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Development of plant diversity flipbooks integrated local wisdom

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Abstract: For plant diversity course, teaching materials in the form of interactive e-modules were not yet available. The diversity of sago plants has been compiled in the form of a supplementary book, but was limited to the printed type. This research aimed to develop flipbook-based e-module teaching materials integrated with local wisdom in the plant diversity course. The e-module contains local wisdom about the diversity of sago plants which were differentiated based on the color of the leaf shoots and the varying shape of the midrib as well as the use of the local (regional) language of the Tehit Kna tribe. E-module was expected to be a bridge in the process of digitizing teaching materials. The data source for this research was 9 active students from the Biology Education Department, odd semester for the 2023/2024 academic year. This research was conducted at the Department of Biology Education, University of Papua Manokwari and used the R&D research method with the ADDIE model but was limited to the following stages: Design, design, framework and preparation of the e-module from the front view, the contents of the book to the back cover of the book; Development, validation of flipbook-based e-module teaching material prototypes by media experts; and Evaluation, assessing each stage until the product produced in the form of an interactive e-module based on a flipbook integrated with local wisdom was declared valid and practical. The research results show that the e-module was very valid (96.5%) and very practical (95.56%).

Keywords: E-module, flipbook, local wisdom, sago diversity

Abstrak: Perkuliahan keanekaragaman tumbuhan belum tersedia bahan ajar berupa e-modul interaktif. Keanekaragaman tumbuhan sagu telah disusun dalam bentuk buku suplemen, namun terbatas pada jenis cetak. Penelitian ini bertujuan mengembangkan bahan ajar e-modul berbasis *flipbook* terintegrasi kearifan lokal pada mata kuliah Keanekaragaman Tumbuhan. E-modul memuat kearifan lokal tentang keanekaragaman tumbuhan sagu yang dibedakan berdasarkan warna pucuk daun dan bentuk pelepah yang bervariasi serta penggunaan bahasa lokal (daerah) suku Tehit Kna. E-modul diharapkan menjadi jembatan dalam proses digitalisasi bahan ajar. Sumber data penelitian ini adalah 9 orang mahasiswa aktif Jurusan Pendidikan Biologi Semester Ganjil Tahun Pelajaran 2023/2024. Penelitian ini dilakukan di Jurusan Pendidikan Biologi Universitas Papua Manokwari dan menggunakan Metode penelitian R&D dengan model ADDIE namun terbatas pada tahap: *Design*, perancangan, pembuatan kerangka dan penyusunan e-module dari bagian tampilan depan, isi hingga bagian sampul belakang buku; *Development,* validasi prototype bahan ajar e-module berbasis *flipbook* oleh ahli media; dan *Evaluation*, penilaian setiap tahap hingga produk yang dihasilkan berupa e-modul interaktif berbasis *flipbook* terintegrasi kearifan lokal dinyatakan valid dan praktis. Hasil penelitian menunjukkan bahwa *e-module* sangat valid (96,5%) dan sangat praktis (95,56%).

Kata kunci: E-modul, flipbook, kearifan lokal, keanekaragaman sagu

INTRODUCTION

The existence of conventional teaching materials needs to be updated with a touch of technology in order to attract students' interest in lectures. Technological innovation greatly explains student loyalty to higher education institutions (Susilawati et al., 2021). Therefore, it is necessary to update the lecture process so that it is able to provide digital skills to students through the application of technology. The integration of digital technology in the classroom aims to enhance and assist the function of teachers, rather than replace it (Singh, 2021). Learning must make students motivated to learn (Damopolii et al., 2018; Sirait et al., 2022; Syauqi et al., 2024). Technology helps teachers make teaching easier and makes students motivated to learn and ultimately have good performance (Adiyono et al., 2024; Damopolii & Kurniadi, 2019; Nashiroh & Iskandar, 2024).

