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Development and preliminary evaluation of a storytelling-based instructional video for roof-truss construction in vocational education

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Abstract: This study developed and preliminarily evaluated a storytelling-based instructional video for roof-truss construction in vocational education. Using the ADDIE framework, the video integrated a problem-centered narrative with three-dimensional modeling, animation, GIF-based visualization, voice-over narration, and synchronized multimedia elements. The study involved Grade XI Building Modeling and Information Design students at SMK Negeri 1 West Sumatra. Evaluation involved three subject-matter experts, three media experts, 19 students, and five teachers. Expert judgments were analyzed using Aiken's V, inter-rater consistency was summarized using Percentage Agreement, and practicality was assessed descriptively from teacher and student responses. The developed video obtained an overall Aiken's V of 0.94 for subject-matter validity and 0.95 for media-design validity. Pairwise expert ratings produced an average Percentage Agreement of 99.42%. During limited classroom implementation, students reported 91% practicality, while teachers reported 94%. These findings indicate that the instructional video met the predefined developmental criteria for expert-based validity, inter-rater agreement, and preliminary practicality. However, because the study did not include a control group, pretest–posttest comparison, or inferential learning-outcome analysis, the results do not establish instructional effectiveness. Further controlled studies are required to examine learning outcomes. Future research should directly examine conceptual understanding, spatial interpretation, technical reasoning, retention, and transfer.

Keywords: storytelling-based instruction; instructional video; roof-truss construction; vocational education; multimedia learning; ADDIE

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1. Introduction

Vocational education requires students to integrate conceptual knowledge with the ability to interpret procedures, structures, materials, and workplace-relevant technical representations (Sanyang & Weller, 2026; Sarmento & Reis, 2026). This requirement is particularly important in building-construction education, where students are expected to understand not only individual structural components but also their spatial arrangement, functional relationships, and construction sequence. For topics such as roof-truss construction, text-based explanations and static illustrations may not fully support learners who need to mentally connect three-dimensional structural relationships and sequential construction processes (Martinkovičová et al., 2025) . Research on multimedia learning indicates that well-designed combinations of verbal and visual representations can support meaningful learning, provided visual, auditory, and textual elements are organized to limit unnecessary cognitive processing and direct attention to relevant information (Fiorella, 2021; Mayer, 2017, 2020).

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Instructional video is particularly relevant to this challenge because it can combine visualization, narration, animation, demonstrations, and learner-controlled review within a single medium. A recent comprehensive review of 257 studies on video-based learning identified visual design, audio characteristics, textual elements, learner activity, production style, and instructional design as important dimensions shaping how educational videos support learning (Navarrete et al., 2025; Qi et al., 2026). In vocational education, video can also provide repeated access to representations of procedural and technical activities that may otherwise be difficult to demonstrate continuously in the classroom. Recent evidence further indicates that video review can function as a learning scaffold in vocational contexts by supporting reflection and engagement with procedural tasks (Diamanti & Angelini, 2025; Giek et al., 2025).

Evidence from building-construction education similarly demonstrates an increasing use of video to represent technical procedures and visually demanding content. Previous development studies have applied video tutorials to construction topics such as door and window detailing, work-volume calculation, and other building-construction procedures, suggesting that video is particularly useful when students must connect technical explanations with visual representations of construction components and processes (Nurfitriyani et al., 2021; Suryono & Sudira, 2023) . However, these applications have largely emphasized tutorials, demonstrations, or procedural presentations rather than deliberately organizing technical content around a narrative sequence.

Storytelling provides a potentially different instructional structure. Educational digital storytelling integrates narration with visual, textual, audio, and other multimedia representations and can organize information around events, problems, consequences, and resolutions rather than presenting technical information as isolated segments (Jonas, 2026; Palioura & Dimoulas, 2022; Wang et al., 2026). A systematic review of 57 educational digital-storytelling studies identified applications across cognitive, affective, conceptual, technological, and social learning domains, though much of the evidence came from outside technical and vocational disciplines (Wu & Chen, 2020). A more recent synthesis likewise indicates that educational digital storytelling can support cognitive and affective learning when its narrative and multimedia components are deliberately designed, while also noting substantial variation across instructional contexts and implementation approaches (Deslis et al., 2025; Li et al., 2026).

This distinction matters for vocational learning because practice-oriented knowledge is often contextual: learners need to understand not only what a component is, but also why it is required, how it relates to other components, and what may occur when a technical decision is inappropriate (Hager, 2004; Sirk, 2024). Digital storytelling has been explored as a way to contextualize vocational knowledge and support the communication of practice-based experience, but its use for predesigned technical instruction remains comparatively underrepresented (Nair & Yunus, 2021; Palupi & Nuro, 2025). Thus, storytelling's potential contribution to construction education lies not merely in making a video more attractive, but in using narrative structure to connect a technical problem with component functions, structural relationships, and the reasoning behind a solution.

This need was identified at SMK Negeri 1 West Sumatra within the Building Modeling and Information Design (*Desain Pemodelan dan Informasi Bangunan*, DPIB) program. Preliminary needs analysis indicated that instruction relied mainly on PowerPoint presentations, textbooks, and general tutorial videos that were not specifically structured around the roof-truss content examined in this study. Among the 19 Grade XI students included in the preliminary survey, 31.5% were categorized as having high understanding, 36.8% moderate understanding, and 31.5% low understanding. These observations served as development needs rather than baseline measures of intervention effectiveness.

