

Development and Validation of a Problem-Based Learning Video to Support Fashion Pattern Competency in Vocational Teacher Education

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ABSTRACT

This study aimed to develop and evaluate a Problem-Based Learning (PBL)-based instructional video to support fashion pattern competency in vocational teacher education. The research used a Research and Development approach based on the Four-D model: define, design, develop, and disseminate. The video integrated problem orientation, information exploration, analysis, solution presentation, and reflection into fashion pattern learning activities. Product validation involved two content experts and two media-language experts, while practicality testing was conducted with 35 students, followed by wider implementation with 105 students. Data were analyzed using Aiken's V and descriptive statistics. Content validity coefficients ranged from 0.67 to 0.83, while media-language validity reached 0.957, indicating a highly valid product. Student evaluations produced a mean score of 3.57 and a feasibility level of 89.21%. The findings demonstrate that the video is valid, practical, and feasible for fashion pattern instruction and vocational teacher preparation.



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Introduction

Digital transformation has significantly influenced teaching and learning practices in higher education, including vocational teacher education. The increasing availability of educational technologies has encouraged lecturers to adopt learning resources that are flexible, accessible, and capable of supporting competency development beyond traditional classroom instruction (Bond et

al., 2021; Navarrete et al., 2025). In vocational disciplines, digital learning media are particularly important because students are expected to acquire both conceptual understanding and practical skills that can be applied in professional contexts.

Within fashion education programs, fashion pattern construction is a core competency that requires students to understand measurement principles, pattern development procedures, and garment adaptation techniques. Learning activities often involve sequential processes that demand careful observation and repeated practice. However, many students experience difficulties when learning pattern transformation because explanations are frequently delivered through demonstrations that are limited by classroom time and students' ability to revisit instructional content Amalia and Irmayanti (2026). Consequently, learning resources capable of visualizing procedures clearly and supporting independent learning are needed Stanciulescu et al (2024).

Instructional video has emerged as one of the most widely used digital media for teaching procedural knowledge. Unlike printed materials or one-time demonstrations, video enables learners to observe processes repeatedly and at their own pace. Previous studies have shown that video-based learning can improve engagement, facilitate self-directed learning, and support the acquisition of practical skills across various educational settings (Navarrete et al., 2025; Noetel et al., 2021). In fashion education, video media have been developed to support learning in garment construction, fashion illustration, and pattern-making courses (Angendari et al., 2022; Handayani & Ernawati, 2024; Ikhlas, 2023). Despite these advantages, many instructional videos remain focused on demonstrating technical procedures and provide limited opportunities for students to engage in analytical or problem-solving activities.

To address this limitation, learning media can be combined with instructional approaches that encourage active participation. Problem-Based Learning (PBL) is widely regarded as an effective approach for vocational education because it places learners in situations that require investigation, decision-making, and solution development (Manuaba et al., 2022; Yanto et al., 2022). Through authentic problems, students are encouraged to connect theoretical knowledge with practical application while developing higher-order thinking skills. Such characteristics make PBL particularly relevant for fashion pattern learning, where students are frequently required to analyze design requirements, modify patterns, and evaluate alternative solutions.

Research has consistently reported positive outcomes associated with both video-based learning and PBL implementation. Video-supported instruction has been found to enhance learning effectiveness, while PBL contributes to improved critical thinking, problem-solving ability, and

learner engagement (Marta et al., 2024; Sukacké et al., 2022). Nevertheless, studies that integrate these two elements within fashion education remain limited. Existing developments generally emphasize procedural demonstrations without explicitly embedding the complete stages of the PBL process. Furthermore, relatively little attention has been given to the role of instructional media in preparing pre-service vocational teachers to implement innovative learning strategies in their future classrooms. The present study is informed by multimedia learning theory and constructivist learning theory. Multimedia learning theory proposes that learning becomes more effective when information is presented through coordinated visual and verbal representations Mayer (2021). Constructivist perspectives, meanwhile, emphasize that knowledge is actively built through experience, interaction, and problem-solving activities (Kumari and Kumar, 2022; Vygotskiĭ et al., 1978). The integration of instructional video and PBL aligns with both perspectives by combining multimedia presentation with learner-centered inquiry processes.

