

Development of Digital Booklet for Class X Biodiversity Materials

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Abstract

Background: Distance learning requires learning media to help students understand the material. Digital booklets are an alternative to teaching biodiversity through visualization. This study aimed to determine the feasibility of digital booklets for class X biodiversity materials. **Methods:** This Research and Development use the ADDIE model. The product is validated by expert validators, material experts, and teachers. Product trials on students were divided into two groups, namely small groups (10 students) and large groups (30 students). **Results:** The results of the product assessment meet the very feasible category with scores of 91.67% (media experts), 61.25% (material experts), and 81.25% (teachers). The small group test on students obtained a percentage of 96%, and the big group test with a percentage of 95.33%. **Conclusions:** The digital booklet learning media product is suitable for class X biodiversity learning.

Keywords: Booklet digital; Research and development; Eligibility of digital-based booklet



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Introduction

Learning activities using learning media can make students more enthusiastic about learning. Media attracts learners in the learning process (Sapriyah, 2019). Learning media is one of the supports to improve the learning process, which boils down to achieving learning outcomes (Arda et al., 2015).

Various media have been used in classroom learning, including print media, charta, torso (Ariyanto et al., 2018); biology magazine (Ferella et al., 2022); modules (Restiana et al., 2022), and stop motion (Maryanti & Kurniawan, 2018). Learning media must be able to arouse the curiosity of students. If students are not interested in learning media and only rely on explanations from the teacher, students will not understand learning well (Paramita et al., 2019). This is because students will only be dominant using the sense of hearing. The learning media used in learning must be by the developmental conditions of students. The rapid development of the digital world influences the world of education. Students are more interested in digital-based media (Pralisaputri et al., 2016). The desire of students to read and pay attention to learning media is higher than using conventional-based learning media (Purwati, 2021).

Biodiversity material contains a wide range of objects, so it is not sufficiently taught through text or the surrounding environment. The limited conditions of teaching biodiversity material with text will saturate, whereas if you take advantage of the environment, it takes more time. It can be handled by visualizing objects through learning media to make the material easier to understand (Dewi et al., 2020). Biodiversity has been taught at the Junior High School (SMP) level. However, students are only taught about the

food chain, so students find it challenging to understand biodiversity material (Sawitri et al., 2014), which needs to be taught with learning media to reduce misconceptions (Ambarwati & Muhammad, 2021), besides being considered as elusive material (Fransiska et al., 2022), and student participation is still lacking (Hasairin & Apriyanti, 2018). In addition, preliminary observations show that the variety of media used is still lacking. They visualize objects through learning media to make the material easier to understand (Dewi et al., 2020).

Booklets have the characteristics of information in the form of text and images (Zulaekah, 2012; de Oliveira et al., 2014), a clear, firm, and easy-to-understand visual (Pralisaputri et al., 2016), and generating motivation to read (de Oliveira et al., 2014). However, if the treatment is not practical in print-based booklets, then the booklets will quickly break down. According to Indriani (2019), booklets have several functions, including 1) arousing students' interest in learning, 2) overcoming difficulties when learning, and 3) facilitating the delivery of material to students.

Booklets are one of the learning media teachers often use. Still, using print-based booklets dominated by writing makes it easier for students to be saturated when reading booklets. Print-based booklets have several disadvantages, including using print-based booklets that are less effective for distance learning and cannot display video or audio (Hoiroh, 2020). In the conditions of distance learning, digital-based media is increasingly needed, one of which is a digital-based booklet that has the characteristics of displaying material dominated by images and videos so that students are not easily saturated when using it (Fatimah & Mufti, 2014).

The use of digital-based booklets is effectively used during distance learning, Khikmawati et al. (2021) stated that digital-based booklets can give students other learning resources besides teachers that allow students to understand lessons more easily. This study aims to develop a digital-based booklet on class X biodiversity materials.

Method

This research uses the ADDIE development model Dick & Carey (1996) developed to design learning systems. This model has five development stages: analysis, design, development, implementation, and evaluation.

