cannot analyze the level of biodiversity in their school environment, especially at SMAN 6 Samarinda. When reviewing student interests, they like biology learning using gadgets or animated technology so that learning is not boring. This is in line with the results of Hanifah et al. (2020) study that students tend to like interesting reading with little description and lots of pictures or colors, so that readers experience increased interest and improve the performance of readers' memory performance through imagination. However, based on interviews with researchers, their learning refers more to textbooks. Therefore, researchers got the idea to make a book but in digital form with lots of pictures, colors, and animations. For students' insights to be broader, the book that will be formed is not a textbook but an encyclopedia.

The researcher's encyclopedia book is right to be made because it has a systematic writing system so that readers can go directly to the topic they want. This is in line with Dewanti & Iلمي (2022), which means that an encyclopedia is one of the reference materials that contains explanations of basic and detailed knowledge information on various branches of science broadly and completely. The researcher then searched several websites for the digital book format used by the researcher. Flipbook was chosen as the digital book format, and the software the researcher used was FLIPHTML5.

Based on the researcher's survey on the software, the output can be accessed via Android, iOS or laptops, and computers, and is free. This is in line with the statement from Fauziah & Wulandari (2022) that FlipHTML5 has advantages including the output of FlipHTML5 in the form of HTML5 which can be accessed online on computers, laptops, or Android and iOS devices, innovative with various features, and free for the process of use and development, and can be saved offline. The results of this survey are in line with the results of the analysis of technological developments, which shows that the five schools have internet facilities, and at SMAN 6 Samarinda, internet access can be used by every student. Based on the results of the curriculum and material analysis, it is known that the curriculum implemented in the five schools is the Independent Curriculum, and after analyzing the environment around the school, which is suitable to be connected with biology material, is biodiversity. Then, based on the analysis of characteristics, students have

not fully used flipbooks and encyclopedia books, but based on the survey, they are very enthusiastic if biodiversity learning is taught through flipbook-based encyclopedia books.

The design stage includes data collection of plants at SMAN 6 Samarinda, making flowcharts, selecting formats, initial drafts of book contents, making designs for book covers and page backgrounds, and making research instruments. The biodiversity material in the encyclopedia book focuses on the biodiversity in the environment of SMAN 6 Samarinda, therefore, the researcher recorded the number and types of plants in the high school environment. After that, the creation of flowcharts and format selection is based on the rules of the Center for the Development and Protection of Language and Literature, Language and Book Development Agency, Ministry of Education and Culture in 2019, concerning technical instructions for compiling encyclopedias. The design of the book contents consists of a draft foreword, a draft table of contents, an initial draft of the material, and a draft bibliography. Furthermore, the creation of the cover design and page background of the book in the Canva application, and the creation of research instruments

The Development stage includes making prototypes, feasibility testing, and product assessment tests. First, a product prototype is made based on a previously designed product. This initial product contains the front and back covers, as well as the contents of the book in PDF format, then imported into FlipHTML5 software and then output in HTML format. The initial product that has been completed is then tested for feasibility by material experts, media experts, and language experts through a feasibility test questionnaire, and assessed by teachers through a teacher assessment questionnaire. The results of the feasibility test and teacher assessment of the product show the criteria of "Very Feasible" with a percentage of 91.75% from material experts, a percentage of 90% from language experts, and a percentage of 88.5% from teacher assessments. Meanwhile, the feasibility test by media experts meets the criteria of "Feasible" with a percentage of 78.88%.

The implementation stage includes product trials conducted on a large group of students in class X-H and product effectiveness tests conducted on class X-G students. The product trial begins with a brief product demonstration, and students are invited to access the flipbook. Furthermore, students are given a response questionnaire to the product being developed. They are invited to fill out the questionnaire while trying the product. Meanwhile, the implementation of the effectiveness test begins with a pretest before students are given learning treatment with the flipbook learning resource "Encyclopedia of Diversity of Kingdom Plantae

at SMAN 6 Samarinda". After the pretest is completed, the researcher teaches using the flipbook resource that the researcher has developed, and after the learning is complete, the researcher gives posttest questions to see the effectiveness of the product in student learning outcomes. The results of the large group trial meet the criteria of "Very Practical" with a percentage of 89.6%. The pretest and posttest score data are normally distributed data as seen from the results of the normality test, and include homogeneous data, as reviewed from the results of the homogeneity test. Furthermore, the N-Gain test results is 0.86 for learning outcomes, so the product was declared effective in the high category.