One way is by using teaching materials in the form of flipbook-based e-modules. Flipbook media has advantages compared to other learning media because it not only presents a combination of text but can also include animation, video, sound and so on which makes it more interactive (Dita et al., 2023; Komikesari et al., 2020; Yomaki et al., 2023). Flipbook is a digital form of three-dimensional e-book technology that can open screen pages as if reading on a monitor screen and flipbook is effective enough in increasing reading motivation (Azzahra & Hestiana, 2021). Based on this explanation, it can be noticed that the flipbook learning media can be employed as a learning media to facilitate the learning process, assist students in learning more practically, meet the requirements of learning media, facilitate the delivery of material by lecturers, and assist students in enhancing their comprehension of concepts.

Biology as a field of science has a broad study of living things and their environment. Abilities, knowledge and skills need to be developed in every biology lesson (Damopolii, Botutihe, et al., 2019; Mandasari et al., 2021; Nwuba et al., 2023; Rahmah et al., 2023). One of the courses in the Department of Biology Education is plant diversity. This course, which combines various concepts related to plant diversity, requires students to be able to understand all the differences and similarities in kingdom plantae. Understanding concepts can be more easily understood if you take real examples or cases from the surrounding environment, so local wisdom becomes important in helping students to concretely understand the concepts studied in lectures. This is in alignment with Verawati and Wahyudi (2024), who asserted that local wisdom can be a potent tool in science education, resulting in increased scientific literacy and engagement.

Papua has diverse local wisdom (Damopolii et al., 2024; Iwan et al., 2020), both animals (Rumbruren et al., 2022), plants (Horota et al., 2023), and can be used as a source of learning (Damopolii, Nunaki, et al., 2019; Rumalolas et al., 2021). One of the local Papuan wisdoms related to the plant diversity course material is the sago plant. Sago has long been consumed as a staple food for the people of eastern Indonesia. Sago has diversity that can

be grouped according to local wisdom. This can be an additional reinforcement of the dicotyledon plant material in the plant diversity course.

The use of flipbook-based e-modules enables an interactive and in-depth learning experience through local wisdom so that it can increase student motivation to be actively involved in learning, creating a more interesting learning atmosphere. E-modules can also facilitate students to carry out independent learning through media, providing opportunities for students for further exploration. All of this is in accordance with Mulyadi et al. (2019) statement that the use of e-modules enriches the learning experience. Integrating local wisdom has significant potential in increasing students' understanding, connecting science with local culture, and motivating students to learn science in a more enjoyable and relevant way (Wulandari et al., 2024).

Research conducted by Pernantah et al. (2022), innovation in social sciences education teaching materials based on digital flipbooks integrated with local wisdom in supporting distance lectures, shows the results that digital flipbook-based textbook innovations were suitable for use in Social Sciences Education lectures and really support lectures conducted online or long distance learning (synchronous or asynchronous). Another relevant research result was carried out by Ayuardini (2023) who developed a flipbook using the ADDIE development model with the results of his research namely that flipbook 3-based media was categorized as suitable for use based on validation from material experts, media experts and language experts.

The development of flipbook-based interactive e-module teaching materials for the plant diversity course is not only an innovative step, but also a solution to overcome the limitations encountered in conventional lectures. Based on the facts and problems that have been discovered in this background, it was felt to be very important to develop flipbook-based interactive e-module teaching materials for the plant diversity course. This research aimed to develop flipbook-based e-module teaching materials integrated with local wisdom in the plant diversity course.

METHOD

Procedures for developing flipbook-based e-module teaching materials integrated with local wisdom in the plant diversity course use the ADDIE model but were limited to the Design (D), Development (D), and Evaluation (E) stages. The Analysis (A) stage was carried out in previous research to produce printed modules. Valid e-modules have only been tested on a small scale to see the practicality of the product but have not yet been Implemented (I) in real classes. Quantitative analysis was carried out to analyze the results of validation and questionnaires using a percentage formula, while qualitative analysis was carried out by describing the research results and connecting them with the results of previous research.