The resulting research gap is therefore more specific than the general absence of digital media in vocational education. Existing research establishes the usefulness of instructional video for representing technical content and demonstrates broad pedagogical applications of digital storytelling. Nevertheless, limited evidence addresses how storytelling structure and three-dimensional construction visualization can be deliberately integrated into a roof-truss instructional video and systematically evaluated for content validity, media-design validity, inter-rater agreement, and classroom practicality in vocational building education (Karantalis & Koukopoulos, 2022). This study addresses this gap by developing a problem-centered storytelling video that organizes roof-truss concepts through a contextual problem, causal relationships among structural components, visual technical explanations, and a concluding resolution. Accordingly, the study was guided by the following research questions:

RQ1. How can a storytelling-based instructional video for roof-truss construction be systematically developed using the ADDIE instructional-design process?
RQ2. To what extent does expert appraisal provide evidence of content and media-design validity and inter-rater agreement for the developed instructional video?
RQ3. How do Grade XI DPIB students and teachers evaluate the practicality of the developed instructional video during limited classroom implementation?

The study contributes to the literature in three connected ways. First, it extends storytelling-based multimedia design into a technical vocational context in which spatial and functional relationships among construction components need to be represented coherently. Second, it operationalizes storytelling not as a decorative feature but as a problem–explanation–resolution structure integrated with three-dimensional roof-truss visualization. Third, it provides development-stage evidence from separate subject-matter and media-expert panels, as well as preliminary teacher and student evaluations of practicality. The contribution is therefore primarily one of instructional-media design and developmental validation, rather than evidence of comparative learning effectiveness.

2. Methods

2.1. Research design

This study employed a Research and Development (R&D) design to develop and conduct a preliminary evaluation of a storytelling-based instructional video for roof-truss construction in vocational education. The development process followed the ADDIE framework, comprising Analysis, Design, Development, Implementation, and Evaluation. ADDIE provides a systematic yet iterative instructional-design structure in which needs identified during analysis inform subsequent design and development, followed by implementation and evaluation of the resulting instructional resource (Branch, 2009).

The study was designed as a development and preliminary evaluation study rather than an effectiveness trial. Accordingly, the evaluation focused on expert-based content and media-design validity, agreement among expert judgments, and perceived practicality among teachers and students. The study did not examine comparative learning effectiveness or causal effects on student achievement.

2.2. Research setting and participants

The study was conducted at SMK Negeri 1 West Sumatra during the second semester of the 2025/2026 academic year. The instructional context was the Grade XI Building Modeling and

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Information Design (*Desain Pemodelan dan Informasi Bangunan*; DPIB) program, with roof-truss construction as the focal technical content.

The evaluation involved three subject-matter experts, three media experts, five DPIB teachers, and 19 Grade XI DPIB students. The subject-matter panel included practitioners and academics with expertise in building construction, while the media panel included lecturers with experience in instructional-media evaluation. The researchers conducted expert appraisal before the limited classroom implementation. Participating teachers and students then evaluated the revised instructional video for practicality.

2.3. Development Procedure

The storytelling-based instructional video was developed using the ADDIE framework, comprising Analysis, Design, Development, Implementation, and Evaluation. Expert appraisal and revision were conducted between the Development and Implementation phases. Figure 1 summarizes the overall development and preliminary evaluation process.



Figure 1. ADDIE-based development and preliminary evaluation process of the storytelling-based instructional video

During the Analysis phase, the team identified instructional needs through teacher interviews, a preliminary student questionnaire, curriculum analysis, learner-characteristic analysis, and roof-truss content analysis. The team also reviewed the applicable Learning Outcomes (*Capaian Pembelajaran*; CP) and Learning Objective Flow (*Alur Tujuan Pembelajaran*; ATP) to determine the video's instructional scope and technical content.

During the Design phase, the selected content was organized into a problem-centered narrative script and storyboard, while three-dimensional roof-truss models were developed in SketchUp to represent structural components and their relationships. During the Development phase, these materials were transformed into animated scenes, GIF-based visualizations, voice-over narration, and supporting graphical elements. The components were then integrated and edited in Canva, with attention to synchronizing verbal and visual information in accordance with multimedia-learning principles (Mayer, 2017). Three subject-matter experts and three media experts then appraised the initial product, and their quantitative ratings and qualitative feedback guided revisions before implementation.

During the Implementation phase, the revised video was introduced to 19 Grade XI DPIB students, after which the students and five DPIB teachers completed the practicality questionnaires. Finally, the Evaluation phase integrated evidence from expert-based validity, inter-rater agreement, qualitative feedback, and teacher and student practicality responses to determine whether the developed product met the predefined developmental criteria.

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2.4. Research instruments

Four instruments were used: a subject-matter validation instrument, a media-design validation instrument, a teacher-practicality questionnaire, and a student-practicality questionnaire. All closed-ended items were rated using a five-point Likert-type response scale ranging from 1 (strongly disagree) to 5 (strongly agree), providing an ordered response structure for evaluating the developed instructional media (Likert, 1932).

The subject-matter validation instrument assessed curriculum alignment, conceptual accuracy, content depth, and clarity of explanation. Previous educational-validation studies informed these dimensions and aligned with established multimedia-evaluation criteria for content quality and alignment between instructional content and learning objectives (Leacock & Nesbit, 2007; Nabhan & Habók, 2026; Sihombing et al., 2026).

The media-design validation instrument assessed visual presentation, audio quality, narrative clarity, integration of media components, and overall media appeal. The instrument was adapted (Aprilia, 2021), and its evaluation domains aligned with multimedia-learning principles emphasizing coordinated verbal and visual design, as well as established criteria for presentation quality and multimedia usability (Leacock & Nesbit, 2007; Mayer, 2003).