The evaluation stage includes product revision by material experts, media experts, language experts, and students, as well as overall product revision. In addition, the calculation of the overall test results data was carried out, except for the effectiveness test, to see the overall feasibility category of the research product. Based on the calculation of the overall results, the product meets the criteria of "Very Eligible" with a percentage of 87.7%. This result is in line with the research results of Azizah et al. (2021) that the digital-based encyclopedia book that was developed is suitable for use as a supplement to teaching materials and has proven to be effective in improving students' digital literacy. The results of another study by Fadhilah et al. (2022) showed that the development of a digital encyclopedia book of ornamental plants based on contextual icons as a learning resource is included in the very good category, so that it is suitable for use. Pardede et al. (2023) in their research results showed that digital flipbook-based learning media on student learning outcomes in plant tissue material meets the criteria of very feasible and has proven to be influential in improving learning outcomes.

Conclusion

Based on the results and discussion of the development of the flipbook-based encyclopedia of biodiversity of the plant kingdom to improve student learning outcomes at SMA Negeri 6 Samarinda, it was preceded by analyzing the school. The use of learning resources to overcome students' difficulties in understanding a material so that students' thinking power and good learning outcomes in biology learning are still encountered obstacles, so to solve this problem, a flipbook-based encyclopedia was chosen as the solution. School facilities that are pro-technological progress indicate that education is now entering the digital era. In addition, students' ignorance regarding the level of biodiversity in their surroundings adds to the problems that must be solved. Based on the results of the analysis, plant data collection, book format design, book contents, book covers, and research instruments

were then carried out. From the results of the design, it then entered the development stage, which began with the creation of a prototype whose results were in the form of HTML biodiversity encyclopedia books, followed by testing the product. The product underwent a feasibility test conducted by three experts, and the percentage calculation results were 91.75, 78.88, 90, and 88.5%, respectively, from material experts, media experts, language experts, and teacher assessments. Thus, the results of the feasibility test by material experts, language experts, and teacher assessments of the product met the criteria of "Very Feasible" and "Feasible" for the feasibility test by media experts. This means that the product is ready for practicality testing and effectiveness testing after being revised based on input from experts. The results of the practicality test percentage calculation were obtained at 89.6%, so that the product meets the criteria of "Feasible," which means that the product is feasible to be used in learning. These results are known by filling in the student response sheet during the product trial by 30 students of class X-H SMAN 6 Samarinda. In addition, after the product was tested for its effectiveness, the results showed that the level of product effectiveness met the criteria of "High," Based on the results of the N-Gain Test of 0.81. The meaning of this score is that the product can improve students' have an impact on improving their learning outcomes.

Acknowledgments

Thank you to all parties who have helped with this research, especially SMAN 6 Samarinda, which has permitted the research location.

Author Contributions

Preparation and development of flipbook biodiversity, data collection and analysis, writing original draft article, S.; validation, review, and editing, M.A.M., E.T.M., U., H., and A. All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Conflicts of Interest

No conflict of interest.

References

- Azizah, Y. N., Lathifah, S. S., & Hidayat, N. (2021). Pengembangan E-Ensiklopedia Keanekaragaman Talas di Kabupaten Bogor Berbasis ESD untuk Meningkatkan Literasi Digital Siswa. *Pedagogia: Jurnal Ilmiah Pendidikan*, 13(2), 52–56. <https://doi.org/10.55215/pedagogia.v13i2.4247>
- Cahya, K. L., & Bektiningsih, K. (2024). Development of