Based on these considerations, this study aimed to develop and validate a Problem-Based Learning-based instructional video for fashion pattern competency in vocational teacher education. The study examined the validity of the developed product from content and media perspectives as well as student responses toward its use. The resulting video is expected to provide an alternative digital learning resource that supports competency-based vocational learning while simultaneously demonstrating the practical implementation of PBL in fashion education.

Method

Research Design

This study employed a Research and Development (R&D) design to produce and evaluate a Problem-Based Learning (PBL)-based instructional video for fashion pattern competency in vocational teacher education. The Four-D (4D) paradigm, which consists of the Define, Design, Develop, and Disseminate phases, was used in the development process. The methodology was chosen because it offers a methodical framework for creating instructional materials and evaluating their viability prior to wider use.

Research Approach

Both product evaluation and product enhancement were supported by a mixed-methods approach. The instructional video was revised using qualitative data that was gathered from expert comments throughout the validation phase. To establish the product's validity and usefulness, quantitative data was gathered using validation tools and student reaction surveys.

Participants and Data Sources

The study involved both expert validators and student participants. Content validation was conducted by two subject-matter experts, while media and language aspects were assessed by two experts in instructional media and language. Student responses were collected through two implementation stages: a limited trial involving 35 Fashion Education students and a dissemination stage involving 105 students.

The 105 students were selected using Cluster Random Sampling techniques based on three parallel Fashion Education classes. The three selected classes were ensured not to be the classes used for the limited trial to avoid experience bias. The qualitative data consisted of comments and recommendations provided by the validators. Quantitative data included expert assessment scores and student questionnaire responses regarding the usability and feasibility of the developed video.

Data Collection Techniques

Data were gathered through documentation, expert validation sheets, and student questionnaires. Documentation was used to support the needs analysis and development process. Validation sheets were employed to assess the quality of the instructional video from content, media, and language perspectives.

The content validation instrument covered material completeness, accuracy, scope, examples, illustrations, terminology, and learning support. The media-language instrument evaluated presentation, visual design, microlearning features, and language quality. To find out how students felt about the video's usefulness and practicality, student surveys were sent out. A four-point Likert scale, with 1 denoting "strongly disagree" and 4 denoting "strongly agree," was employed for each item. Content Validation Instrument explain in Table 1.

Table 1. Content Validation Instrument

<i>No.</i>	<i>Aspect</i>	<i>Indicators</i>	<i>Items</i>
1	Content relevance	Content completeness, breadth, depth, and alignment with learning objectives	3
2	Content accuracy	Accuracy of concepts, facts, examples, illustrations, and terminology	5
3	Learning stimulation	Promotes curiosity, knowledge development, and questioning skills	3

Table 2. Media and Language Validation Instrument

<i>No.</i>	<i>Aspect</i>	<i>Indicators</i>	<i>Items</i>
1	Presentation	Clarity of objectives, content organization, motivation, interaction, and information completeness	12
2	Visual design	Font, layout, illustrations, and overall appearance	13
3	Microlearning features	Accessibility, concise delivery, interactivity, and content navigation	5
4	Language	Readability, clarity, grammatical accuracy, and language effectiveness	9

Data Analysis Techniques

Validator feedback was analyzed descriptively and used to revise the product. Quantitative validation data were analyzed using Aiken's V coefficient to determine the validity of each assessment indicator.

$$V = \frac{\sum s}{n(c-1)}$$

where s represents the adjusted score, n refers to the number of validators, and c denotes the number of rating categories.

The validity coefficients were interpreted using three categories: values below 0.40 indicated low validity, values between 0.40 and 0.80 indicated valid, and values above 0.80 indicated highly valid. Student response data were analyzed using descriptive statistics in the form of mean scores and percentages. The instructional video was considered feasible when it met the established validity criteria and received positive evaluations from students.