The teacher- and student-practicality questionnaires assessed ease of use, clarity and attractiveness of the material, perceived usefulness, and efficiency of learning activities. These dimensions were informed by previous practicality and technology-use evaluations, while perceived usefulness and ease of use were also conceptually consistent with established technology-acceptance constructs (Davis, 1989; Evangelou & Xenos, 2025).

In addition to the closed-ended ratings, qualitative comments from the expert panels were retained as complementary evidence and used to identify revisions to content, visual presentation, narration, and technical design before the limited classroom implementation. Expert judgments for evaluating item and content validity (Aiken, 1985).

2.5. Data analysis

2.5.1 Expert-based content and media-design validity

We analyzed expert ratings using Aiken's V coefficient to quantify agreement on the relevance of the evaluated items (Aiken, 1985; Penfield & Giacobbi, 2004). We calculated Aiken's V using Equation (1).

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

In Equation (1), n is the number of experts, c is the number of response categories, and s is the adjusted rating assigned to each item. Equation (2) was used to obtain the adjusted rating.

$$s = r - l_0 \quad (2)$$

In Equation (2), r is the score assigned by an expert, and l_0 is the lowest possible score on the response scale.

Each validation panel consisted of three experts, and the instrument used five response categories. The original research protocol specified V ≥ 0.92 as the criterion for acceptable expert-based validity. We summarized item-level coefficients to describe the instructional video's overall content and media-design validity. We interpreted Aiken's V as evidence from expert appraisal rather than evidence of instructional effectiveness.

2.5.2 Agreement among expert ratings

We summarized agreement among media-expert judgments using the Percentage Agreement (PA) procedure adopted in the original research protocol (Borich, 2015). Because three media experts participated, we calculated pairwise PA values for each validator pair and summarized them descriptively. We calculated percentage agreement using Equation (3).

$$PA = [1 - \frac{A - B}{A + B}] \times 100\% \quad (3)$$

In Equation (3), A and B represent the higher and lower ratings in the comparison, respectively. The study interpreted a PA value of at least 75% as acceptable agreement, based on the criterion adopted. Because PA is a descriptive agreement statistic, the results were interpreted as inter-rater agreement rather than psychometric reliability of the instructional medium.

2.5.3 Practicality analysis

Teacher and student responses were analyzed descriptively by comparing the observed scores with their corresponding maximum possible scores. The practicality percentage was calculated using Equation (4).

$$Practicality\ (\%) = \frac{Observed\ score}{Maximum\ possible\ score} \times 100 \quad (4)$$

The study classified the resulting percentages according to its practicality criteria (Jumaroh et al., 2022), interpreting values of at least 76% as practical.

Because the limited field evaluation involved 19 students, five teachers, one instructional-media product, and no comparison condition, the practicality results were interpreted as descriptive evidence of preliminary usability and acceptance rather than as population-level estimates or evidence of learning effectiveness.

2.6. Scope of inference

The quantitative analyses were limited to expert-based validity, inter-rater agreement, and descriptive practicality. The study did not include a pretest–posttest comparison, a control group, or inferential analysis of student learning outcomes.

Consequently, the study supports conclusions regarding the developmental quality, expert-appraised validity, agreement among expert judgments, and preliminary practicality of the storytelling-based instructional video. It does not establish that the instructional medium improves student achievement, motivation, retention, or other learning outcomes.

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3. Results

3.1 Development of the storytelling-based instructional video (RQ1)

The ADDIE-based development process resulted in a storytelling-based instructional video for roof-truss construction. The product integrated a problem-centered narrative with three-dimensional modeling, animated structural representations, GIF-based sequences, voice-over narration, textual explanations, and synchronized visual elements. The principal outputs of the Design and Development phases are presented in Figures 2–7. The team first developed a three-dimensional roof-truss model in SketchUp to provide a consistent visual representation of the arrangement and relationships among structural components, as shown in Figure 2.

