



Design and development of website-based digital learning media supported by factual video

Asni Johari ¹, Ahmad Fadhil N ^{2,*}, Depriana Megawati Silitonga ¹ and Upik Yelianti ¹

¹ Department of Mathematics and Natural, Faculty of Teacher Training and Education, Jambi University, Muaro Jambi 36361, Jambi, Indonesia.

² Master of Science in Information Technology Program, Faculty of Computer Science, President University, Jl. Ki Hajar Dewantara, Kota Jababeka, Cikarang Utara, Bekasi, Jawa Barat, 17550, Indonesia.

Open Access Research Journal of Multidisciplinary Studies, 2026, 11(01), 056–061

Publication history: Received on 21 January 2026; revised on 01 March 2026; accepted on 02 March 2026

Article DOI: <https://doi.org/10.53022/oarjms.2026.11.1.0019>

Abstract

The integration of web-based information technology in science education is crucial for creating interactive and learner-centered digital learning environments. This study aimed to develop website-based digital learning media integrated with factual video and to examine its feasibility and effectiveness in science learning. The media presents butterfly species diversity content from Muhammad Sabki Urban Forest, Jambi, and was designed with an emphasis on interactivity, user interface quality, and web functionality. The study employed a Research and Development (R&D) approach using the ADDIE model, involving junior high school students in small- and large-group trials. Data were collected through expert validation, user response questionnaires, and pretest–posttest assessments. The results showed that the media achieved a “very good” feasibility category, with positive responses from teachers and students. Effectiveness testing using the Wilcoxon Signed Rank Test indicated a significant improvement in learning outcomes ($p < 0.001$), with a high average N-gain score of 0.74. These findings indicate that website-based digital learning media integrated with factual video are effective in enhancing students’ conceptual understanding and learning outcomes in science education.

Keywords: Information Technology; Digital Learning Media; Website-Based Learning; Factual Video

1. Introduction

The integration of information technology (IT) into learning systems has become a critical foundation for implementing student-centered and meaningful learning in contemporary education. Digital learning environments are expected to promote active engagement, conceptual understanding, and higher-order thinking by enabling learners to interact with content through multiple representations and flexible learning pathways. Recent studies emphasize that technology-enhanced learning environments, when designed pedagogically, can significantly improve student engagement and learning outcomes by shifting instruction from teacher-centered delivery to learner-centered exploration [1] [2] [3].

Despite the increasing availability of digital infrastructure in schools, including internet connectivity, mobile devices, and web-based platforms, classroom practices in many contexts remain dominated by conventional instructional approaches. Learning activities often rely on static presentations and printed textbooks, resulting in passive learning experiences and limited opportunities for conceptual visualization, particularly in science subjects that involve abstract concepts such as biological classification. This mismatch between technological availability and pedagogical utilization highlights a persistent challenge in digital education: technology alone does not transform learning unless it is integrated through well-designed instructional media that support interaction, visualization, and learner autonomy [4] [5] [6].

* Corresponding author: Ahmad Fadhil N

Website-based digital learning media integrated with video content represent a promising approach to addressing this challenge. Web-based platforms allow learning materials, multimedia resources, and assessments to be organized within a single, accessible digital environment that supports flexible access and self-directed learning. When combined with factual video—video recordings derived from real-world contexts—learning media can provide authentic visual experiences that bridge abstract scientific concepts with observable phenomena. Research in multimedia learning consistently shows that instructional videos grounded in real contexts enhance conceptual understanding and knowledge retention by supporting cognitive processing and dual-channel learning [7] [8].

In science education, factual video is particularly valuable for presenting biological diversity and classification, as it enables students to observe real organisms, environmental contexts, and distinguishing characteristics that are difficult to convey through text alone. Embedding such videos within a website-based learning system further enhances their instructional value by enabling interaction, repetition, and integration with other learning activities. Therefore, this study focuses on the design and development of website-based digital learning media integrated with factual video as an IT-driven instructional innovation aimed at improving student engagement, conceptual understanding, and learning outcomes in science education.