Result and Discussion

Development of the Problem-Based Learning Video

The development process began with a needs analysis conducted in the Fashion Pattern Construction course. The findings indicated that students experienced difficulties in understanding the transformation of basic patterns into bustier patterns and required learning resources that could clearly demonstrate each stage of the procedure. These results highlighted the need for instructional media that not only visualizes practical processes but also promotes active engagement during learning.

Based on these findings, a storyboard was designed by integrating the stages of Problem-Based Learning (PBL) into the instructional sequence. The video consisted of three sections: introduction, learning activities, and closing. Within the learning activities, students were guided through problem orientation, information gathering, analysis, solution presentation, and reflection. This structure was intended to support both procedural understanding and problem-solving skills.

The PBL stages were implemented through an authentic pattern construction problem. Each group received a different bustier design without instructions on how to transform the basic pattern. Students analyzed the design, identified the required pattern modifications, selected appropriate pattern transformation techniques, and developed the bustier pattern accordingly. Each group then presented and justified its solution based on technical considerations.

The production stage involved recording learning activities in the fashion laboratory and editing the materials using Canva. Additional visual elements, including instructional texts, illustrations, transitions, and phase indicators, were incorporated to improve clarity and learning flow. The final product was a 23-minute and 1-second instructional video that can be accessed through digital learning platforms.

The developed video reflects the principles of multimedia learning and constructivist learning. The combination of visual demonstrations, narration, and supporting text facilitates the presentation of procedural knowledge, while the PBL framework encourages students to actively construct understanding through investigation and problem-solving activities. Such characteristics are consistent with the competency-oriented nature of vocational education (Du, 2023; Mayer, 2021).

The findings of this study are consistent with those of Maksum et al (2025) and Wagino et al (2025), who reported that Problem-Based Learning (PBL) enhances students' competencies in vocational education. While Maksum et al (2025) emphasized the development of workplace competencies and Wagino et al (2025) highlighted improvements in learning outcomes, problem-solving abilities, and technical skills, the present study extends these findings by demonstrating that the integration of PBL into multimedia-based instructional videos facilitates students' active construction of procedural knowledge through investigation and problem-solving activities. visual examples of the developed PBL video explain in Figure 1.

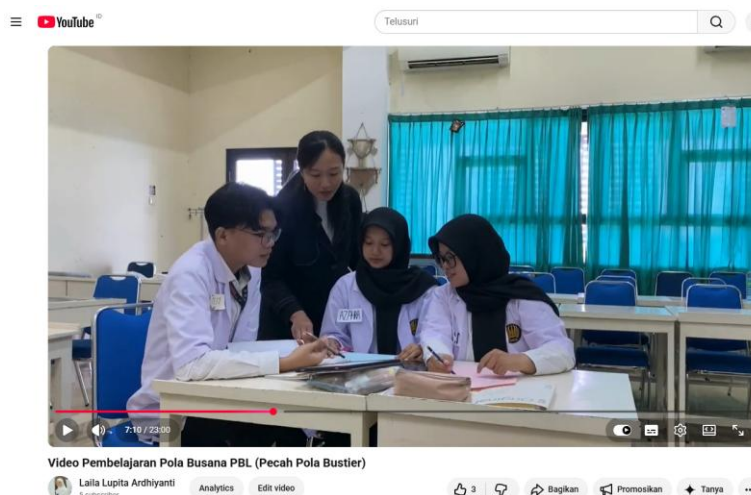


Fig 1: Screenshots or visual examples of the developed PBL video

Content Validation Results

Content validation was conducted to examine the accuracy, relevance, and completeness of the instructional materials. The results showed that all indicators achieved Aiken's V values ranging from 0.67 to 0.83, indicating valid to highly valid categories. Content Validation Results explain in Table 3.