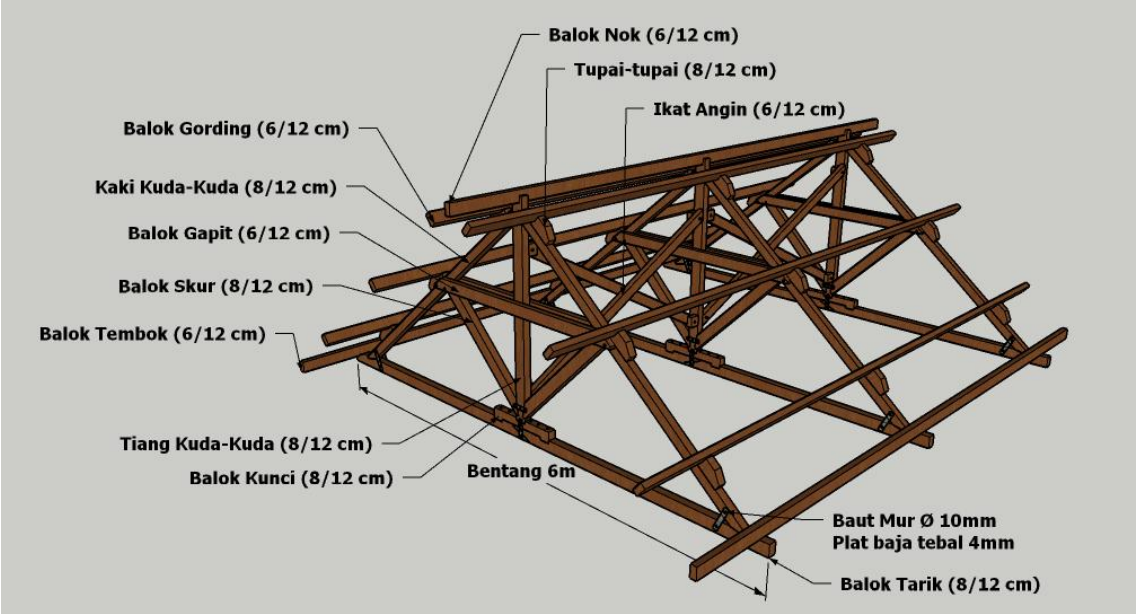


Figure 2. Three-dimensional roof-truss visualization developed in SketchUp

Figure 2 shows the three-dimensional model used as the visual foundation for subsequent media production. The model enabled consistent representation of individual roof-truss components and their spatial relationships throughout the instructional sequence.

The three-dimensional model was subsequently transformed into animated and sequential visual representations. Figure 3 shows the development of animated roof-truss scenes, while Figure 4 presents the GIF-based visualization used to represent structural components and processes progressively.

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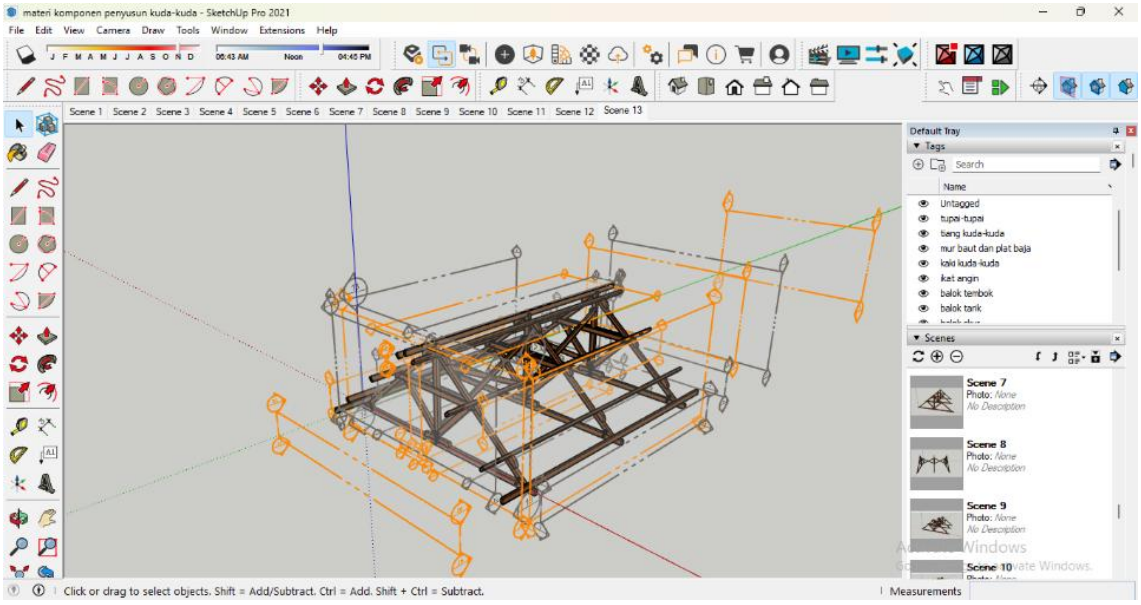


Figure 3. Development of animated roof-truss scenes

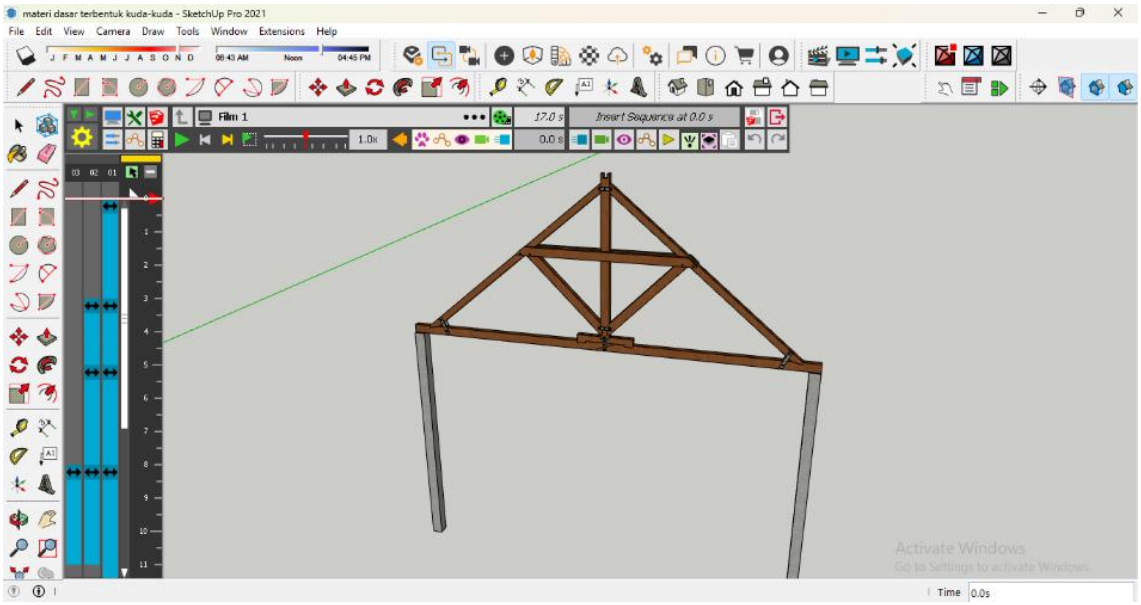


Figure 4. Development of GIF-based roof-truss visualizations

The animated scenes provided dynamic representations of component arrangement and structural relationships, while the GIF-based sequences presented selected technical processes in successive visual stages.

