

Developing Animated Video to Improve Critical Thinking Skills in Patisserie Product Classification

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ABSTRACT

The purpose of this study was to develop and evaluate a learning design using animated videos to enhance critical thinking skills among Culinary Education students studying the classification of pastry and bakery products. The ADDIE instructional design model, including analysis, design, development, implementation, and evaluation, guided the development process. Learning needs were identified through literature reviews and consultations with instructors and students. Modules and storyboards were created and validated by experts in pastry and instructional design. The findings demonstrated that the learning design effectively addressed identified learning needs and supported practical skill development. Animated videos provided engaging, flexible, and accessible learning media suitable for independent study beyond classroom hours. The developed materials met eligibility standards for content quality and usability while aligning with the learning outcomes of the Patisserie Course. Overall, integrating digital technology with instructional objectives strengthened learning effectiveness and supported meaningful educational experiences.

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Introduction

The use of technology in the learning process is now not only a necessity but also a demand in the world of global education Rijal (2020). One form of utilization is the use of learning media as a means of assisting in delivering material. Learning media has a strategic role in increasing the effectiveness of learning, especially when combined with interactive content that allows students to

learn independently and actively (Abbas, 2020; Purba, 2021). In the digital era, traditional education has transformed into a modern, dynamic, and responsive system, utilizing various types of technology-supported learning media (Ima et al., 2025; Anderson, 2008). This transformation is not limited to the substitution of conventional tools but also signifies a pedagogical shift towards student-centered learning (AG. Gunawan, 2025; Gunawan et al., 2023, 2025), where learners are encouraged to construct knowledge through exploration, collaboration, and interaction with digital resources Laurillard (2012). Moreover, the adoption of educational technologies has been proven to foster flexibility in learning environments, enabling hybrid and blended learning models that combine face-to-face interaction with online learning platforms Garrison and Vaughan (2008). Such approaches are particularly relevant in preparing students to meet the challenges of the 21st century, which demand digital literacy, creativity, critical thinking, and problem-solving skills Trilling and Fadel (2009). Furthermore, studies have shown that the effective integration of digital media—such as simulations, animations, and interactive videos—can enhance students' cognitive engagement and support deeper learning by presenting complex concepts in more accessible and visually stimulating ways (Clark and Mayer, 2016; Mayer and Moreno, 2002). Therefore, leveraging technology in the form of innovative learning media is no longer an option but an imperative for creating educational systems that are equitable, engaging, and future-oriented.

For many years, educational institutions have employed animated videos, and several studies have assessed and documented their effectiveness in raising student motivation, engagement, and performance Kleftodimos (2024). Computer-animated videos offer a powerful tool in education by enhancing engagement, improving comprehension of complex topics, and potentially boosting retention rates (Mayer and Moreno, 2002; Clark and Mayer, 2016). Teachers who create these videos can leverage animation's visual and storytelling capabilities to make learning more accessible and enjoyable for students. According to cognitive theory of multimedia learning, animation and other multimedia elements (text, images, video) can enhance student comprehension when aligned with principles of reducing extraneous cognitive load Mayer and Moreno (2002). Furthermore, recent studies found that participants' cognitive load was not increased by animation or interactive video content, while motivation improved significantly. However, it was also shown that interactive video materials could induce higher unnecessary cognitive load compared to animation Tugtekin and Dursun (2022). This aligns with Ismail et al. (2017), who argue that multimedia components in animation videos can help students visualize abstract concepts and foster creativity.

The results of the needs analysis conducted on Culinary Education Study Program students of the 2024 intake showed that there were challenges in learning the Patisserie course, especially in the material on the classification of patisserie product types. Students experienced confusion in determining the type and characteristics of products according to dough classification, while this material is a foundation for achieving higher learning outcomes. The classification of patisserie product types includes various dough categories, examples of products, and the characteristics of each type, which are crucial for students' mastery in later practical applications.