Table 3. Content Validation Results

No	Aspect	Aiken's V	Category
1	Material completeness	0.83	Highly Valid
2	Material coverage	0.83	Highly Valid
3	Depth of content	0.67	Valid
4	Concept accuracy	0.83	Highly Valid
5	Accuracy of facts and data	0.67	Valid
6	Relevance of examples	0.83	Highly Valid
7	Accuracy of illustrations	0.83	Highly Valid
8	Technical terminology	0.83	Highly Valid
9	Stimulating curiosity	0.67	Valid
10	Knowledge enhancement	0.83	Highly Valid
11	Encouraging discussion	0.83	Highly Valid

The highest scores were obtained for material completeness, content coverage, conceptual accuracy, examples, illustrations, and technical terminology. Several indicators, including depth of content, factual accuracy, and stimulation of curiosity, received comparatively lower scores,

although they remained within the valid category. Expert reviewers recommended providing more detailed explanations and additional examples to strengthen students' conceptual understanding.

Overall, the validation results indicate that the instructional content adequately represents the competencies targeted in the Fashion Pattern Construction course. Accurate and relevant learning materials are essential in vocational education because students are expected to transfer conceptual knowledge into practical performance. The findings therefore suggest that the developed video provides an appropriate foundation for competency development in fashion education (Nurtanto et al., 2018; Yulianti et al., 2023). This finding is consistent with recent studies reporting that instructional videos received high feasibility ratings from content experts, media experts, and students, confirming their suitability for vocational learning Daryono et al (2021).

Media and Language Validation Results

The video was further evaluated from media and language perspectives. The overall validity coefficient reached 0.957, indicating a highly valid product. Media and Language Validation Results explain in Table 4.

Table 4. Media and Language Validation Results

<i>No</i>	<i>Aspect</i>	<i>Aiken's V</i>	<i>Category</i>
1	Presentation	0.93	Highly Valid
2	Visual Design	1.00	Highly Valid
3	Microlearning Features	0.92	Highly Valid
4	Language	0.84	Highly Valid
5	Overall	0.957	Highly Valid

High scores were obtained across presentation, visual design, microlearning features, and language aspects. The experts particularly highlighted the clarity of visual presentation, logical content organization, readability, and accessibility of the video. Suggestions for improvement mainly concerned increasing learner interaction opportunities and refining several language expressions.

These findings demonstrate that the developed video successfully combines instructional content with effective multimedia design. In vocational learning environments, clear visual demonstrations play an important role because students frequently learn procedural skills through observation and imitation. High scores were obtained across presentation, visual design, microlearning features, and language aspects. The experts particularly highlighted the clarity of

visual presentation, logical content organization, readability, and accessibility of the video. Suggestions for improvement mainly concerned increasing learner interaction opportunities and refining several language expressions. These findings indicate that the developed video effectively integrates instructional content with multimedia design. In vocational education, clear visual demonstrations support procedural learning and improve learning efficiency (Mayer, 2021; Navarrete et al., 2025). The findings are consistent with recent studies reporting that video-based instructional media integrated with active learning models are valid, practical, and effective in supporting student learning and engagement in vocational education Jalinus and Nabawi (2018).

Limited Trial Results

A limited trial involving 35 students was conducted to evaluate the practicality of the instructional video. The results showed positive evaluations across all indicators, with percentage scores ranging from 87.14% to 91.43%. Limited Trial Results (n = 35) explain in Table 5.

Table 5. Limited Trial Results (n = 35)

<i>No</i>	<i>Indicator</i>	<i>Mean</i>	<i>Percentage (%)</i>	<i>Category</i>
1	The video presents learning materials completely.	3.49	87.14	Very Good
2	The video clearly explains important concepts and procedures.	3.57	89.29	Very Good
9	The video motivates me to learn independently.	3.58	89.64	Very Good
10	The information presented in the video is reliable and useful.	3.66	91.43	Very Good

Students reported that the video presented the material clearly, provided relevant examples, and offered explanations that were easy to follow. Positive responses were also observed regarding visual appearance, audio quality, and the integration of PBL activities within the learning process.

The findings indicate that the video is practical and suitable for instructional use. Beyond supporting content comprehension, the integration of problem-solving activities encouraged students to engage more actively with the learning materials. This result is consistent with previous studies reporting the positive contribution of PBL to student engagement and higher-order thinking

development (Arviani et al., 2023; Komariah et al., 2019). The positive student responses are consistent with recent studies showing that video-based instructional media improves student engagement and learning outcomes in vocational education, particularly in practical courses Wijaya et al (2025). Similarly, the instructional video developed in this study supported students' understanding of bustier pattern construction and promoted active engagement during learning.

