

Development of Mechanical Learning Media Based on Google Sites in Basic Engineering Subjects for Grade X Vocational High School

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Article Info

Article history:

Accepted: 26 April 2026

Publish: 08 Juni 2026

Keywords:

Learning Media;

Google Sites;

Mechanical Learning;

ADDIE;

Learning Outcomes.

Abstract

This study aims to develop a web-based learning media using Google Sites, named Mechanical Learning, for Basic Engineering subjects in Grade X Vocational High School. The research was motivated by the limited use of technology in learning and teacher-centered instructional practices. This study employed a Research and Development (R&D) method using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The subjects consisted of material experts, media experts, and students. Data were collected through validation questionnaires, practicality questionnaires, and learning outcome tests. Data analysis used descriptive statistics and N-Gain analysis. The results showed that the developed media is highly valid, with material validation scores of 4.49 and 4.30, and media validation scores of 4.75 and 4.60. The practicality test showed an average score of 4.47 (very practical), while the effectiveness test showed an N-Gain of 70.68% (moderately effective). Therefore, Mechanical Learning media is valid, practical, and effective to support learning outcomes.

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1. INTRODUCTION

The rapid development of information and communication technology has significantly transformed the education sector (Ula & Nugraheni, 2024). Technology integration enables flexible learning and provides broader access to learning resources (Prihatin, 2022). Furthermore, digital learning media contributes to increased motivation and learner autonomy (Wandini et al., 2026).

Effective learning is not only determined by teacher delivery but also by student engagement and independence (Komalasari et al., 2025). Student-centered learning requires accessible and interactive learning resources (Imaniyah et al., 2025). Therefore, appropriate learning media plays a crucial role in improving understanding and engagement (Astuti et al., 2024).

Traditional teaching methods, which rely heavily on lectures, often reduce student participation. In contrast, digital media such as web-based learning platforms offer interactive and flexible learning experiences (Rohma et al., 2022). Research shows that web-based learning can significantly improve student motivation and learning outcomes (Karyati, 2023; Sa'diyah, 2019).

In vocational education, particularly Basic Engineering subjects, students need both conceptual understanding and practical insight (Yudianto & Alimuddin, 2023). However, observations show that learning is still dominated by lectures, with limited use of digital media.

Google Sites is a simple and accessible platform that allows teachers to create structured learning content without programming skills (Farahani, 2023). It supports multimedia integration, making learning more engaging (Maharani & Sari, 2023).

Previous studies indicate that Google Sites-based learning media are effective in improving learning outcomes (Rekmana & Ramadani, 2024; Usman & Achmad, 2024). However, its application in Basic Engineering subjects, particularly in industrial technology development topics, remains limited.

Therefore, this study aims to develop Mechanical Learning media using Google Sites to improve student learning outcomes.

2. METHOD

This study used the Research and Development (R&D) method with the ADDIE model (Branch, 2009). The stages include:

- a. Analysis: Identifying learning problems, student characteristics, and curriculum needs (Sugiyono, 2018).
- b. Design: Developing flowcharts and learning content structure.
- c. Development: Creating the Google Sites-based media and validating it with experts.
- d. Implementation: Testing the media on students.
- e. Evaluation: Measuring effectiveness using N-Gain.

The subjects included material experts, media experts, and Grade X vocational students. Data collection instruments consisted of validation sheets, practicality questionnaires, and learning outcome tests. Data were analyzed using Likert scale and N-Gain analysis.

3. RESULTS AND DISCUSSION

a. Results

The developed Mechanical Learning media includes structured menus such as Home, Instructions, Learning Objectives, Materials, Videos, Glossary, Evaluation, and Profile.

1) Validity Results:

Material experts: 4.49 and 4.30 (very valid)

Media experts: 4.75 and 4.60 (very valid)

2) Practicality Results:

Average score: 4.47 (very practical)

3) Effectiveness Results:

N-Gain score: 70.68% (moderately effective)

b. Discussion

The high validity indicates that the media aligns with instructional design principles and content accuracy (Kustandi & Darmawan, 2020). The practicality score shows that the media is easy to use and accessible (Google, 2023).

The effectiveness result demonstrates that web-based learning improves student understanding through multimedia integration, supporting Mayer's multimedia learning theory (Mayer, 2009). This aligns with previous findings that digital media enhances learning outcomes and engagement (Rohma et al., 2022; Wahyudi et al., 2023).

Google Sites also supports independent learning by providing flexible access to materials (Farahani, 2023). However, its limitations include dependency on internet access and limited interactivity compared to LMS platforms (Fitriani et al., 2021).

Overall, the findings confirm that Mechanical Learning media effectively improves student learning outcomes.

4. CONCLUSION

This study successfully developed Mechanical Learning media based on Google Sites using the ADDIE model. The media is categorized as very valid, very practical, and moderately effective. It can be used as an alternative learning resource to improve student learning outcomes in Basic Engineering subjects. The development of Mechanical Learning media based on Google Sites for Grade X Basic Engineering subjects successfully meets validity, practicality, and effectiveness criteria. Validation scores from both material and media experts indicate high content accuracy and instructional alignment, while practicality tests confirm ease of use and accessibility. The media demonstrates moderate effectiveness in improving student learning outcomes, as evidenced by an N-Gain score of 70.68%. Overall, Mechanical Learning media serves as a feasible and interactive web-based learning resource that supports student-centered learning, enhances engagement, and can complement conventional instructional methods in vocational education. Future studies may explore enhanced interactivity, offline accessibility, and longitudinal impact on student performance.

5. ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to Universitas Negeri Padang for supporting this research. Special thanks are extended to the material and media experts for their valuable feedback, as well as the students who participated in the study. The authors also appreciate the guidance from mentors and colleagues who contributed to the successful development and evaluation of the Mechanical Learning media.

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