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Web-Based Media Using a Project-Based Learning Approach in Textile Materials for Children's Clothing

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Abstract: This study aims to develop web-based learning media using a Project-Based Learning approach on textile materials for children's clothing and to determine its feasibility and students' responses in supporting quality education. This study employed a Research and Development (R&D) method using the ADDIE model, which consists of analysis, design, development, implementation, and evaluation stages. The implementation stage involved students of the Fashion Education Study Program. Data were collected through expert validation sheets and student response questionnaires using a Likert scale. The results showed that the developed media were categorized as very valid, with a material expert validation score of 94.3% and a media expert validation score of 92.5%. Students' responses also indicated very positive results, with an average score of 92.5%. These findings demonstrate that the web-based learning media integrated with the Project-Based Learning approach are feasible and effective in supporting students' engagement and understanding of textile materials for children's clothing. Therefore, this media can be used as an alternative instructional tool to improve the quality of learning in vocational fashion education.

Keywords: Children's clothing; Project-based learning; Textile materials; Vocational education; Web-based media

Introduction

Twenty-first century learning requires students to possess critical, creative, collaborative, and communicative thinking skills. One learning approach considered effective in meeting these demands is Project-Based Learning (PjBL), as it encourages students to actively engage in the learning process through real-world problem solving and the creation of authentic products (Guo et al., 2020; Zulyusri et al., 2023; Selasmawati & Lidyasari, 2023; Anwar et al., 2024; Marlina et al., 2025; Kokotsaki et al., 2016; Almulla, 2020; Delianti & Jalinus, 2020; Arianta et al., 2024). Various studies have shown that the implementation of PjBL can improve learning outcomes, creativity, motivation, and higher-order thinking skills across different educational levels (Anwar et al., 2024; Aji et al., 2023; Firmansyah & Dewi, 2021; Aghayani & Hajmohammadi, 2019; Khaira et al., 2025; Latifa et al., 2022; Amri et al., 2020). In addition, PjBL has also been found effective in developing twenty-first century skills such as collaboration and communication (Guo et al., 2020; Evenddy et al., 2023; Sagita et al., 2023; Tamim et al., 2011; Akhyar et al., 2023).

Along with the advancement of digital technology, the integration of PjBL with web-based learning media has become increasingly relevant. Web-based media provide flexible access to learning, more engaging material visualization, and support independent and collaborative learning (Rahmawati & Sudargo, 2021; Lestari, 2020; Ningsih et al., 2025; Lestari et al., 2024; Susanti et al., 2022; Nursafitri & Ansori, 2024; Means et al., 2013; Hwang & Wu, 2012; Mangesa et al., 2023; Fadhilah et al., 2024; Sadriati, 2023). National studies also indicate that PjBL-based web media can enhance students' digital literacy and learning engagement (Siregar et al., 2024; Pratama et al., 2022).

In the context of vocational education, particularly in fashion education, learning about textile materials for children's clothing requires both conceptual understanding and practical skills. Therefore, the

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application of web-based learning media through a Project-Based Learning approach is considered relevant for bridging theory and practice (Rahmania, 2023; Sahil, 2023; Handayani, 2020).

However, based on preliminary observations in the Fashion Education Study Program at Universitas Negeri Medan, the learning process of textile materials for children's clothing is still dominated by conventional methods, with limited use of interactive and technology-based learning media. Existing instructional media tend to focus on theoretical explanations and are not optimally integrated with project-based learning activities. As a result, students experience difficulties in understanding the characteristics of textile materials and applying them in the context of children's clothing design.

In addition, currently available web-based learning media have not been specifically designed to accommodate the characteristics of textile materials for children's clothing, which require the integration of conceptual knowledge and practical application. This indicates a gap between the needs of vocational fashion education and the available learning media. Therefore, this study aims to develop web-based learning media integrated with a Project-Based Learning approach specifically for textile materials in children's clothing. The novelty of this research lies in the integration of structured project activities within web-based media to support students' active learning, creativity, and understanding. This research is important as it provides an innovative instructional solution to improve the quality of learning in vocational fashion education.

Method

This study employed a Research and Development (R&D) method using the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation. The ADDIE model is widely used in the development of instructional media due to its systematic and structured approach (Dona & Armiati, 2025; Adinugraha, 2018). The study was conducted in the Fashion Education Study Program at Universitas Negeri Medan, involving students enrolled in the Children's Clothing course, particularly in the topic of textile materials for children's clothing.

In the analysis stage, learning needs, student characteristics, and problems in the learning process were identified. The findings indicated that learning was still dominated by conventional methods, with limited use of interactive and technology-based media, resulting in low student engagement and difficulties in understanding textile materials.

In the design stage, the structure of the web-based learning media was developed, including the organization of learning materials, interface design, and the preparation of project-based learning activities aligned with the Project-Based Learning approach. This learning approach follows the syntax of Project-Based Learning, which includes problem identification, project planning, implementation, monitoring, and evaluation (Undari, 2023; Doyan et al., 2024).