Product assessment involves media experts, materials, and teachers using questionnaires. The product assessment questionnaire uses a Likert scale with 4 in question so that it can be handled through visualization of the chosen object (Strongly agree, Agree, Disagree, and Strongly disagree). The Likert scale is appropriate for measuring a person's perception and opinion of a statement Bahrun et al. (2017) for experts in assessing a product. The instrument used underwent an expert judgment validation process involving two instrument experts.

Product assessment data from experts are scored, and the average percentage value is calculated using a formula I.

$$\text{Validation} = \frac{\text{Number of Scores each Criterion}}{\text{Maximum Number of Scores}}$$

Source: Maulia et al. (2018)

The results of values based on formula one are interpreted based on the criteria in Table 1.

Table 1. Validation Criteria

Value (%)	Interpretation
70-100	<i>Digital-based booklets are well worth using</i>
50-74	<i>Digital-based booklets worth using</i>
24-49	<i>Digital-based booklets are not worth using</i>
0-25	<i>Digital-based booklets are not very worth using</i>

Source: [Pranatawijaya et al. \(2019\)](#).

The practicality test of the digital-based booklet was carried out using a Guttman scale selection questionnaire for learners to make it easier when assessing developed products.

The results of values based on formula two are then interpreted qualitatively with the criteria in [Table 2](#).

Table 2. Practicality assessment criteria

Value (%)	Interpretation
70-100	<i>Digital-based booklets are convenient to use</i>
50-74	<i>Digital-based booklets are practical to use</i>
24-49	<i>Digital-based booklets are impractical to use</i>
0-25	<i>Digital-based booklets are very impractical to use</i>

Source: [Akbar \(2013\)](#).

Result

The analysis stage obtained information during distance learning. The media used is still textual, so it is less able to display biological objects. Students experience difficulty understanding biodiversity material through text and tend to feel bored while participating in learning activities. Based on observations and interviews shows the need for learning media that can help students better understand biodiversity material.

The analysis stage analyzes gaps in the learning process by interviewing biology teachers in class X SMA, analyzing students, analyzing the learning media used, and compiling research plans. The interview results show that teachers teaching biodiversity materials only use images from the internet as a learning medium when learning remotely so that learning feels monotonous. Then the results of the student analysis are that students feel bored because the teacher only presents texts, and students feel bored when reading them. Researchers and teachers use media analysis for discussion. The discussion results obtained a digital-based booklet as a supporting medium for biodiversity learning during distance learning.

The booklet was chosen because it presents information dominated by images with a combination of text to complement information. Image visualization is expected to be more exciting and make it easier for students to understand the material.

Design

The results of the design stage in the form of product prototypes compiled using the Canva application include covers, table of contents, introductions, and biodiversity materials (definition of biodiversity, gene-level biodiversity, species-level biodiversity, ecosystem-level biodiversity) supported by images and videos. The product is finalized with Flip PDF Corporate, with a pop feature to display images and videos.

Development

Product prototypes have been finalized by considering knowledge and skills from the learning objectives of biodiversity material. Then validation is carried out by involving media experts, material experts, and teachers. The average result of the percentage of media expert assessments was 91.67% in the "Very Worthy" category, Material Experts 61.25% in the "Worthy" category, and Teachers 81.25% in the "Very Worthy" category.

Implementation

The results of the implementation stage were obtained from piloting the product using a small group test involving ten students with 96% assessment results in the "very feasible" category and a large group trial with 30 students with an assessment result of 95.33% with a "very feasible" category. In this implementation, researchers have not been able to convey the planned learning design for learning using the developed booklet. However, researchers have conducted small groups and field trials independently by learners (not involving a formal learning atmosphere).

Evaluation

The results of the evaluation stage are to make improvements from the suggestions and inputs given by students during the implementation stage.

Discussion

Compiling a research plan, researchers do by designing learning media that are effectively used when understanding biodiversity material.

The design stage is carried out in two details: creating a flowchart. The flowchart depicts a step that makes it easier for researchers to compile digital-based booklet media (Budiman et al., 2021). Preparing a flowchart for a digital-based booklet media consists of compiling a title page of the university emblem, class, author's name, and the biology education emblem. Then in compiling the table of contents according to the order of the pages, compiling an introduction containing an introduction to the biodiversity material, compiling material consisting of the notion of biodiversity, gene-level biodiversity with examples of roses, ivory coconut (*Cocos nucifera* var *Eburnea*), and green coconut (*Cocos nucifera* var *Viridis*).