Narrative production was subsequently incorporated into the developed media. As shown in Figure 5, voice-over narration was recorded using the finalized storytelling script, with attention to clarity, pacing, and correspondence between the spoken explanation and the visual sequence.

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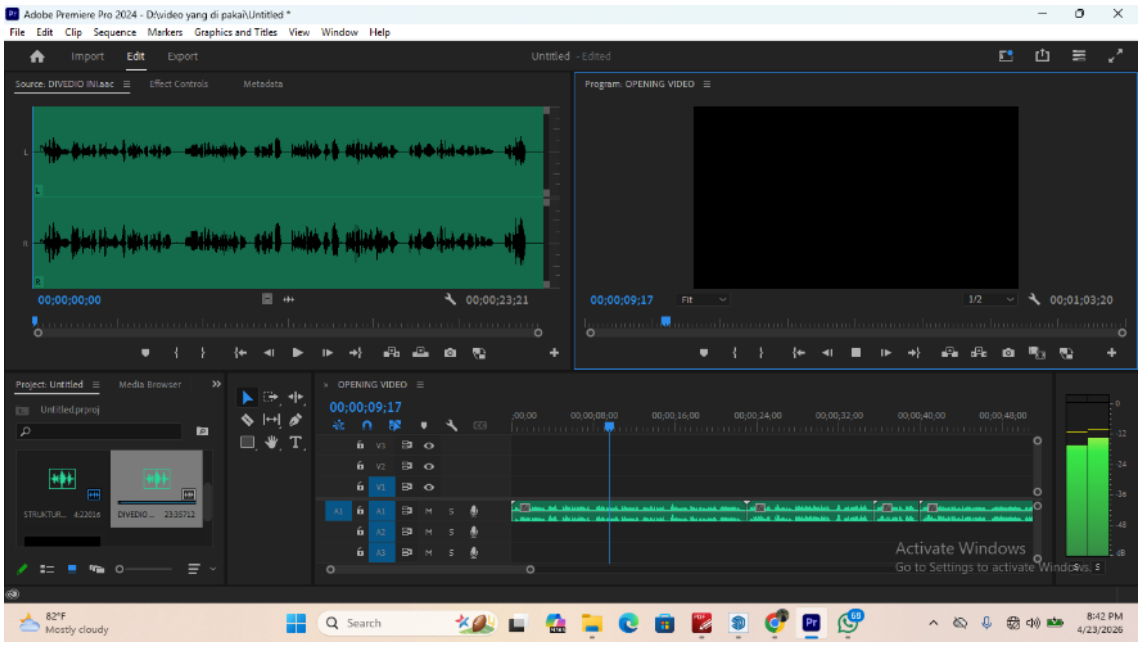


Figure 5. Voice-over recording process for the storytelling-based instructional video

The visual and narrative components were then assembled into the complete instructional video. Figure 6 shows the integration and editing of animations, GIF-based visualizations, narration, text, and supporting graphical elements in Canva.

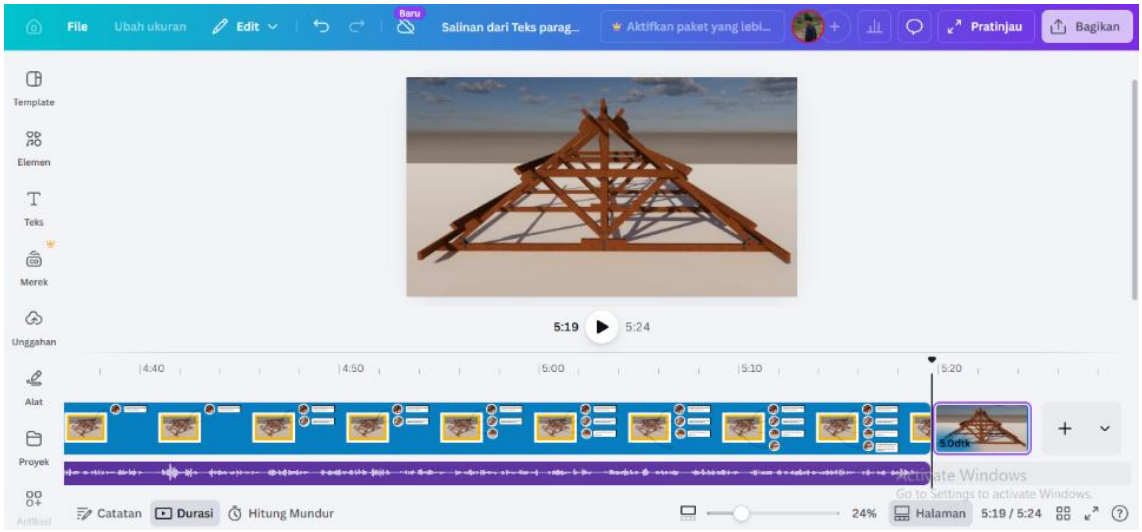


Figure 6. Integration and editing of multimedia components in Canva

After integrating the multimedia, final adjustments were made to improve alignment among narration, visual presentation, scene sequence, and technical explanations. Figure 7 illustrates this refinement process.