In this context, interactive learning media based on digital technology is a potential solution. Putri (2021) emphasized that interactive media can overcome the limitations of learning time in class because it is flexible to use anytime and anywhere. This opinion is reinforced by Munawar (2019) and Dwi (2021), who emphasize the importance of various learning sources and media in facing global educational challenges and overcoming motivational constraints. Similarly, interactive media has been proven to stimulate positive student responses to learning materials (Muthmainnah, 2018; Johnson et al., 2016). One relevant form of interactive media in the current digital landscape is animated video. Canva, as one of the widely used platforms, offers flexibility and simplicity, providing templates that allow teachers and students to create attractive animated content without advanced technical skills Fauzi and Sari (2022).

In his research, Fahmi (2022) stated that during learning activities in the culinary arts department at SMK Singosari, students often felt bored and paid less attention due to monotonous methods, as the media used were limited to PowerPoint and textbooks. In line with this, Wahyudin et al (2016) argued that the learning media currently used are insufficient in creating a fun and varied learning environment. The use of modules as a learning medium by teachers has not fully optimized supporting features such as video or animation. Based on this background, the development of animated video learning media is deemed necessary to provide more variations in delivering patisserie product classification material in the Culinary Education Study Program, Universitas Pendidikan Indonesia. Therefore, this study was conducted with the aim of developing animated video learning media to improve students' understanding and critical thinking skills.

Method

In order to create and evaluate animated video-based learning resources that enhance critical thinking abilities in the classification of pastry products, this study used the ADDIE (Analyze, Design, Develop, Implement, Evaluate) paradigm as a systematic instructional design framework.

Analysis Stage. The Analysis Stage involves identifying the basic abilities of students about the classification of pastry and bakery products, determining needs, establishing Learning Outcomes for the course, and outlining the material. Initial assessments include surveys and tests. The analysis's findings emphasize the necessity of interesting and visually appealing content to help students better comprehend how bakery and pastry products are categorized and to develop their analytical abilities.

Design Stage. The design stage is the phase where the creation of flowcharts, storyboards, and media components such as images, text, video, and animations accompanied by sound and music takes place. The software used in the creation of these components is the Canva website. The learning objectives and particular content needs are set during the design process to direct the creation of instructional materials.

Development Stage. Animated videos are created throughout the development phase using the storyboard and material layout. Canva is selected due to its versatility and user-friendliness, which enable the production of captivating interactive video content without the need for sophisticated technical knowledge because the application comes with templates. The pages are made to follow the learning objectives and organize the process of creating information in a methodical way. This page blends story and visual components to clarify difficult material topics and provide definitions, identifying product types from each classification of pastry dough, showcasing the characteristics of example products based on their type, and encouraging critical thinking through reflective questions. The animated videos created are reviewed by subject matter experts from academic representatives (lecturers) and practitioners (executive chefs), as well as media experts in the field of educational technology. These experts' input is utilized to improve the videos' content and make sure they are interesting, approachable, and appropriate for use as educational tools.

Implementation Stage

After product revision is carried out at the development stage and declared feasible, the product will be implemented in trial on limited class. During the Implementation phase, animation-based videos are distributed in the classroom with the experimental group, while the control group receives traditional instruction on patisserie product classification. Both groups consist of 20 students and were taught by the same lecturer to maintain instructional consistency. The experimental group engages with animated videos covering topic related to patisserie product classification that align with the learning objectives. Student engagement in class is monitored through observations by lecturers, and feedback collected through student questionnaires.

Furthermore, both groups are given pre- and post-critical thinking assessments to gauge how much their critical thinking abilities have improved. The exam results offer quantifiable information on improvements in critical thinking skills, enabling a comparison of the efficacy of traditional education with animation-based video learning.