Diversity material at the species level uses examples from the family Felidae, namely tigers, cats, and lions. Other examples of species-level diversity material are sawo manila (*Manilkara zapota*) and sawo kecil (*Manilkara kauki*). The last material is ecosystem-level diversity by taking the example of Wediombo Beach and Mangrove Forest in Baros Mangrove Forest. After compiling the material, compile a glossary consisting of notions, abiotic, biotics, grafts, ecosystems, and varieties. Then compile the information to be added on the "Did you know" page. The last part of creating a flowchart is that it contains the researcher's profile placed at the end of the page.

In the development stage, the researcher develops from the flowchart that has been made before. Development of digital-based booklet media using the Corporate Flip PDF application. This application has advantages such as easy use and can add videos, images, and links to appear in booklets based (Seruni et al., 2019).

After the digital-based booklet is completed, it performs validation by media experts, material experts, and teachers. Based on the validation of media experts, a percentage of 91.67% was obtained with the category "very feasible. The assessment of media experts obtained high results in both aspects, namely the design aspects of the booklet and the layout of the booklet components; this follows the statement of Arsyad (2017), namely the feasibility of the booklet is determined by the design of the title page, booklet format, font size and layout of the digital booklet media. Material experts obtained a percentage of 61.25% with the category of "worthy." In the expert assessment of the material on the linguistic aspect, researchers use language that students poorly understand. This is per Aini's theory (2020), which states that the language in the booklet uses communicative language so that students can easily understand. And teacher assessments obtained 81.25% with the category "very decent." Teachers argue that the language used by researchers is easy for students to understand. This result is to the statement of Putri (2020) that the language aspect in developing booklets using language is adapted to the development of readers' abilities and the accuracy of correct and precise sentences.

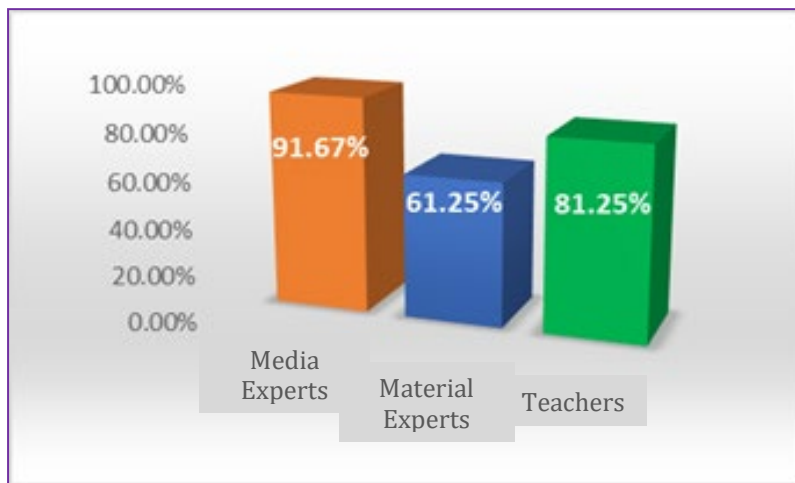


Figure 1. Product validation by experts

In addition to quantitative assessments, researchers also received suggestions for product improvements, including in the cover section, the color combination was felt to be less varied, and the booklet title could not be read correctly (Figure 2); improvements were also made to the content section of the "species-level diversity" sub-material could not be read well. The layout was not neat (Figure 3).



Figure 2. Digital-based booklet cover: (a) before and (b) after revision



Figure 3. Improvements to the contents (a) before (a) and (b) after the repair

The fourth stage is implementation, by testing the product on students. Response assessment by learners is divided into small classes and large classes. Small classes obtained a percentage of 96% with the "convenient" category, and large class trials obtained a percentage of 95.33% with the "convenient" category

It is based on a questionnaire of student responses, and the material in the digital-based booklet is easy to understand, adding new information and knowledge to learners. Digital-based booklets are interested in being used in learning because images and videos make it easy for students to understand the material. This is to the statement of [Wardani et al. \(2013\)](#), namely that image media serves to channel the message from the source of the message to the recipient and attracts attention when learning.