The development stage involved creating the web-based learning media based on the prepared design. The developed product was then validated by material experts and media experts to assess content feasibility, alignment with the Project-Based Learning approach, language clarity, visual design, and usability.

The implementation stage was carried out through a limited trial involving students of the Fashion Education Study Program. In this stage, students used the developed web-based learning media in project-based learning activities to evaluate its practicality and effectiveness in supporting the learning process. The use of multiple instruments in this stage is consistent with previous studies on Project-Based Learning and digital learning media (Dona & Armiati, 2025; Pratama et al., 2022).

The evaluation stage was conducted to analyze the results of expert validation and student responses, as well as to identify necessary improvements to the developed media. The evaluation results were used to determine the feasibility of the web-based learning media for instructional use.

Data were collected using expert validation sheets and student response questionnaires based on a five-point Likert scale. The expert validation instruments assessed content suitability, alignment with the Project-Based Learning approach, language accuracy, visual appearance, and usability. Meanwhile, student response questionnaires measured perceptions of content quality, presentation, visual design, language use, and usefulness of the learning media.

Data analysis was conducted using descriptive quantitative techniques by converting the obtained scores into percentages. The results were then interpreted using predefined criteria to determine the feasibility level of the developed web-based learning media.

Expert Media Feasibility Analysis

The feasibility of the web-based learning media was evaluated by material experts and media experts using validation instruments. The assessment results were converted into percentages and interpreted based on the criteria presented in Table 1.

Table 1. Interpretation of Web-Based Learning Media Validity

Score (%)	Category
≤ 54	Very invalid
55–64	Less valid
65–79	Moderately valid
80–89	Valid

90–100	Very valid

The criteria in Table 1 were used to determine the feasibility level of the web-based learning media in terms of content quality, alignment with the Project-Based Learning approach, language clarity, visual appearance, and graphical design.

Analysis of Students' Responses

The analysis of students' responses was conducted to examine students' perceptions of the use of web-based learning media through a Project-Based Learning approach on textile materials for children's clothing. Students' responses were analyzed descriptively and categorized based on the criteria shown in Table 2.

Table 2. Interpretation of Students' Response Questionnaire

Score (%)	Category
0–20	Very poor
21–40	Poor
41–60	Fair
61–80	Good
81–100	Very good

Evaluation Indicators of Learning Media

The material expert validation instrument was used to assess the feasibility of the web-based learning media in terms of content suitability, alignment with the Project-Based Learning approach, and language clarity and accuracy. Meanwhile, the media expert validation instrument focused on presentation quality, visual and graphical design, as well as ease of access and usability. Students' response questionnaires assessed the quality of the learning content, presentation, visual appearance, language use, and the usefulness of the learning media.

Result and Discussion

The results of the study indicate an improvement in students' learning outcomes after the implementation of web-based learning media through a Project-Based Learning (PjBL) approach. This finding is consistent with previous studies reporting that PjBL is effective in enhancing conceptual understanding and learning outcomes (Anwar et al., 2024; Aji et al., 2023; Guo et al., 2020).

A significant increase in students' learning activities and engagement was also observed during the learning process. Students became more actively involved in discussions, collaborated effectively in groups, and demonstrated greater responsibility toward the projects they completed. These findings support prior research indicating that PjBL enhances participation and collaborative skills (Selasmawati & Lidyasari, 2023; Evenddy et al., 2023; Siregar et al., 2024). Students' responses to the use of web-based learning media were categorized as very positive. The web-based media were perceived as facilitating access to learning materials, improving understanding of textile materials, and supporting systematic project-based learning. These results are consistent with previous studies (Rahmawati & Sudargo, 2021; Ningsih et al., 2025; Lestari et al., 2024; Pratama et al., 2022).

Results of Media Development

The development of web-based learning media using a Project-Based Learning approach was carried out following the ADDIE model. The developed product consists of learning materials on textile materials for children's clothing, presented in the form of text, images, and structured project-based activities. The media were designed to facilitate students in understanding textile characteristics and applying them in children's clothing design through project-based tasks.

The web-based platform provides several main features, including learning modules, project instructions, material visualization, and evaluation components. These features support the implementation of Project-Based Learning, particularly in the stages of project planning, implementation, and monitoring.

Results of Material Expert Validation

The validation results from material experts indicate that the developed web-based learning media are categorized as very valid, with an average score of 94.30%. The highest score was obtained in the aspects of content feasibility and alignment with Project-Based Learning characteristics, each scoring 95.00%. This indicates that the developed media are consistent with learning objectives and effectively integrate Project-Based Learning principles. The results of the material expert validation are presented in Table 3

Table 3. Results of Material Expert Validation

Assessment Aspect	Score (%)	Category
Content feasibility of textile materials for children's clothing	95	Very valid
Suitability with Project-Based Learning characteristics	95	Very valid
Language feasibility	93	Very valid
Average	94.3	Very valid

Based on Table 3, the web-based learning media were rated as very valid by the material expert, with an average score of 94.3%. This indicates that the textile materials for children's clothing were developed in accordance with course learning outcomes, the characteristics of Project-Based Learning, and clear, comprehensible language.

