The Development of Learning Video Using Prezi Application on Photosynthesis Material to Improve Learning Motivation for 11th Grade Students

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Abstract: This study aimed to develop interactive learning videos using the Prezi application on the topic of photosynthesis to improve the learning motivation of 11th-grade students at SMK Darul Muklisin, Jember. The research employed the Research and Development (R&D) method with the 4D model (Define, Design, Develop, Disseminate). Data were collected through expert validation and student motivation questionnaires. Validation results from media and subject matter experts showed high feasibility, while a limited trial with 10 students indicated a significant increase in motivation scores, from 2.35 (low) to 3.52 (very high). These findings demonstrate that Prezi-based videos are effective in enhancing student motivation and facilitating understanding of complex material such as photosynthesis. In conclusion, interactive video media developed with Prezi is both feasible and effective, making it a potential innovative solution for digital-based classrooms.

Keywords: Biology learning; Interactive video; Learning motivation; Photosynthesis; Prezi

Introduction

Motivation is a key element that determines the success of students in learning. It serves as the internal drive that encourages them to persist, strive, and stay engaged in the learning process (Rahman & Fuad, 2024; Schunk & DiBenedetto, 2020). In education, motivated students are more active, enthusiastic, and ready to face challenges. However, research shows that many Indonesian students struggle with declining motivation. According to UNICEF (2020), around 70% of students in Indonesia experience learning demotivation. This condition is triggered by several factors, such as monotonous teaching methods, lack of interactive learning, and the complexity of certain subjects. Boredom, in particular, often leads students to become passive and disengaged (Özerk, 2020; Hasri et al., 2023).

A similar situation occurs at SMK Darul Muklisin, Jember. Based on interviews with teachers, the learning process still relies heavily on textbooks and printed modules. Limited use of technology and interactive media has made it difficult for students to visualize concepts, forcing them to rely only on imagination. This not only reduces their comprehension but also contributes to a lack of enthusiasm in attending classes (Ndraha & Harefa, 2023; Pekrun et al., 2023). Addressing this problem requires innovative media that make learning more tangible, engaging, and motivating, particularly through digital platforms that align with students' digital literacy levels (Ichsan et al., 2023; Zulyusri et al., 2023).

In line with the rapid growth of digital technology, the integration of digital media into learning is increasingly essential. Digital media, such as interactive

videos, have been proven to enhance students' participation and motivation (Sitepu, 2021; Aulia et al., 2024). One promising application is Prezi, a presentation platform that enables material to be delivered in a more dynamic and interactive way compared to traditional slides. Unlike conventional methods, Prezi emphasizes visual storytelling, allowing teachers to organize content more creatively and systematically. For students, especially those belonging to the digital generation, visual learning through Prezi is more accessible and engaging, making complex concepts easier to understand. Recent studies have demonstrated that the use of interactive digital media, such as Prezi, significantly enhances student engagement and motivation in learning environments (Aprizia & Sandra, 2025).

Photosynthesis is one of the biology topics that students often find difficult. The process involves chemical reactions and biological mechanisms at the cellular level, which are abstract and not easily imagined. Yet, understanding photosynthesis is crucial as it forms the basis of all life processes on Earth. Previous studies generally focused on how digital media can improve engagement in general science learning, but few have specifically applied Prezi-based learning videos to tackle motivation issues in biology classes at vocational schools. This study seeks to fill that gap. By using Prezi, the process of photosynthesis can be visualized step by step—from sunlight absorption to glucose formation and gas exchange through stomata—making it more concrete and comprehensible (Putri & Sofyan, 2020; Bujang et al., 2022).

The novelty of this research lies in the development of interactive Prezi-based learning videos designed specifically for the photosynthesis topic and tested in a vocational school setting. Unlike standard teaching materials or even conventional digital slides, this medium combines interactivity and visualization to address students' motivational challenges directly. Moreover, its application at SMK Darul Muklisin is urgent because students there face low motivation due to limited teaching resources and lack of technology integration.

Therefore, this study is important not only as an effort to improve student motivation at the local level but also as a contribution to innovative teaching practices in the digital era. By developing and implementing Prezi-based learning videos, teachers are provided with a practical solution that modernizes the learning process, enhances conceptual understanding, and fosters enthusiasm among students to actively participate in biology learning.