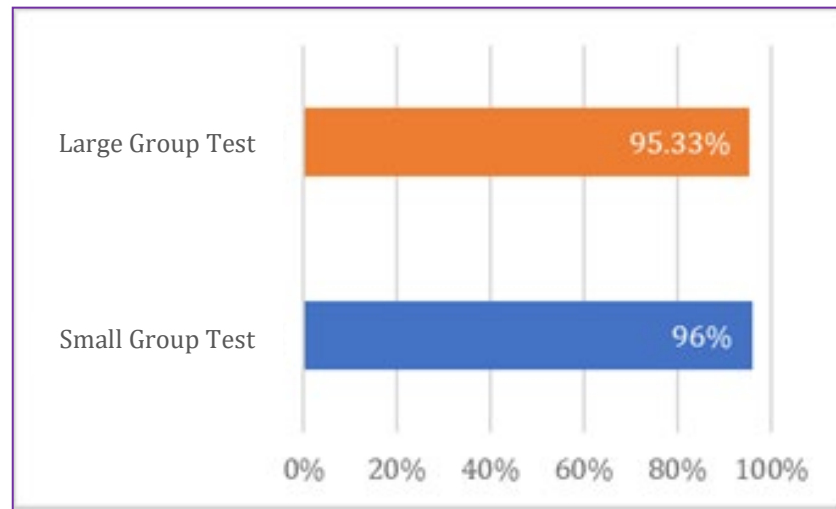


Figure 4. Diagram of student response results

Evaluation stage. In this stage, the researcher makes improvements from the suggestions from students during the implementation stage. The evaluation process is still limited to students' perceptions, not yet thoroughly related to the atmosphere of learning and performance. Based on this research, digital-based booklets can be an alternative to helping students in carrying out distance learning ([Imtihana et al., 2014](#)).

Conclusions

This research resulted in a digital-based Media booklet on biodiversity material declared feasible in terms of validity and practicality. Digital-based media booklets on biodiversity materials are stated with a very valid assessment from media experts with a percentage of 91.67% (very feasible). Digital-based booklet media biodiversity material was declared feasible by material experts with a percentage of 61.75% (feasible). Digital-based booklet media on biodiversity material was declared very valid from teacher assessment, averaging 81.25% (feasible). Digital-based booklet media of biodiversity materials is declared practical based on the average student assessment results with a percentage of 95.33% (efficient). The product needs to be implemented in learning with specific models and assessments.

Declaration statement

The authors reported no potential conflict of interest.

References

- Aini, C. N. (2020). Pengembangan media pembelajaran IPA berbasis booklet pada materi interaksi makhluk hidup dengan lingkungannya untuk sisa kelas VII MTs/SMP. In *Angewandte Chemie International Edition*, 6(11), 951–952. (Issue 465). Institut Agama Islam Negeri Jember.
- Akbar, S. (2013). *Instrumen perangkat pembelajaran*. Remaja Rosdakara.
- Ambarwati, R., & Muhammad, R. A. (2021). Pengembangan E-Book Keanekaragaman Hayati sebagai Sumber Belajar untuk