2. Materials and Methods

This study is a Research and Development (R&D) employing the ADDIE model (Analyze, Design, Development, Implementation, Evaluation) to design, develop, and test website-based digital learning media integrated with factual video [9] [10]. The research subjects were eighth-grade students at junior high school 35 Muaro Jambi who had studied biological classification. The study was conducted in two trial stages: a small-group trial (6 students) and a large-group trial (26 students), followed by implementation with seventh-grade students (28 students) as the main users of the learning media.

The analysis stage involved identifying learning problems and student needs through classroom observations, interviews with science teachers, and student questionnaires. The design stage included creating storyboards, structuring factual videos, developing narratives and illustrations, and selecting the website as the delivery platform. In the development stage, the media product was produced, validated by content and media experts, revised based on expert feedback, and then trialed with small and large groups to assess feasibility and functionality before full implementation.

The implementation stage involved deploying the media in class, accompanied by pretest and posttest assessments to evaluate its effectiveness in improving student learning outcomes. The evaluation stage included formative evaluation for incremental product improvement and summative evaluation to measure the overall effectiveness of the media. Data were analyzed both qualitatively (expert feedback, teacher and student responses) and quantitatively (validation and response questionnaires, pretest-posttest scores), with Likert-scale instruments measuring perceptions of media feasibility and effectiveness. Pretest-posttest results were statistically analyzed to determine the impact of the digital learning media on student achievement.

3. Results

3.1. Material Validation Results

Material validation by experts was conducted in three stages. The average scores increased from 53.3% (Good) in the first stage to 85% (Very Good) in the second stage, and 95% (Very Good) in the third stage. The most significant improvement occurred in the language aspect, which increased from 25% to 100% after revisions, indicating that the media met the feasibility criteria in terms of content, language, and evaluation (Gambar 1).

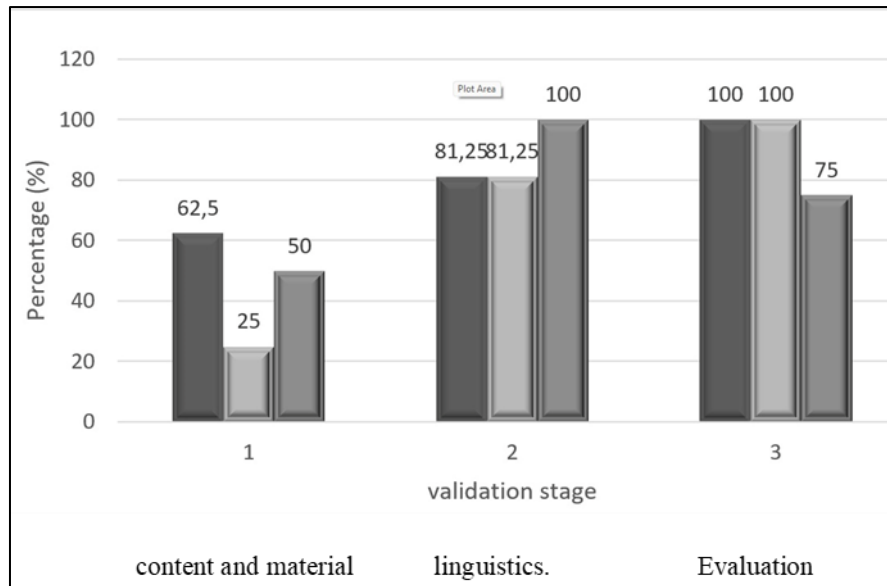


Figure 1 Graph of material expert validation results

3.2. Media Validation Results

Media validation by experts was carried out in two stages, covering visual appearance, factual video content, and the website platform. The average scores increased from 70% (Good) in the first stage to 93.3% (Very Good) after revisions, demonstrating that the digital media based on a website and factual videos was feasible in terms of visuals, content, and platform presentation (Gambar 2).