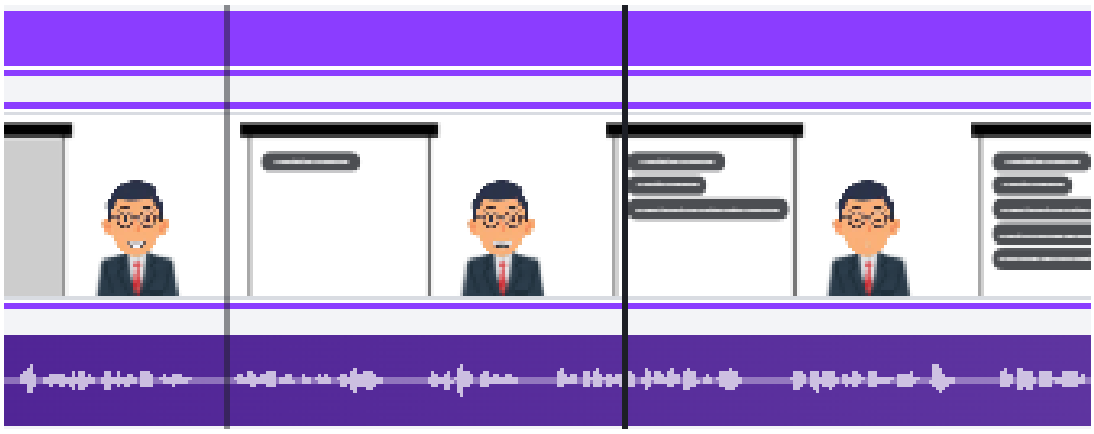


Figure 7. Visual and narrative synchronization and final adjustment of the instructional video

Together, Figures 2–7 document the progression from the initial three-dimensional technical visualization to the integrated storytelling-based instructional video. The completed product was subsequently subjected to expert appraisal and revision before limited classroom implementation.

3.2 Expert-based validity and inter-rater agreement (RQ2)

The subject-matter experts evaluated four dimensions: curriculum alignment, conceptual accuracy, content depth, and clarity of explanation. Table 1 presents the results.

Table 1. Subject-matter expert validation of the storytelling-based instructional video

Validation aspect	Mean expert rating	Aiken's V	Interpretation
Curriculum alignment	4.83	0.92	Valid
Conceptual accuracy	4.7	0.92	Valid
Content depth	4.67	0.92	Valid
Clarity of explanation	5.00	1	Valid
Overall	4.80	0.94	Valid

As shown in Table 1, all subject-matter dimensions met the prespecified Aiken's V criterion of 0.92. The overall mean expert rating was 4.80 out of 5.00, accompanied by an overall Aiken's V coefficient of 0.94. Clarity of explanation received the highest appraisal, with a mean rating of 5.00 and an Aiken's V of 1.00, whereas curriculum alignment, conceptual accuracy, and content depth each obtained an Aiken's V of 0.92. These findings indicate that the instructional content met the expert-based validity criterion established in the study protocol. The media experts separately evaluated visual presentation, audio quality, narrative clarity, multimedia integration, and media appeal. Table 2 summarizes the results.

Table 2. Media-design expert validation of the storytelling-based instructional video

Validation aspect	Mean expert rating	Aiken's V	Interpretation
Visual presentation	4.9	0.97	Valid
Audio quality	4.83	0.96	Valid
Narrative clarity	4.83	0.96	Valid
Media integration	4.67	0.92	Valid
Media appeal	4.8	0.94	Valid
Overall	4.81	0.95	Valid

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Table 2 shows that all media-design dimensions met the predefined validity criterion. The overall mean expert rating was 4.81 out of 5.00, with an overall Aiken's V coefficient of 0.95. Visual presentation received the highest coefficient (V = 0.97), followed by audio quality and narrative clarity (V = 0.96 each), media appeal (V = 0.94), and media integration (V = 0.92). These results provide expert-based evidence supporting the instructional video's media-design validity.

In addition to the quantitative ratings, the expert panels provided qualitative recommendations for product refinement. The main revisions included adding information on roof-truss spans and component dimensions, reorganizing the material by construction sequence, adding animation to visually inactive sections, changing the background to white, removing unnecessary object shadows, and separating explanations of individual roof-truss components into distinct visual segments. Table 3 presents the pairwise results.

Table 3. Pairwise agreement among media-expert ratings

Validator pair	Percentage Agreement (%)	Interpretation
Validator 1–Validator 2	99.13	Acceptable agreement
Validator 1–Validator 3	99.13	Acceptable agreement
Validator 2–Validator 3	100	Acceptable agreement
Average	99.42	High agreement

As shown in Table 3, pairwise Percentage Agreement ranged from 99.13% to 100.00%, with an overall average of 99.42%. All values substantially exceeded the 75% acceptance criterion specified in the study protocol, indicating highly consistent judgments among the three media experts. Consistent with this study's analytical framework, Percentage Agreement is interpreted as evidence of inter-rater agreement rather than the instructional video's psychometric reliability.

3.3 Preliminary practicality during classroom implementation (RQ3)

Following expert appraisal and revision, the instructional video was implemented with 19 Grade XI DPIB students. Table 4 summarizes student responses to the practicality questionnaire.

Table 4. Student evaluation of the practicality of the instructional video

Practicality aspect	Observed score	Maximum score	Percentage (%)	Interpretation
Ease of use	173	190	91	Practical
Media appeal	169	190	89	Practical
Clarity of material	164	190	86	Practical
Usefulness	172	190	91	Practical
Time efficiency	183	190	96	Practical
Total	861	950	91	Practical

As shown in Table 4, the overall student practicality score was 861 of 950 possible points, equivalent to 90.63% and reported as 91% after rounding. The corresponding overall mean rating was 4.53 (SD = 0.51). Time efficiency received the highest descriptive percentage (96%), followed by ease of use and usefulness (91% each), media appeal (89%), and clarity of material (86%). All evaluated dimensions exceeded the predetermined practicality criterion. Five DPIB teachers independently evaluated the same instructional resource after implementation. Table 5 presents their responses.