- Melatihkan Literasi Digital Peserta Didik Kelas X SMA. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, 10(2), 326–334. <https://doi.org/10.26740/bioedu.v10n2.p326-334>
- Arda, Saehana, S., & Darsikin. (2015). Pengembangan Media Pembelajaran Interaktif Mata Pelajaran Prakarya Untuk Siswa Smp Kelas Viii. *Jurnal Teknologi Pembelajaran Indonesia*, 3(1), 40–50. https://doi.org/10.23887/jurnal_tp.v11i1.634
- Ariyanto, A., Priyayi, D. F., & Dewi, L. (2018). Penggunaan Media Pembelajaran Biologi Di Sekolah Menengah Atas (Sma) Swasta Salatiga. *BIOEDUKASI (Jurnal Pendidikan Biologi)*, 9(1), 1–13. <https://doi.org/10.24127/bioedukasi.v9i1.1377>
- Arsyad, A. (2017). *Media Pembelajaran* (p. 233). Raja Grafindo Persada.
- Bahrin, S., Alifah, S., & Mulyono, S. (2017). Rancang Bangun Sistem Informasi Survey Pemasaran dan Penjualan Berbasis Web. *Jurnal Transistor Elektro Dan Informatika*, 2(2), 82. <https://doi.org/10.30659/ei.2.2.%25p>
- Budiman, I., Saori, S., & Anwar, N. R. (2021). Analisis pengendalian mutu di bidang industri makanan. 1(10), 206–212. <https://doi.org/10.47492/jip.v1i10.419>
- de Oliveira, S. C., Lopes, M. V., & Fernandes, A. F. (2014). Development and validation of an educational booklet for healthy eating during pregnancy. *Rev Lat Am Enfermagem*, 22(4), 611–620. <https://doi.org/10.1590/0104-1169.3313.2459>
- Dewi, N. A., Kartijono, N. E., & Dewi, N. K. (2020). Pengembangan Media Audio-Visual Pembelajaran Materi Keanekaragaman Hayati Indonesia Di Sekolah Menengah Atas. *Bioma : Jurnal Ilmiah Biologi*, 9(1), 87–101. <https://doi.org/10.26877/bioma.v9i1.6036>
- Dick, W., & Carey, L. (1996). *The Systematic Dessign of Instruction*. Harper Collins Publisher.
- Fatimah, S., & Mufti, Y. (2014). Pengembangan Media Pembelajaran Ipa-Fisika Smartphone Berbasis Android Sebagai Penguat Karakter Sains Siswa. *Kaunia: Integration and Interconnection Islam and Science*, 10(1), 59–64.
- Ferella, E., Titin, T., & Syamswisna, S. (2022). Kelayakan Majalah Biologi Sebagai Media Pembelajaran Submateri Interaksi Dalam Ekosistem Kelas X SMA/MA. *EduNaturalia: Jurnal Biologi Dan Kependidikan Biologi*, 3(1), 1–8. <https://doi.org/10.26418/edunaturalia.v3i1.54153>
- Fransiska, N., Ningsih, K., & Marlina, R. (2022). Pengaruh Model Pembelajaran Savi Berbantuan Flipchart Terhadap Hasil Belajar Peserta Didik Pada Materi Keanekaragaman Hayati. *EduNaturalia: Jurnal Biologi Dan Kependidikan Biologi*, 2(1), 14–19. <https://doi.org/10.26418/edunaturalia.v2i1.54410>
- Hasairin, A., & Apriyanti, D. (2018). Penerapan Model Pembelajaran Kooperatif Tipe Talking Chips Pada Materi Keanekaragaman Hayati Di MAN 1 Medan. *Jurnal Pelita Pendidikan*, 6(4), 253–264. <https://doi.org/10.24114/jpp.v6i4.11719>
- Hoiroh, A. M. M. (2020). Pengembangan media booklet elektronik materi jamur untuk meningkatkan pemahaman konsep siswa kelas X SMA. *Berkala Ilmiah Pendidikan Biologi*, 9(1), 292–301.
- Imtihana, M., Martin, P., & Priyono, B. (2014). Pengembangan Buklet Berbasis Penelitian Sebagai Sumber Belajar Materi Pencemaran Lingkungan Di Sma. *Journal of Biology Education*, 3(2), 186–192. <https://doi.org/10.15294/jbe.v3i2.4459>
- Indriani, S. (2019). *Pengembangan booklet gizi sebagai media edukasi bagi penderita hipertensi di puskesmas poasia kelurahan andunouhu kota kendari*. Politeknik Kesehatan Kendari.
- Khikmawati, D. K., Alfian, R., Nugroho, A. A., & Susilo, A. (2021). Pemanfaatan E-book untuk Meningkatkan Minat Belajar Siswa Sekolah Dasar di Kudus. *Buletin KKN Pendidikan*, 3(1), 74–82. <https://doi.org/10.23917/bkknndik.v3i1.14671>
- Maryanti, S., & Kurniawan, D. T. (2018). Pengembangan Media Pembelajaran Video Animasi Stop Motion Untuk Pembelajaran Biologi Dengan Aplikasi Picpac. *Jurnal BIOEDUIN: Program Studi Pendidikan Biologi*, 8(1), 26–33. <https://doi.org/10.15575/bioeduin.v8i1.2922>
- Maulia, H. H., Sri, T., & Wulandari, H. (2018). Uji Validasi Pengembangan LKS (Lembar Kerja Siswa) Biologi SMA Berbasis Problem Based Learning pada Materi Perubahan Lingkungan untuk meningkatkan kemampuan berfikir kritis. Test Validation of the Development of LKS (Student Works Sheet) Based on Problem B. *Proceeding Biology Education Conference*, 15(1), 354–360.
- Paramita, R., Panjaitan, R. G. P., & Ariyati, E. (2019). Pengembangan Booklet Hasil Inventarisasi Tumbuhan Obat Sebagai Media Pembelajaran Pada Materi Manfaat Keanekaragaman Hayati. *Jurnal IPA & Pembelajaran IPA*, 2(2), 83–88. <https://doi.org/10.24815/jipi.v2i2.12389>
- Pralisaputri, K. R., Soegiyanto, H., & Muryani, C. (2016). Pengembangan Media Booklet Berbasis Sets pada Materi Pokok Mitigasi dan Adaptasi Bencana Alam Untuk Kelas X SMA Negeri 8 Surakarta Tahun Ajaran 2014/2015. *Jurnal GeoEco*, 2(2), 147–154.
- Pranatawijaya, V. H., Widiatry, W., Priskila, R., & Putra, P. B. A. A. (2019). Penerapan Skala Likert dan Skala Dikotomi Pada Kuesioner Online. *Jurnal Sains Dan Informatika*, 5(2), 128–137. <https://doi.org/10.34128/jsi.v5i2.185>
- Purwati, L. M. (2021). Media Pembelajaran Digital Interaktif Berbasis Adobe Flash Pada Masa Pandemi Di Sekolah Dasar. *Autentik : Jurnal Pengembangan Pendidikan Dasar*, 5(2), 152–158. <https://doi.org/10.36379/autentik.v5i2.133>
- Putri, N. M. (2020). Pengembangan Booklet Sebagai Media Pembelajaran Pada Mata Pelajaran Pengelolaan Bisnis Ritel Materi Perlindungan Konsumen Kelas Xi Bdp Di Smkn Mojoagung. *Jurnal Pendidikan Tata Niaga (JPTN)*, 8(3).