Results of Media Expert Validation

The results of media expert validation show that the web-based learning media achieved an average score of

92.50%, categorized as very valid. The media were considered visually appealing, well-structured, and easy to access. The graphical design and navigation features support effective learning and enhance user experience. The results are presented in Table 4.

Table 4. Results of Media Expert Validation

Assessment Aspect	Score (%)	Category
Web-based media presentation feasibility	93	Very valid
Visual and graphical design	92	Very valid
Average	92.5	Very valid

The media expert validation results indicate that the web-based learning media obtained an average score of 92.5%, categorized as very valid. The media were considered visually appealing, well-organized, and easy to access and use in the learning process.

Results of Students' Response Test

The results of students' responses indicate that the developed web-based learning media received very positive feedback, with an average score of 92.50%. The highest score was found in the content aspect (95.00%), followed by presentation (93.00%), language (92.00%), and visual design (90.00%). These results suggest that the media effectively support students' understanding and engagement in learning textile materials for children's clothing. The results are presented in Table 5

Table 5. Students' Responses to the Learning Media

Assessment Aspect	Score (%)	Category
Content	95	Very good
Presentation	93	Very good
Visual design	90	Very good
Language	92	Very good
Average	92.5	Very good

Based on Table 5, the web-based learning media received very positive responses from students, with an average score of 92.5%. This indicates that the media effectively supported students' understanding of textile materials for children's clothing and enhanced their engagement in project-based learning.

Discussion

The findings of this study indicate that the web-based learning media integrated with the Project-Based Learning approach have a high level of feasibility and are well-received by students. This is reflected in the high validation scores from both material and media experts, as well as the very positive student responses. These results are consistent with previous studies that reported the effectiveness of Project-Based Learning in enhancing student engagement and learning outcomes (Guo et al., 2020; Anwar et al., 2024; Marlina et al., 2025; Khaira et al., 2025; Almulla, 2020; Kokotsaki et al., 2016; Delianti & Jalinus, 2020; Arianta et al., 2024).

The developed media play a significant role in supporting the implementation of Project-Based Learning, particularly in the project planning, implementation, and monitoring stages. The availability of structured project instructions and accessible learning materials enables students to better understand the workflow of project completion and apply theoretical knowledge in practical contexts. This finding is in line with previous research emphasizing that Project-Based Learning can enhance students' critical thinking and independent learning (Hmelo-Silver, 2004; Krajcik & Blumenfeld, 2006; Amri et al., 2020; Latifa et al., 2022).

Compared to previous studies, the novelty of this research lies in the integration of web-based media specifically designed for textile materials in children's clothing. While earlier studies have focused on general web-based learning or Project-Based Learning applications, this study emphasizes the combination of both approaches in a vocational fashion context. This provides a more contextual and practical learning experience that aligns with the needs of fashion education students (Susanti et al., 2022; Nursafitri & Ansori, 2024; Hung et al., 2012; Mangesa et al., 2023; Fadhilah et al., 2024).

However, several limitations were identified during the implementation stage. Some students experienced technical challenges, such as unstable internet connections and difficulties in navigating certain features of the web-based media. These challenges affected the smoothness of the learning process but were addressed by providing additional guidance and simplifying the navigation structure. Overall, the results demonstrate that the integration of web-based learning media with a Project-Based Learning approach can effectively support student engagement, understanding, and practical skills in textile materials for children's clothing

Conclusion

The developed web-based learning media integrated with the Project-Based Learning approach for textile materials in children's clothing were proven to be highly feasible for instructional use. This is supported by the material expert validation score of 94.30% and media expert validation score of 92.50%, both categorized as very valid. In addition, students' responses showed very positive results with an average score of 92.50%, indicating that the media effectively support student engagement and understanding.

These findings demonstrate that the integration of web-based media and Project-Based Learning can serve as an effective instructional solution in vocational fashion education. This study implies that educators can

utilize this media to enhance interactive and project-oriented learning. Future research is recommended to examine the effectiveness of this media in improving learning outcomes, creativity, and practical skills on a larger scale and in different learning contexts.

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Author Contributions
All authors contributed equally to this research. Erni was responsible for the research design and manuscript preparation. Yudhistira Anggraini and Halimul Bahri contributed to data collection, analysis, and interpretation. Nurhayati Tanjung assisted in reviewing, editing, and validating the manuscript. All authors have read and approved the final version of the manuscript.

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Conflicts of Interest
The researchers funded this research independently

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