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Table 5. Teacher evaluation of the practicality of the instructional video

Practicality aspect	Observed score	Maximum score	Percentage (%)	Interpretation
Ease of use	71	75	95	Practical
Clarity of material presentation	70	75	93	Practical
Ease of understanding the material	69	75	92	Practical
Perceived usefulness	68	75	91	Practical
Learning-time efficiency	73	75	97	Practical
Total	351	375	94	Practical

Table 5 shows an overall teacher practicality score of 351 of 375 possible points, equivalent to 93.60% and reported as 94% after rounding, with an overall mean rating of 4.68 (SD = 0.47). Learning-time efficiency received the highest descriptive rating (97%), followed by ease of use (95%), clarity of presentation (93%), ease of understanding (92%), and perceived usefulness (91%).

Taken together, the student and teacher responses indicate favorable preliminary perceptions of the developed instructional video across ease of use, presentation, usefulness, and learning-time efficiency. However, because these responses were collected from a limited implementation involving one school, 19 students, and five teachers, the findings provide descriptive evidence of preliminary practicality and acceptance, not population-level estimates of usability or evidence of learning effectiveness.

4. Discussion

4.1 Storytelling and technical visualization as an instructional-design approach

This study's principal design contribution is integrating problem-centered storytelling with three-dimensional visualization of roof-truss construction. Rather than presenting structural components as isolated technical information, the developed video organizes them within a sequence that connects an initial construction problem with component functions, structural relationships, technical explanations, and a concluding resolution. This structure provides a coherent framework for representing content in which spatial and functional relationships are central to understanding.

This approach aligns with educational digital storytelling, which combines narrative with visual, verbal, and other multimedia representations to contextualize information and connect concepts in a meaningful sequence. A systematic review of 57 studies showed that educational digital storytelling has been applied across diverse learning contexts and has addressed cognitive, conceptual, affective, technological, and social dimensions of learning (Wu & Chen, 2020). The integration of narration, animation, and three-dimensional representations also aligns with multimedia-learning principles that emphasize the coordinated presentation of words and graphics while reducing extraneous information that does not support the instructional objective (Mayer, 2003, 2017).

The design also reflects established criteria for multimedia-learning resources, particularly content quality, alignment with learning objectives, presentation design, and usability (Leacock & Nesbit, 2007). Within vocational building education, video tutorials have similarly been developed to represent visually demanding construction content, including detailed drawings of building

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components, demonstrating the relevance of video-based representation within comparable DPIB learning contexts (Suryono & Sudira, 2023). The present study extends this application by structuring the technical content around a problem–explanation–resolution narrative rather than relying solely on tutorial or procedural presentation.

However, these findings do not show that the narrative structure itself improves learning. The contribution at this stage is therefore primarily instructional and developmental: the study shows how storytelling and three-dimensional technical visualization can be systematically integrated into a roof-truss instructional resource and subjected to expert and classroom-based preliminary evaluation.

4.2 Expert-based validity and inter-rater agreement

The expert appraisal provided favorable developmental evidence for both the instructional content and media design. The subject-matter panel produced an overall mean rating of 4.80 and an Aiken's V of 0.94, whereas the media-design panel produced an overall mean rating of 4.81 and an Aiken's V of 0.95. All assessed dimensions met the predefined criterion, with clarity of explanation receiving the highest subject-matter coefficient and visual presentation receiving the highest media-design coefficient.

Aiken's V summarizes structured judgments about the relevance or validity of rated items, making it appropriate to interpret these results as expert-based evidence rather than evidence of learning effectiveness (Aiken, 1985). Methodological work on Aiken's V further emphasizes that the coefficient reflects judgments obtained from the participating expert panel and that uncertainty surrounding the underlying content-relevance estimate should be considered when making broader inferences (Penfield & Giacobbi, 2004). Because each panel in the present study consisted of three experts, the coefficients are therefore best interpreted as developmental evidence within the appraisal procedure used in this study.

The qualitative feedback adds an important dimension to the numerical results. Expert recommendations led to revisions to roof-truss dimensions, the sequencing of construction content, additional animation, simplified backgrounds, the removal of unnecessary shadows, and the separation of component explanations. This iterative revision aligns with the ADDIE framework, where evaluation information can feed back into refining instructional materials before implementation (Branch, 2009).

The average Percentage Agreement of 99.42% further indicates highly consistent judgments among the three media experts under the pairwise procedure adopted in the study. Nevertheless, this statistic should remain interpreted as descriptive inter-rater agreement, not as psychometric reliability of the video or its instruments. Methodological literature distinguishes agreement among raters from other forms of measurement reliability and stresses that interpretation depends on the particular agreement statistic and rating design used (Hallgren, 2012). Thus, the high PA value strengthens the consistency of expert appraisal but does not, by itself, establish broader measurement reliability.

4.3 Preliminary practicality from student and teacher perspectives

The limited classroom implementation produced favorable practicality evaluations from both participant groups. Students reported an overall practicality score of 91% (M = 4.53, SD = 0.51), while teachers reported 94% (M = 4.68, SD = 0.47). Learning-time efficiency received the highest

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descriptive percentage in both groups, while ease of use, clarity, usefulness, and media appeal also exceeded the predefined practicality criterion.