- Restiana, V., Suhendi, S., Yudiyanto, Y., & Hakim, N. (2022). Pengembangan Modul Pembelajaran Biologi Berbasis Inkuiri Terbimbing pada Materi Ekosistem untuk Siswa Kelas X SMAN 2 Menggala. *Biodik*, 8(1), 149–158. <https://doi.org/10.22437/bio.v8i1.14758>
- Sapriyah. (2019). Media pembelajaran dalam proses belajar mengajar. *Diklat Review : Jurnal Manajemen Pendidikan Dan Pelatihan*, 3(1), 45–56. <https://doi.org/10.35446/diklatreview.v3i1.349>
- Sawitri, D. W., Wisanti, & Ambarwati, R. (2014). Pengembangan modul keanekaragaman hayati berbasis pendekatan saintifik untuk siswa kelas X SMA. 3(3), 410–415.
- Seruni, R., Munawaoh, S., Kurniadewi, F., & Nurjayadi, M. (2019). Pengembangan Modul Elektronik (E-Module) Biokimia Pada Materi Metabolisme Lipid Menggunakan Flip Pdf Professional. *JTK (Jurnal Tadris Kimiya)*, 4(1), 48–56. <https://doi.org/10.15575/jtk.v4i1.4672>
- Wardani, F. T., Ibrahim, M. Y., & Zakro, A. (2013). Penggunaan Media Gambar Untuk Meningkatkan Pemahaman Siswa Pada Mata Pelajaran Sosiologi. *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa*, 2(6), 1–12. <https://doi.org/10.26418/jppk.v2i6.2166>
- Zulaekah, S. (2012). Pendidikan gizi dengan media booklet terhadap pengetahuan gizi. *KEMAS: Jurnal Kesehatan Masyarakat*, 7(2), 127–133.