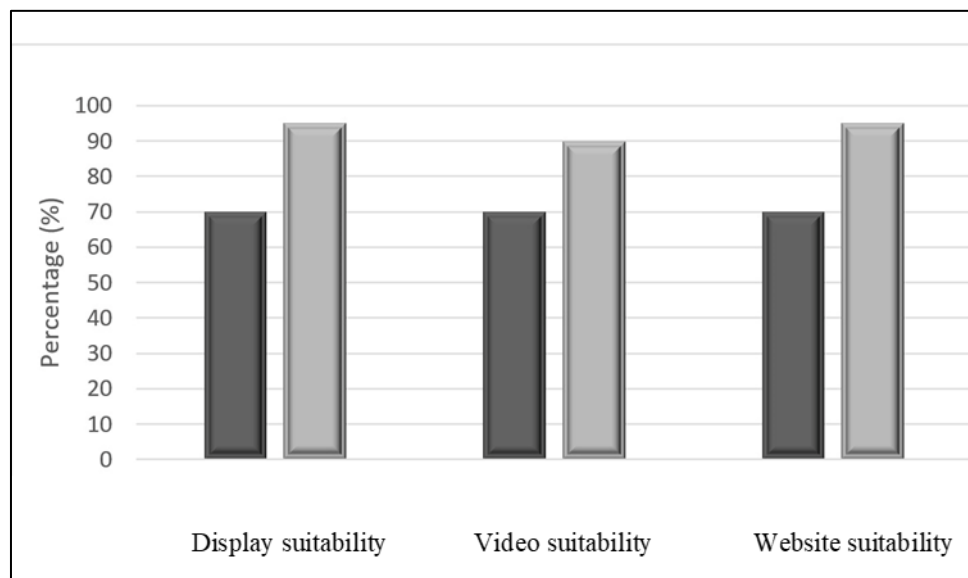


Figure 2 Graph of media expert validation results

3.3. Science Teacher Evaluation

Evaluation by the science teacher showed an average score of 98.3% (Very Good), covering content relevance, clarity of language, design, and the media's potential to improve student understanding. This indicates that the media is highly suitable for teaching seventh-grade science (Tabel 1).

Table 1 Teacher Assessment Results in the Science Study Field

No	Assessment aspect	Validation stage (%)
1	Factual video media feasibility	97,5
2	Website feasibility	100
Average (%)		98,3
Category		Very good

3.4. Small Group Trial Results

A small group trial with 6 students resulted in an average score of 87.5% (Very Good). The highest score was for media appearance at 93.1%, while content delivery and media usefulness scored 87.5%, and website accessibility and navigation scored 81.94%. These results show that the media is visually appealing, clear, and beneficial for students.

3.5. Large Group Trial Results

A large group trial with 26 students produced an average score of 95.15% (Very Good). The highest score was for media usefulness at 95.19%, followed by content delivery at 90.87%, media appearance at 90.06%, and website accessibility and navigation at 88.46%. Overall, the media proved effective, engaging, and easy to use for students (Tabel 2).

Table 2 Results of Large Group Trial

No	Assessment aspect	Percentage (%)
1	Media appearance	90,06
2	Presentation	90,87
3	Ease of Access and Website Navigation	88,46
4	Media usefulness	95,19
Average (%)		95,15
Category		Very good

3.6. Nonparametric Test (Wilcoxon Signed Rank Test)

Pretest data were non-normal (Sig. 0.043) while posttest data were normal (Sig. 0.336), so analysis used the Wilcoxon Signed Rank Test. The results showed $Z = -4.625$ with significance < 0.001 , indicating a significant difference between pretest and posttest scores. This demonstrates that the media significantly improved students' learning outcomes (Tabel 3).

Table 3 Results of the Wilcoxon Signed Rank Test

Test Statistic	Value
Z	-4,625
Asymptotic Significance (2-tailed)	< 0,001
Note	There is a significant difference

3.7. N-Gain Test Results

The N-Gain analysis of 28 students showed an average score of 0.74, with a minimum of 0.38 and a maximum of 1.00, categorized as high. This confirms that the website-based digital learning media with factual videos effectively enhanced students' conceptual understanding, interest, and cognitive learning outcomes (Tabel 4).

Table 4 N-Gain Score Test Results

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
N-Gain	28	.38	1.00	.7400	.10369
Valid N (listwise)	28				

4. Discussion

The results of the study indicate that integrating web-based digital technology and factual video in learning media significantly enhances the feasibility and quality of instructional products and positively impacts student engagement. Expert validation yielded “Very Good” ratings, suggesting that digital technology supports content delivery in a more engaging, contextual, and understandable way compared to conventional media. These findings are consistent with research showing that interactive digital learning tools increase student engagement and achievement when integrated into educational activities [11].