The data source for this research was 9 active students in the odd semester Biology Education Department for the 2023/2024 academic year who have contracted plant diversity

course. The research uses research and development (R&D) methods. This method was a research method used to produce certain products (Sugiyono, 2020).

RESULTS AND DISCUSSION

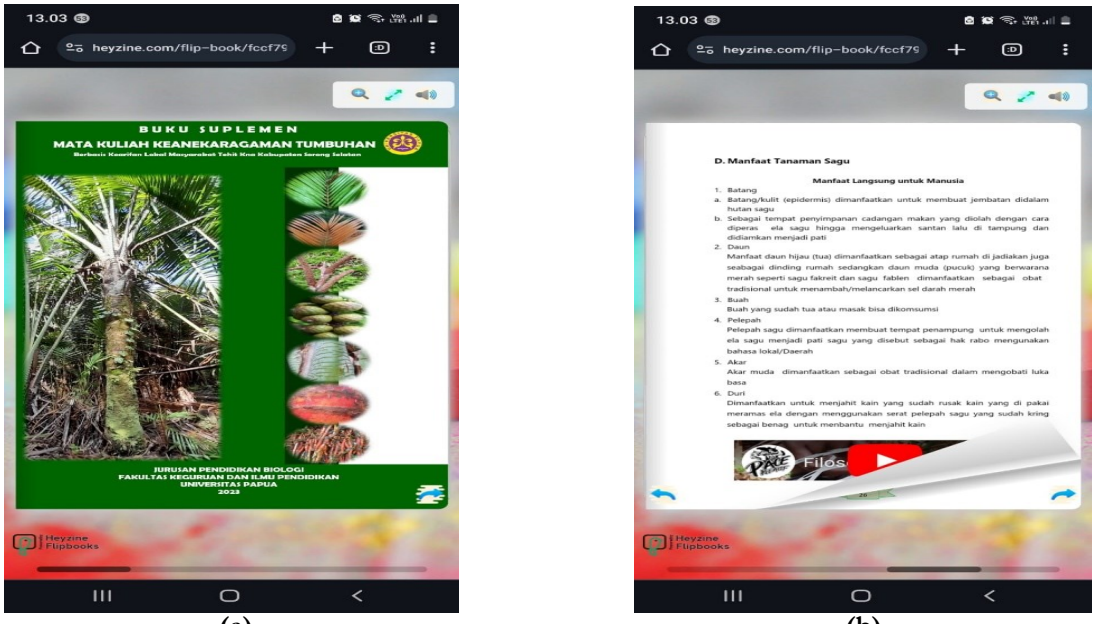
Product validity

The product in the form of a flipbook prototype produced through the analysis, design and development stages was submitted to the media validator to assess the product's validity. The suitability of the flipbook material content has been validated in previous research by plant diversity lecturer and got a score of 97.1% in the very valid category. Furthermore, this research obtained additional value for the validity of flipbook media from media experts with a final result of 95.8% in the very valid category. The validation process was carried out several times until the expected results were obtained. Based on the media validation process, the final product assessment results were obtained as follows:

Table 1. Media expert validation results

No.	Assessment Aspects	Total Score
1	Screen Design View	24
2	Ease of Use	15
3	Consistency	12
4	Graphics	25
5	Meaningfulness	16
	Total score	92
	Percentage	95.8
	Criteria	Very Valid

Table 1 shows that the level of validity of the flipbook by media experts is 95.8%, so it is within the very valid criteria. Next, the validation results of material experts and media experts are averaged in Table 2.



(a) **(b)**

Figure 1. Flipbook screenshot: (a) flipbook front page; (b) flipbook contents page.

Table 2. Average validation results

Validator		Percentage Mean	Kriteria
Material	**Media**		
97.1	95.8	96.45	Very valid

The overall validation results show that the flipbook-based e-module media is very suitable for use. Appropriate teaching media plays an important role in the learning process. The use of media in the form of flipbook-based e-modules in the plant diversity course provides a new color to the learning process, in line with current conditions where everything is leading to digitalization. Teaching media that keeps up with the times will be more easily accepted by students. This is in line with the statement that students currently spend more time using gadgets (Sari & Avianty, 2023). Therefore, the teaching media used must also be able to adapt to these developments.