- Augmented Reality Based Flipbook Media on Natural Science Subject Matter of Ecosystems. *Jurnal Penelitian Pendidikan IPA*, 10(11), 8436–8445. <https://doi.org/10.29303/jppipa.v10i11.7630>
- Dewanti, S., & Ilmi, B. (2022). Pemanfaatan Ensiklopedia sebagai Penambah Pengetahuan Pemustaka di Perpustakaan Daerah Kabupaten Wonosobo. *BIBLIOTIKA: Jurnal Kajian Perpustakaan dan Informasi*, 6(2), 169–178. <https://doi.org/10.17977/um008v6i22022p169-178>
- Fadhilah, R., Auliaty, Y., & Wardhani, P. A. (2022). Pengembangan Ensiklopedia Digital Tanaman Hias Berbasis Kontekstual sebagai Sumber Belajar dalam Pembelajaran IPA Kelas IV SD. *Educational Technology Journal*, 2(2), 29–37. <https://doi.org/10.26740/etj.v2n2.p29-37>
- Fauziah, A., & Wulandari, S. S. (2022). Pengembangan E-Modul Berbasis Flipbook untuk Pembelajaran Materi Ruang Lingkup Administrasi Kepegawaian. *Edukatif: Jurnal Ilmu Pendidikan*, 4(2), 2202–2212. <https://doi.org/10.31004/edukatif.v4i2.2363>
- Hanifah, H., Afrikani, T., & Yani, I. (2020). Pengembangan Media Ajar E-Booklet Materi Plantae untuk Meningkatkan Hasil Belajar Biologi Siswa. *Journal of Biology Education Research (JBER)*, 1(1), 10–16. <https://doi.org/10.55215/jber.v1i1.2631>
- Hanjowo, M. D. F. F., Athahirah, N., Saputra, R. F., Al-Farisi, S., & Rozaq, R. W. A. (2023). Peran Pendidikan Indonesia di Era Society 5.0. *ETNIK: Jurnal Ekonomi dan Teknik*, 2(5), 423–428. <https://doi.org/10.54543/etnik.v2i5.190>
- Hardiansyah, F., & Mulyadi, M. (2022). Improve Science Learning Outcomes for Elementary School Students Through The Development of Flipbook Media. *Jurnal Penelitian Pendidikan IPA*, 8(6), 3069–3077. <https://doi.org/10.29303/jppipa.v8i6.2413>
- Hidayatullah, Z., Makhrus, M., & Gunada, I. W. (2018). Pengaruh Pendekatan Konflik Kognitif Terhadap Hasil Belajar Gelombang Mekanik Peserta Didik MAN 2 Mataram. *Jurnal Ilmiah Profesi Pendidikan*, 3(2), 171–175. <https://doi.org/10.29303/jipp.v3i2.27>
- Jayanti, W., & Setyasto, N. (2024). Development of Kvisoft-Based Flipbook Learning Media on Learning Outcomes in Natural Sciences on the Human Circulatory System. *Jurnal Penelitian Pendidikan IPA*, 10(5), 2511–2520. <https://doi.org/10.29303/jppipa.v10i5.7025>
- Kemdikbud. (2013). *Panduan Pelaksanaan Program Adiwiyata*. Jakarta: Kementerian Pendidikan dan Kebudayaan.
- Kiswandini, D. A., Suyanto, S., Pratama, A. T., & Yustisiana, S. R. T. U. (2023). Electronic Whorksheets Development Based on ESD (Education for Sustainable Development) Biodiversity Subject. *Jurnal Penelitian Pendidikan IPA*, 9(8), 6353–6358. <https://doi.org/10.29303/jppipa.v9i8.4454>
- Kusumasari, A., Suryawati, E., & Anwar, L. (2022). Development of SSIBL E-Modules on Ecology and Biodiversity Materials to Improve Critical Thinking and Motivation. *RaDEn: Research and Development in Education*, 4(2), 1066–1082. <https://doi.org/10.22219/raden.v4i2.33775>
- Lestari, V. R., Khotimah, K., & Iksam, I. (2024). Ekoraya: Biodiversity Flipbook Based on Science Literacy. *Jurnal Pendidikan Dasar Nusantara*, 10(1), 63–76. <https://doi.org/10.29407/jpdn.v10i1.22799>
- Nugraha, W. H., & Rachmadiarti, F. (2022). Development of STEM-Based Flipbook on Biodiversity Materials to Train Critical Thinking Skills for X-Grade Students of Senior High School. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, 11(2), 302–311. <https://doi.org/10.26740/bioedu.v11n2.p302-311>
- Nuryanti, B., Artika, E. E., Wulandari, N., & Aulia, N. A. N. (2019). Analisis Pemanfaatan Ensiklopedia di Perpustakaan IAIN Tulungagung. *Shout Al-Maktabah: Jurnal Perpsuatakaan, Arsip dan Dokumentasi*, 11(1), 99–110. <https://doi.org/10.15548/shaut.v11i1.123>
- Pardede, Y., Silalahi, M. V., & Silaban, W. (2023). Pengembangan Media Pembelajaran Berbasis Digital Flipbook Terhadap Hasil Belajar Siswa pada Materi Jaringan Tumbuhan di Kelas XI PMIA SMA Negeri 5 Pematang Siantar. *IJMS: Indonesian Journal of Mathematics and Natural Science*, 01(03), 161–166. Retrieved from <https://jurnal.academiacenter.org/index.php/IJMS>
- Putri, L., Permana, I., & Holiyani, I. (2023). Upaya Meningkatkan Literasi Digital Peserta Didik Melalui Penggunaan E-Modul Berbasis Flipbook pada Materi Keanekaragaman Hayati. *Report of Biological Education*, 4(2), 85–98. <https://doi.org/10.37150/rebion.v4i2.2307>
- Rahma, A., & Sandika, B. (2022). Pengaruh Smartphone Terhadap Motivasi dan Hasil Belajar Biologi Materi Sistem Ekskresi Kelas XI SMA. *Jurnal Inovasi Pembelajaran Biologi*, 3(1), 43–52. <https://doi.org/10.26740/jipb.v3n1.p43-52>
- Rahmawati, I. E., & Sunarso, A. (2024). Development of Flipbook Learning Media in IPAS Subjects to Improve Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, 10(12), 10999–11008. <https://doi.org/10.29303/jppipa.v10i8.7937>
- Ramadhani, R., Surtikanti, H. K., & Riandi, R. (2024). Kajian Literatur: Potensi Citizen Science Project untuk Meningkatkan Kesadaran Lingkungan pada Materi Keanekaragaman Hayati. *Jurnal Jeumpa:*