These results suggest that the developed video was perceived as usable and suitable for the instructional context in which it was evaluated. The favorable ratings for ease of use and perceived usefulness are conceptually consistent with established technology-acceptance research, in which perceived usefulness and perceived ease of use are central dimensions of users' responses to technology (Davis, 1989). However, the present study did not test the Technology Acceptance Model or relationships among its constructs; these concepts are relevant only as interpretive support for the observed practicality dimensions.

The positive responses are also compatible with broader evidence on instructional video. A systematic review and meta-analysis of video-based learning found that video can support learning when appropriately integrated into instructional design, although the reviewed evidence came primarily from higher education settings (Noetel et al., 2021). Consequently, those findings provide a broader theoretical context but should not be treated as direct evidence that the video developed in the present study improves learning among vocational-school students.

Accordingly, the 91% and 94% practicality scores support a narrower conclusion: participating students and teachers positively evaluated the instructional video during limited classroom implementation. They do not establish superiority over conventional instruction or improvements in achievement, motivation, retention, or technical competence.

4.4 Implications and boundaries of the evidence

The findings provide a development-stage example of how problem-centered storytelling and three-dimensional technical visualization can be integrated within vocational building education. For roof-truss instruction, this approach offers a structured way to connect contextual problems, component functions, spatial relationships, and technical explanations within a single multimedia resource. The design may also provide a useful development framework for other vocational topics characterized by spatial, procedural, or component-based content, although its applicability beyond the present context requires further evaluation. This implication is consistent with the study's intended contribution as an instructional-media design and developmental-validation study rather than a test of comparative effectiveness.

Methodologically, the study illustrates a staged evaluation process in which expert appraisal, qualitative revision, inter-rater agreement, and classroom practicality assessment precede a formal effectiveness trial. This process allowed the team to identify and refine technical-content accuracy, multimedia design, and usability concerns before broader implementation. The favorable expert and user evaluations therefore provide a basis for subsequent empirical testing, not evidence that the instructional video is superior to existing instructional approaches.

Several limitations define the scope of the evidence. Expert appraisal involved only three subject-matter experts and three media experts, while the classroom evaluation included 19 students and five teachers from one vocational school. The implementation evaluated a single instructional product, and the student and teacher outcomes were based on self-reported practicality rather than direct measures of learning. Although the student and teacher evaluations were favorable, these results represent preliminary usability and acceptance within the evaluated setting.

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Future research could therefore extend this developmental evidence with larger, multi-site samples, comparison conditions, and direct assessments of learning. Outcomes particularly relevant to roof-truss instruction include conceptual understanding, spatial interpretation, technical reasoning, retention, and transfer to construction-related tasks. Delayed assessments would also help determine whether any observed learning benefits are sustained beyond immediate classroom use.

5. Conclusion

This study developed a storytelling-based instructional video for roof-truss construction using the ADDIE framework. The final product integrated a problem-centered narrative with three-dimensional roof-truss modeling, animation, GIF-based visualization, voice-over narration, textual explanation, and synchronized multimedia elements. The development process shows how storytelling can be operationalized as an instructional structure that links contextual construction problems with component functions and spatial relationships in vocational learning.

The developed video met the predefined developmental evaluation criteria. Subject-matter appraisal produced an overall mean rating of 4.80 and an Aiken's V of 0.94, while media-design appraisal produced a mean rating of 4.81 and an Aiken's V of 0.95. Media experts also showed high agreement, with an average Percentage Agreement of 99.42%. During limited classroom implementation, students reported 91% practicality (M = 4.53, SD = 0.51) and teachers reported 94% practicality (M = 4.68, SD = 0.47).

Taken together, the findings support the developmental validity, consistency of expert judgments, and preliminary practicality of the storytelling-based instructional video within the evaluated setting. They do not establish that the medium improves student achievement, motivation, retention, or technical competence. Controlled, outcome-based studies are therefore required before conclusions can be drawn about instructional effectiveness.

Author's declaration

Author contribution

Laras Oktavia Andreas: Conceptualization, methodology, research supervision, data analysis and interpretation, validation, writing—original draft, and writing—review and editing. **Johandra Fakhriy Rahmadi:** Investigation, development of the instructional video, data collection, data analysis, visualization, and manuscript preparation. **Fitra Rifwan:** Methodological review, validation, and writing—review and editing. **Windry Novalia Jufri:** Content review, validation, and writing—review and editing. All authors reviewed and approved the final manuscript.

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Conflict of interest

The authors declare no financial or non-financial competing interests related to this study.

Data availability

The data supporting the findings of this study, including expert-validation records and practicality questionnaire data, are available from the corresponding author upon reasonable request.

Ethical clearance

Formal permission to conduct the study at SMK Negeri 1 Sumatera Barat was granted by the West Sumatra Provincial Education Office through Research Permit No. 000.9/3368/PSMK/DISDIK-2026, dated 4 May 2026. The approved research period was 4–18 May 2026. The permission required coordination with the school principal, implementation of the research without disrupting teachers or school activities, and collection of data in accordance with applicable regulations.

AI statement

AI-assisted tools were used only for language editing, grammar checking, and improving manuscript clarity. They were not used to generate research data, conduct statistical analyses, or determine the study findings. The authors reviewed the final manuscript and remain fully responsible for its accuracy, interpretation, originality, and scientific integrity.

Publisher's and Journal's note

Universitas Negeri Padang, as the publisher, and the Editor of Jurnal Pendidikan Teknologi Kejuruan state that there is no conflict of interest towards this article publication.

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