Product practicality

Learning media must be easily used by students so that students do not have difficulty in the learning process so that learning objectives can be achieved as expected (Annisa et al., 2020). This directs research to carry out a practical analysis of the e-module that has been developed. Based on the results of data analysis, the following results were obtained:

Table 3. Practicality of flipbooks based on student responses

No	Assessment Criteria				Total Score	%	Practicality Criteria
	Very good (4)	Good (3)	Less good (2)	Not good (1)			
R1	10	0	0	0	40	100	Very Practical
R2	9	1	0	0	39	97,5	Very Practical
R3	10	0	0	0	40	100	Very Practical
R4	6	4	0	0	36	90	Very Practical
R5	8	2	0	0	38	95	Very Practical
R6	7	3	0	0	37	92,5	Very Practical
R7	9	1	0	0	39	97,5	Very Practical
R8	7	2	1	0	36	90	Very Practical
R9	9	1	0	0	39	97,5	Very Practical
Total Average					**38,22**	**95,56**	**Very Practical**

The flipbook-based module is implemented in the biology education department, especially for students who have contracted the plant diversity course. After using the flipbook, students provide responses by filling out a questionnaire. The results of data analysis show that the student response to the flipbook received a score of 95.56%, which makes the flipbook fall into the very practical criteria.

These practical results were in line with the activities carried out by students when implementing flipbooks. Students looked enthusiastic about using flipbooks with their respective gadgets. Using a flipbook is like reading a normal book, opening each sheet accompanied by the distinctive sound of sheets of paper. The advantage compared to conventional books, flipbooks contain additional content such as YouTube videos so that students can actually see how sago plants were processed. This is in line with the statement from Raibowo et al. (2020) that teaching materials in the form of interactive multimedia are used to stimulate abstract to concrete learning processes that can be observed directly.

In groups, students work on student worksheet which is contained in a flipbook and integrated with Google Form. Students actively discuss with their group friends to complete the student worksheet. After that, the lecture ended with a post-test to test students' understanding of plant diversity, especially sago plants. Students' interest in using flipbooks was increasingly visible. This was because the post-test was designed in interactive form using Quizizz. The answers given by students will immediately get a score. Students become more focused and enthusiastic in taking the post-test.

CONCLUSION

The flipbook-based interactive e-module integrated with local wisdom in plant diversity courses developed using the ADDIE model and was very valid (96.5%) and very practical (95.6%). Students looked enthusiastic about using flipbooks with their respective gadgets. Students' interest in using flipbooks was increasingly visible.

REFERENCES

Adiyono, A., Haya, E. W., Oktavia, E. D., & Prasetiyo, T. (2024). Learning interaction in the digital era: Technological innovations and education management strategies to enhance student engagement. *Journal of Research in Instructional*, *4*(2), 205–221. https://doi.org/10.30862/jri.v4i1.333

Annisa, A. R., Putra, A. P., & Dharmono, D. (2020). Kepraktisan media pembelajaran daya antibakteri ekstrak buah sawo berbasis macromedia flash. *Quantum: Jurnal Inovasi Pendidikan Sains*, *11*(1), 72. https://doi.org/10.20527/quantum.v11i1.8204

Ayuardini, M. (2023). Pengembangan e-modul interaktif berbasis flipbook pada pembahasan biologi. *Faktor Exacta*, *15*(4), 259–271. http://dx.doi.org/10.30998/faktorexacta.v15i4.14924

Azzahra, B., & Hestiana, D. (2021). The effectiveness of using flipbook to increase reading motivation. *Prosiding Seminar Nasional Ilmu Pendidikan Dan Multidisiplin*, *4*, 114–117. https://prosiding.esaunggul.ac.id/index.php/snip/article/view/155