Method

This study employed the Research and Development (R&D) method, which aims to produce a valid, practical, and effective learning product. R&D is a systematic approach used to design and test new educational products to improve learning quality (Waruwu, 2024; Gustiani, 2023). The development procedure in this study followed the 4D model proposed by Thiagarajan, consisting of four stages: Define, Design, Develop, and Disseminate (Fajri & Taufiqurrahman, 2017) as the procedural framework. This model has gained renewed relevance in recent research, being recognized as a systematic framework for R&D in educational innovation contexts (Indaryanti et al., 2025). However, in this research the model was modified to suit limited classroom implementation, ending at the Develop stage without conducting large-scale dissemination (see Figure 1).
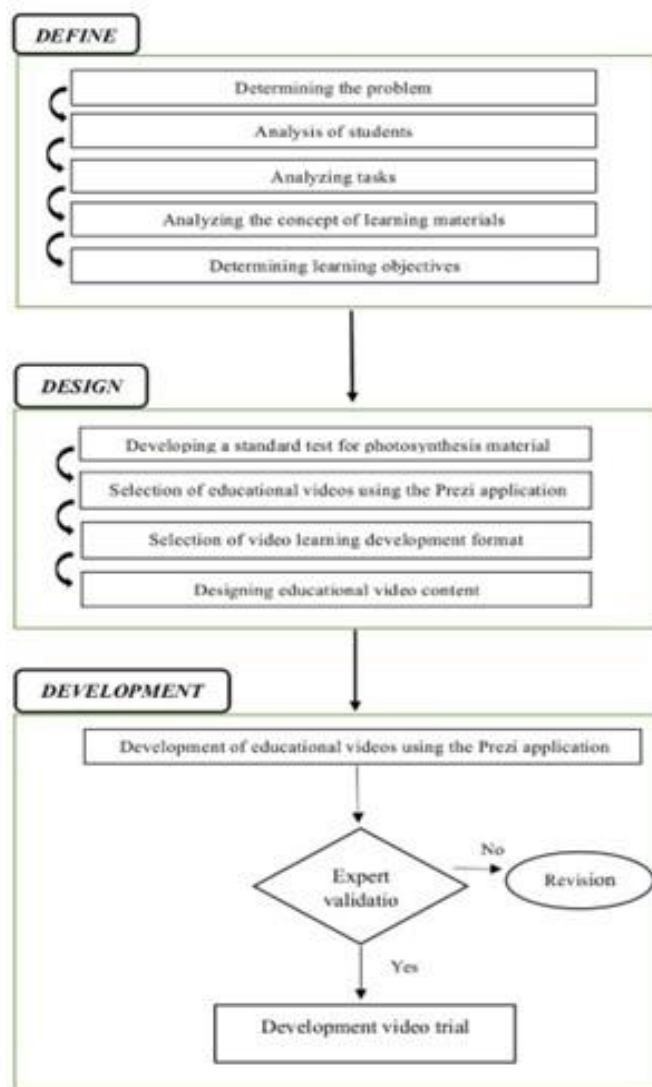

Figure 1. Modified 4D model used in this study

The research was conducted as a limited trial involving 10 students of Grade XI at SMK Darul Muklisin, Jember Regency, selected through purposive sampling. The purpose of this limited trial was to test the feasibility of the developed Prezi-based video learning media and its potential to enhance students' learning motivation, not to generalize to the wider population.

Data Collection Techniques

Data were collected using: Interviews, to explore initial needs and problems in learning; Expert validation questionnaires, completed by material and media experts to evaluate feasibility; and Student motivation questionnaires, administered after using the media.

Data Analysis Techniques

The data were analyzed both qualitatively and quantitatively: Qualitative analysis was used to process suggestions from experts and students, which informed product revisions; and Quantitative analysis was applied to score-based data from expert validation and student questionnaires.