- Jurnal Pendidikan Sains & Biologi*, 11(1), 84–99.
<https://doi.org/10.33059/jj.v11i1.9134>
- Rida, M. N. H., Fatmawati, U., Karyanto, P., & Kusumawati, L. (2025). Developing a Flipbook on Environmental Change Topics to Enhance Students' Conceptual Understanding of Sustainable Living. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 11(1), 195–207. <https://doi.org/10.22219/jpbi.v11i1.37548>
- Sari, R. D., Nisa, A. F., Masjid, A. Al, Havifah, B., & Khosiyono, C. (2025). Science Flipbook Media on Elementary School Students' Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, 11(4), 979–986. <https://doi.org/10.29303/jppipa.v11i4.10308>
- Sugiyono, S. (2019). *Metode Penelitian dan Pengembangan (Research and Development/R&D)*. Bandung: Alfabeta.
- Sumarmi, S., Aliman, M., & Mutia, T. (2021). The Effect of Digital Eco-Learning in Student Worksheet Flipbook to Environmental Project Literacy and Pedagogic Competency. *Journal of Technology and Science Education*, 11(2), 357–370. <https://doi.org/10.3926/jotse.1175>
- Talitha, S., Rosdiana, R., Mukhtar, R. H., & Suhilman, S. (2023). Pengembangan Bahan Ajar Digital Flipbook dalam Meningkatkan Kompetensi Guru MGMP Bahasa Indonesia SMA Kota Bogor. *SWARNA: Jurnal Pengabdian kepada Masyarakat*, 2(1), 169–177. <https://doi.org/10.55681/swarna.v2i1.314>
- Wilujeng, I., & Hidayatullah, Z. (2021). Alternative Learning Model in Physics Learning: Effect of the Conceptual Change Model with Cognitive Conflict on Critical Thinking Skill. *Momentum: Physics Education Journal*, 5(2), 111–120. <https://doi.org/10.21067/mpej.v5i2.5260>