Furthermore, trials with both small and large groups demonstrated that digital media provide a positive learning experience in terms of visual design, content delivery, access, and navigation. High evaluation scores from teachers further indicate strong support for integrating technology in teaching, as digital media offer flexibility and accessibility across multiple devices a finding supported by research reporting that strategic use of technology enhances both engagement and academic performance [12] [13].

Finally, effectiveness analyses using nonparametric tests and N-gain scores show that technology-based digital learning media significantly improve students’ cognitive learning outcomes, with substantial score gains. This reinforces the principle that strategic and contextual integration of digital technology in instructional design supports better learning achievement and addresses 21st-century learning demands [12].

5. Conclusion

The digital learning media based on a website and factual videos, developed to present the diversity of butterfly species in Hutan Kota Muhammad Sabki Jambi, has proven highly feasible and effective for teaching Life Science, particularly the classification of living organisms. Expert validation of content and media yielded very high scores, accompanied by positive feedback from teachers and students, while effectiveness analysis using the Wilcoxon test and N-gain indicated significant improvements in student learning outcomes. The integration of digital technology enables contextual, interactive, and easily accessible learning, allowing students to study independently and flexibly, in line with the demands of modern, technology-enhanced education.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest exists among the Authors.

References

- [1] Khotimah, Husnul; Astuti, Eka Yuli; Apriani, D. 2019. Technology-Based Education (Problems and Challenges). *Proceedings of the National Education Seminar, Postgraduate Program, PGRI University of Palembang*, pp. 357–368
- [2] Johari, A. Risma Hesy Amrulia, Retni S. Budiarti, Ratna Sari Dewi. 2022. The Effect of Cooperative Learning Model Using Snowball Throwing Type with Scientific Approach Toward Students’ Learning Outcomes. *International Journal of Applied Science of Research*. 5(3): 211-215.
- [3] Fitri, R., Selaras, G. H., & Andima, R. 2019. Multiple Intelligences of Grade X Social Sciences and Linguistics Students with Cross-Interest in Biology. *Bioeducation Journal*. 3(2): 101–112.

- [4] Johari A, Riza Alifia Zukri, Raissa Mataniari, Harlis, Muswita. 2023. Classification Study of the Order of Coleoptera for High School Biology E-bookletslet Development Materials. *International Journal of Applied Science and Research*. 6(1): 39-44.
- [5] Farsa, H., Johari, A., & Kamid, K. 2022. Development of a Comic-Based E-Module Equipped with Factual Videos for Grade VII Junior High School Science Learning. *Biodik*, 8(2): 22–30.
- [6] Rasapta, D., Septa, Syty, S. Q., & Jabar, A. 2022. Introduction to the Use of Google Sites for Website Creation at MI Hidayatull Athfal Gunung Sindur. *Abdi Jurnal Publikasi*, 1(2): 285–289.
- [7] Kusumaningtyas, S. I. 2022. The Use of Google Sites and Learning Videos During the COVID-19 Pandemic on Three-Dimensional Geometry Material. *SCIENCE: Journal of Innovation in Mathematics and Science Education*, 2(1): 1–9.
- [8] Branch, R. M. 2009. Approach, Instructional Design: The ADDIE. In *Department of Educational Psychology and Instructional Technology University of Georgia*. 53(9).
- [9] Setyosari, P. 2016. Educational and Development Research Methods. Kencana.
- [10] Aminah, S. 2018. Implementation of the ADDIE Model in an Educational Game for English Learning (A Case Study at junior high school 8 Pagar alam). *Jurnal Ilmiah Betrik*, 9(3): 152–162.
- [11] Rawe, T. 2022. Application of the ADDIE Model and Self-Directed Learning in the E-Learning-Based “English Study at Home” Program at Eye Level Citra Gran Cibubur. *Jurnal Instruksional*, 3(2): 164–172.
- [12] Hake, R. R. 1998. Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. *American Journal of Physics*, 66(1): 64–74.
- [13] Hurrahma, M., & Sylvia, I. 2022. Effectiveness of Liveworksheet-Based E-Worksheets (E-LKPD) in Improving Sociology Learning Outcomes of Grade XI Social Science Students at Senior High School 5 Padang. *Jurnal Sikola: Journal of Educational and Learning Studies*, 4(1), 14–22.