Feasibility data were analyzed using the formula from Riduwan & Buditjahjanto (2015):

$$\text{Feasibility (\%)} = \left(\frac{\Sigma X}{N \times S_{max}}\right) \times 100\% \qquad (1)$$

Information:

ΣX = total score obtained from all validators

N = number of statement items multiplied by the number of validators

S_{max} = maximum score per statement item

Data for each item and overall responses can be interpreted into categories based on the following table.

Table 1. Feasibility categories (Riduwan & Buditjahjanto, 2015)

Category	Score (%)
Very suitable	81.00–100.00
Suitable	61.00–80.00
Fairly suitable	41.00–60.00
Less suitable	21.00–40.00
Not suitable	0.00–20.00

The next step after obtaining the feasibility data for learning using the Prezi application is to measure student learning motivation through a questionnaire that uses a Likert scale of 1-4. The scores obtained by the students are then calculated using the average score formula to determine their level of motivation. The following formula is used.

$$\text{Average student score} = \frac{\sum R}{N \times P} \qquad (2)$$

Information:

$\sum R$ = total score obtained by all students from the questionnaire

N = number of students

P = Number of statements in the motivation questionnaire

The average score is then classified into the following categories.

Table 2. Motivation score categories (Sugiyono, 2019)

Category	Average score (%)
Very low	1.00–1.75
Low	1.76–2.50
High	2.51–3.25
Very high	3.26–4.00

Result and Discussion

This research aims to develop video-based learning materials on photosynthesis using the Prezi application, with the objectives of assessing their feasibility and evaluating their impact on the learning motivation of 11th-grade students. Data were collected through expert validation (content and media experts) and student motivation questionnaires.
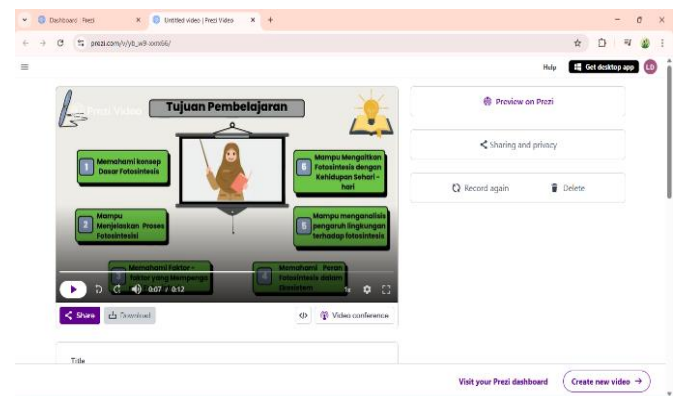

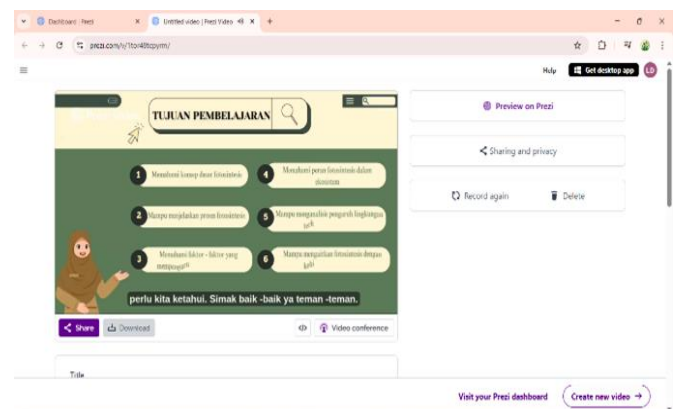**Figure 2.** The appearance of the video before revision (without subtitles)

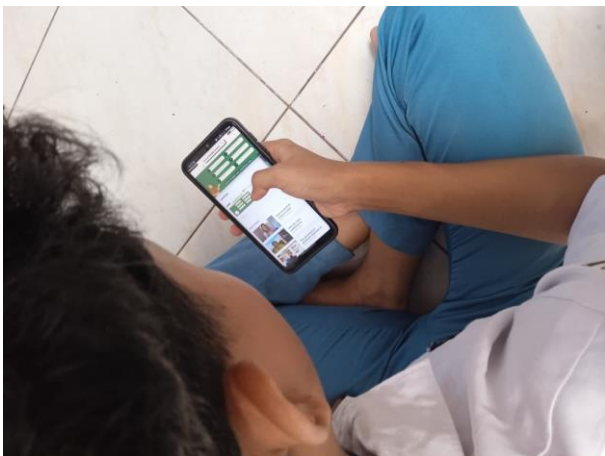**Figure 3.** The appearance of the video after revision (with subtitles)

Figure 4. Students engage in learning photosynthesis using a Prezi-based video at school, which helps them understand the concepts effectively

Following feedback from validators, the learning media was refined to ensure feasibility and effectiveness. The revised video was then implemented with a group of 10 students to examine its effect on learning motivation.