Dissemination Stage

Following the revisions based on expert validation and the limited trial, the final version of the instructional video was disseminated for broader implementation. The video was uploaded to YouTube to facilitate access and was shared with lecturers teaching the Fashion Pattern Construction course. It was subsequently implemented in different classes taught by different lecturers, involving 105 students who had not participated in the limited trial. Following the implementation, students completed a response questionnaire to evaluate the usability, clarity, and practicality of the instructional video. The dissemination results produced a mean score of 3.57 and a feasibility percentage of 89.21%, indicating a highly feasible category. Student Responses in the Dissemination Stage (n = 105) explain in Table 6.

Table 6. Student Responses in the Dissemination Stage (n = 105)

<i>No</i>	<i>Measure</i>	<i>Score</i>
1	Mean Score	3.57
2	Percentage	89.21%
3	Category	Highly Feasible
4	Number of Respondents	105

Students perceived the video as useful, understandable, and relevant to their learning needs. The combination of procedural demonstrations and PBL activities enabled learners to connect theoretical concepts with practical applications. In addition, the video supported self-paced learning because students could revisit the instructional content whenever needed.

The positive student responses are consistent with recent studies on video-based learning in vocational education. Recent studies showing that video-based instructional media improves student engagement and learning outcomes in vocational education, particularly in practical courses Wijaya et al (2025). Previous research has shown that instructional videos provide multimodal representations of practical work, allowing learners to observe movements, actions, and procedural details that are difficult to explain through verbal instruction alone Chan (2020). The ability to replay videos also supports deliberate practice by enabling students to review each

procedure repeatedly at their own pace. These features are particularly important in bustier pattern construction, where students must master sequential pattern-making procedures through careful observation and repeated practice. In addition, recent studies have identified YouTube as an effective platform for vocational learning because it provides flexible access to instructional videos Arkenback (2025). In the present study, uploading the instructional video to YouTube enabled students to access the learning materials anytime and revisit the content as needed, supporting self-paced learning and reinforcing the positive perceptions of the video's usefulness, clarity, and relevance.

The results reinforce previous findings that Problem-Based Learning contributes to competency development, learner readiness, and problem-solving skills in vocational education (Marta et al., 2024; Mulyadi et al., 2025; Sharma et al., 2023; Sukackè et al., 2022). These findings are further supported by recent research demonstrating that integrating instructional videos into project-based learning enhances students' competency acquisition and learning engagement. The use of multimedia within active learning environments enables students to better understand practical procedures while actively participating in problem-solving activities Hidayat et al (2026). Similarly, the PBL-based instructional video developed in this study helped students connect theoretical concepts with practical applications, resulting in highly positive responses regarding its usefulness and practicality. Beyond its role as a learning resource, the developed video also serves as a pedagogical model for pre-service vocational teachers by demonstrating how student-centered learning can be integrated into digital instructional media.

Conclusion

This study successfully developed and validated a Problem-Based Learning (PBL) video to support fashion pattern competency in vocational teacher education. Based on expert assessments, the results show that the produced video attained excellent levels of media validity, language validity, and content validity. Additionally, the small trial and broader implementation results showed that the film was very useful and well-received by pupils. These results imply that incorporating PBL into instructional films might be a useful learning tool to assist competency-based learning in courses on fashion patterns.

The study contributes to vocational teacher education by providing an instructional medium that simultaneously supports technical competency development and models the implementation of student-centered learning. Students may participate more actively in the learning process and

improve their comprehension of fashion pattern building when real-world problem-solving exercises are incorporated into video-based instruction. For vocational education programs looking to use digital technology and active learning strategies, the produced film can thus be used as an alternative learning resource.

It is advised that future study use experimental or quasi-experimental research methodologies to assess how well the created film improves students' learning outcomes, problem-solving skills, and practical performance. Further development may also extend the application of PBL-based instructional videos to other areas of fashion education and vocational training to broaden their educational impact.

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