Damopolii, I., Botutihe, V. T., & Nunaki, J. H. (2019). The contribution of science process skill towards students cognitive achievement through guided inquiry-based learning. *Journal of Physics: Conference Series*, *1317*(1), 012184. https://doi.org/10.1088/1742-6596/1317/1/012184

Damopolii, I., & Kurniadi, B. (2019). Training students metacognitive skill using mobile learning. *Journal of Physics: Conference Series*, *1317*(1), 012185. https://doi.org/10.1088/1742-6596/1317/1/012185

Damopolii, I., Lefaan, P. T., & Manga, M. (2018). Hubungan motivasi belajar dengan hasil belajar biologi siswa di SMP 21 Rendani Manokwari. *Prosiding Seminar Nasional Pendidikan Biologi*, *1*, 427–430. https://jurnalfkip.unram.ac.id/index.php/SemnasBIO/article/view/689

Damopolii, I., Nunaki, J. H., Jeni, J., Rampheri, M. B., & Ambusaidi, K. A. (2024). An integration of local wisdom into a problem-based student book to empower students' conservation attitudes. *Participatory Educational Research*, *11*(1), 158–177. https://doi.org/10.17275/per.24.10.11.1

Damopolii, I., Nunaki, J. H., Nusantari, E., & Kandowangko, N. Y. (2019). Integrating local resources into inquiry-based teaching materials to training students' science process skills. *AIP Conference Proceedings*, *2120*, 060003. https://doi.org/10.1063/1.5115703

Dita, K. I., Tuririday, H. T., Damopolii, I., & Latjompoh, M. (2023). Designing the human circulatory system e-module to increase student achievement. *Inornatus: Biology Education Journal*, *3*(2), 75–84. https://doi.org/10.30862/inornatus.v3i2.422

Horota, S., Damopolii, I., Kilmaskossu, J. P., & Nusantari, E. (2023). Development of an ethnobiology supplement book based on the study of medicinal plants in Wonawa District, Kepulauan Yapen Serui Regency. *Inornatus: Biology Education Journal*, *3*(1), 40–49. https://doi.org/10.30862/inornatus.v3i1.421

Iwan, I., Istisaroh, I., Sirait, S. H. K., & Damopolii, I. (2020). The development of teaching materials oriented problem-based learning integrating Tifa to train student's critical thinking skills. *AIP Conference Proceedings*, *2215*, 030006. https://doi.org/10.1063/5.0000587

Komikesari, H., Mutoharoh, M., Dewi, P. S., Utami, G. N., Anggraini, W., & Himmah, E. F. (2020). Development of e-module using flip pdf professional on temperature and heat material. *Journal of Physics: Conference Series*, *1572*(1). https://doi.org/10.1088/1742-6596/1572/1/012017

Mandasari, F., Iwan, I., & Damopolii, I. (2021). The relationship between science process skills and biology learning outcome. *Journal of Research in Instructional*, *1*(1), 23–32. https://doi.org/10.30862/jri.v1i1.9

Mulyadi, M., Atmazaki, A., & R, S. (2019). The Development of Interactive Multimedia E-Module on Indonesia Language Course. Proceedings of the 1st International Conference on Innovation in Education (ICoIE 2018), *178*, 291–295. https://doi.org/10.2991/icoie-18.2019.65

Nashiroh, P. K., & Iskandar, R. (2024). Bibliometric analysis: Learning using generative AI. *Journal of Research in Instructional*, *4*(1), 194–204. https://doi.org/10.30862/jri.v4i1.392

Nwuba, I. S., Egwu, S. O., Awosika, O. F., & Osuafor, A. M. (2023). Examining of crossover instructional strategy toward biology students' academic performance in secondary schools. *Inornatus: Biology Education Journal*, *3*(2), 50–59. https://doi.org/10.30862/inornatus.v3i2.420