The validation and motivation results are summarized: Media Expert Validation Conducted by a lecturer at the University of PGRI Argopuro Jember, the assessment yielded a score of 87 out of 100. Based on the categorization by Riduwan & Buditjahjanto (2015), this percentage (87%) indicates that the media is "very suitable for use." This result suggests that the developed video meets high-quality standards and can be effectively implemented in teaching photosynthesis; Content Expert Validation Conducted by a Biology Education lecturer at the same university, the

assessment produced a score of 65 out of 70, equivalent to 92.86%. According to the same categorization framework, this also falls into the "very suitable for use" category, confirming the high quality of the developed material for classroom application; Student Motivation Questionnaire Administered to 10 students of Class XI at Darul Muklisin Vocational School, the instrument consisted of 32 statements on a 4-point Likert scale. The total score obtained was 1.128 out of a maximum of 1.280.

The average motivation score was therefore:

$$\frac{1.128}{320} = 3.52$$

According to Sugiyono (2019), this value falls into the "high category," indicating that the Prezi-based learning video positively influenced students' motivation.

The learning media developed in this research comprises interactive learning videos utilizing the Prezi application, focusing on the topic of photosynthesis for 11th-grade students. This video is systematically designed to leverage the visual and animation capabilities of Prezi, presenting the material in a sequential and engaging manner. The development process employed the 4D model, consisting of the Define, Design, Develop, and Disseminate stages. During the Define stage, a needs analysis was conducted through observations and interviews with biology teachers. The Design stage involved preparing storyboards and mapping the material. The Develop stage entailed creating the video and conducting feasibility testing through expert validation.
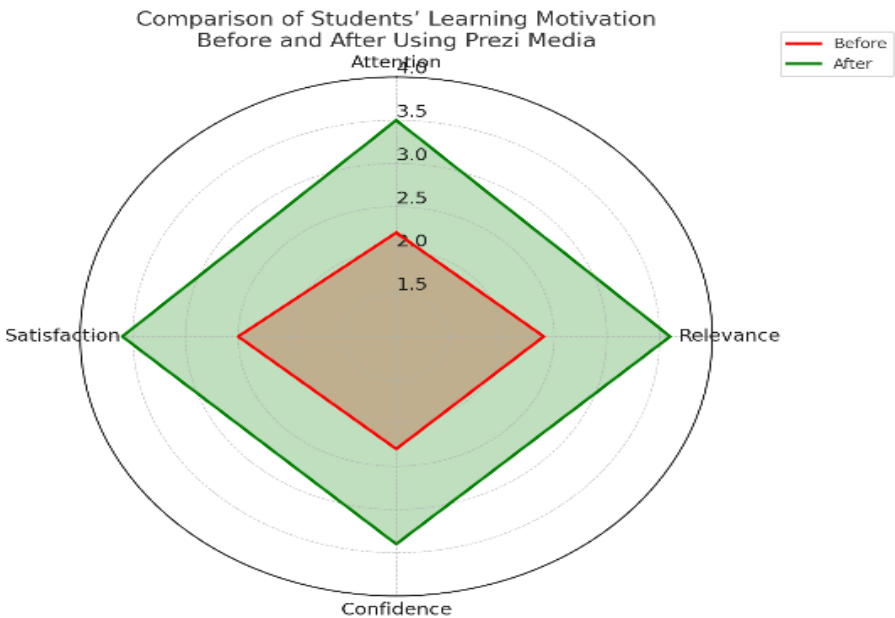

Figure 5. Comparison of student learning motivation before and after using Prezi media

The developed learning media consists of interactive videos on photosynthesis, systematically designed using the 4D model (Define, Design, Develop, and Disseminate). In the Define stage, needs analysis was conducted through observations and teacher interviews. The Design stage involved storyboard creation and content mapping. The Develop stage included video production and feasibility testing through expert validation. Results showed 92.86% from the content expert and 87% from the media expert, both categorized as "very suitable."

Subsequently, limited implementation with 10 students demonstrated positive outcomes. The average student motivation score reached 3.52 (high category).

Figure 5 shows that students' motivation score before using the media was 2.35 (low category). After the implementation, the score increased to 3.52 (high category). This demonstrates that the Prezi-based video learning media effectively enhances student learning motivation. Students responded positively, noting that visualization and animation improved their understanding of photosynthesis. The subject teacher also agreed that the media is suitable for digital-based learning due to its interactive and engaging nature.

According to Slavin (2019), educational psychology highlights the role of technology in supporting students' enthusiasm, attention, and comprehension. Prezi's visual and animation features align well with these principles, helping students engage more actively in the learning process (Zafer et al., 2025; Xu et al., 2023). Recent evidence shows that the frequent use of interactive digital tools significantly enhances student engagement and achievement in science learning by providing personalized, dynamic learning experiences (Zafer et al., 2025). Moreover, visual cues modeled after peer attention patterns—similar to those leveraged in Prezi's zooming and storytelling interface—can further deepen focus and retention (Xu et al., 2023).

Moreno & Mayer (2007) emphasized that interactive multimodal learning environments, which combine visual, auditory, and kinesthetic elements, significantly enhance students' understanding and engagement. This supports the findings in the current study, where Prezi-based videos, through dynamic visuals and animations, provided multiple channels for information processing, leading to higher motivation and better comprehension of photosynthesis among students.

Previous studies also support these findings. Fitri et al. (2024) confirmed that Prezi fosters attention and comprehension through dynamic presentations. Kristiantari et al. (2022) highlighted its effectiveness for digital and hybrid learning. Ladjar et al. (2025) emphasized Prezi's non-linear and interactive design, which encourages student engagement. Other studies have shown similar results: Muharni et al. (2021) reported increased motivation and outcomes in science subjects; Rifaldi et al. (2021) found that visual animations aid understanding of complex concepts like photosynthesis; Susanto et al. (2025) observed significant motivation improvement with Prezi-based media; and Meilany et al. (2021) recorded increased student interest (7.31%) and learning outcomes (21.2%).

Additional supporting studies further validate these results. Putri & Lestari (2023) revealed that interactive videos enhanced conceptual mastery and student curiosity in biology lessons. Wulandari et al. (2022) noted that technology-enhanced media helps maintain student engagement even in challenging scientific topics. Similarly, Arsyad (2020) emphasized that media-rich instruction improves both cognitive and affective domains of learning. Moreover, Kurniawan & Dewi (2021) highlighted that digital tools foster collaborative learning, while Firmansyah et al. (2023) showed positive effects of visualization on motivation. More recently, Ningsih (2024) found that animation-based media boosts critical thinking in science, and Handayani & Susanto (2023) reported similar success in biology learning. Consistently, Rahayu & Rahman (2022) confirmed the role of interactive platforms in increasing participation, and Maulana & Puspitasari (2023) observed improved learning outcomes through Prezi-integrated teaching.

Collectively, these findings confirm that the developed Prezi-based video learning media is feasible, effective, and has strong potential to enhance both learning quality and student motivation in the classroom.

Conclusion

This study successfully developed interactive Prezi-based video learning media on photosynthesis for 11th-grade students. Expert validation and limited implementation showed that the media is highly feasible and effectively increases student motivation. Prezi's interactive features make abstract concepts more concrete and engaging, enhancing comprehension and enthusiasm. These findings indicate that Prezi-based media is a practical and effective tool to improve learning quality in vocational school biology classes. Teachers are encouraged to integrate such digital media in other subjects, and future research can explore its application on a larger scale.

Author Contributions

Conceptualization, methodology, formal analysis, investigation, resources, data curation, writing—original draft preparation, L.D.; validation, writing—review and editing, visualization, I.M.A. and H.R.P. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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