Pernantah, P. S., Rizka, M., Handrianto, C., & Syaputra, E. (2022). Inovasi bahan ajar pendidikan IPS berbasis digital flipbook terintegrasi local wisdom dalam menunjang perkuliahan jarak jauh. *J-PIPS (Jurnal Pendidikan Ilmu Pengetahuan Sosial)*, *8*(2), 136–145. https://doi.org/10.18860/jpips.v8i2.14886

Rahmah, F., Sirait, S. H. K., & Nunaki, J. H. (2023). The use of teams games tournament learning to increase students' learning outcomes in classification of living things. *Inornatus: Biology Education Journal*, *3*(1), 32–39. https://doi.org/10.30862/inornatus.v3i1.388

Raibowo, S., Adi, S., & Hariadi, I. (2020). Efektivitas dan Uji Kelayakan Bahan Ajar Tenis Lapangan Berbasis Multimedia Interaktif. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *5*(7), 944–952. http://dx.doi.org/10.17977/jptpp.v5i7.13726

Rumalolas, N., Rosely, M. S., Nunaki, J. H., Damopolii, I., & Kandowangko, N. Y. (2021). The inquiry-based student book integrated with local resources: The impact on student science process skill. *Journal of Research in Instructional*, *1*(2), 133–146. https://doi.org/10.30862/jri.v1i2.17

Rumbruren, Y., Damopolii, I., & Nebore, I. D. Y. (2022). Diversity of fish caught by fishermen at Warido Amberimasi village: Development of supplement book for animal diversity course. *Inornatus: Biology Education Journal*, *2*(1), 11–23. https://doi.org/10.30862/inornatus.v2i1.271

Sari, R. K., & Avianty, D. (2023). Pengembangan Media ajar berbasis artificial intelegence pada mata kuliah evaluasi pembelajaran matematika. *Prismatika: Jurnal Pendidikan Dan Riset Matematika*, *6*(1), 31–42. https://doi.org/10.33503/prismatika.v6i1.3501

Singh, M. N. (2021). Inroad of digital technology in education: Age of digital classroom. *Higher Education for the Future*, *8*(1), 20–30. https://doi.org/10.1177/2347631120980272

Sirait, S. H. K., Kurniawan, R. P., Jeni, J., & Damopolii, I. (2022). Motivasi belajar biologi siswa selama pandemi. *Journal on Teacher Education*, *3*(2), 112–119. https://doi.org/10.31004/jote.v3i2.3203

Sugiyono. (2020). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Alfabeta.

Susilawati, E., Khaira, I., & Pratama, I. (2021). Antecedents to student loyalty in indonesian higher education institutions: The mediating role of technology innovation. *Educational Sciences: Theory and Practice*, *21*(3), 40–56. https://doi.org/10.12738/jestp.2021.3.004

Syauqi, S. K., Winarno, N., Samsudin, A., Damopolii, I., & Firdaus, R. A. (2024). From online to in-person: Students'motivation and self-regulation in science teaching activities

during and after the Covid-19 pandemic. *INSECTA: Integrative Science Education and Teaching Activity Journal*, *5*(1), 87–107. https://jurnal.iainponorogo.ac.id/index.php/insecta/article/view/8689

Verawati, N. N. S. P., & Wahyudi, W. (2024). Raising the issue of local wisdom in science learning and its impact on increasing students' scientific literacy. *International Journal of Ethnoscience and Technology in Education*, *1*(1), 42. https://doi.org/10.33394/ijete.v1i1.10881

Wulandari, D. U., Mariana, N., Wiryanto, W., & Amien, M. S. (2024). Integration of ethnomathematics teaching materials in mathematics learning in elementary school. *IJORER : International Journal of Recent Educational Research*, *5*(1), 204–218. https://doi.org/10.46245/ijorer.v5i1.542

Yomaki, E. K., Nunaki, J. H., Jeni, J., Mergwar, S. D. I., & Damopolii, I. (2023). Flipbook based on problem-based learning: Its development to bolster student critical thinking skills. *AIP Conference Proceedings*, *2614*(1), 020022. https://doi.org/10.1063/5.0126212