Evaluation Stage

The last step, evaluation, entails examining information gathered from surveys, pre- and post-tests, and classroom observations in order to determine how well animated video content teaches. Robert Maribe Branch states that (2009) 'The evaluate phase's goal is to evaluate the instructional methods and products' quality both before to and following deployment.' The goal of this evaluation stage is to see or estimate the quality of the learning product and process, which can both be done before and after implementation. Robert Maribe Branch (2009) notes that at this evaluation stage, the quality of the product can be determined through three aspects: 1) Perception, 2) Learning, 3) Performance. The first aspect is viewed from the perceptions or responses of students. These perceptions or responses are the students' assessments of the products produced. The second aspect is the attitudes and behaviors of students during the learning process. In the performance aspect (attitudes/behavior), this is an evaluation of the behavior or attitude of students during the learning process when using the product. To assess the behavior or attitude of students during the learning process using the patisserie media product, a student activity observation sheet is used. The third aspect is seen from the learning outcomes of students. According to Mukhtar and Samsu (2003:72), one of the objects of product evaluation implementation is the learning outcomes in accordance with the learning objectives that have been set and should be achieved. Critical thinking skills in this study were measured using a test instrument in the form of essay questions developed based on the higher-order cognitive levels (HOTS) in Bloom's Taxonomy revised by Anderson & Krathwohl (2001). This instrument includes two main indicators of critical thinking, namely: (1) analyzing (C4), and (2) evaluating (C5). Analyzing (C4) in the context of this study is measured through questions that ask students to describe components, distinguish relevant and irrelevant information, and connect the causes and effects of a phenomenon presented in an animated video. The Evaluating indicator (C5) in this study, is measured through questions that ask students to provide arguments supported by evidence, and consider alternative solutions to the problems presented.

Result and Discussion

This research aims to develop an animated video-based learning resources that enhance critical thinking abilities in the classification of pastry products. The development of this media is carried out using the ADDIE stages (Analyze, Design, Develop, Implement, Evaluate) are presented in Figure 1.

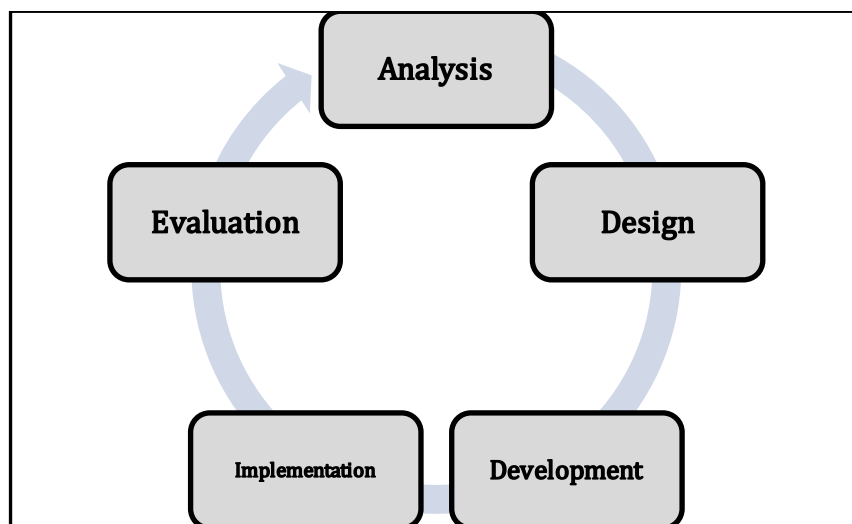


Fig 1: ADDIE development stages (Analyze, Design, Develop, Implement, Evaluate)

The initial analysis stage reveals a clear need for instructional improvements in developing Animated Videos. The establishment of Course Learning Outcomes (CLO) is based on the 2018 Curriculum syllabus of the Culinary Education Study Program for the Patisserie course with course code BG216 in the Culinary Education Study Program. The research focuses on the CLO related to the mastery of concepts about the classification of types of patisserie products.

This determination is made so that the content of the material in the media is in line with the learning objectives and the competency indicators of students. This is in accordance with the opinion of Sutisnawati (2022), who emphasizes that mapping learning outcomes is very important so that media development is relevant to user targets. Canva is chosen for its flexibility and ease of use, allowing the creation of engaging interactive video content without advanced technical skills as templates are provided within the application. Studies in the literature show that using animation as a teaching tool has benefits for interactively and graphically communicating complicated knowledge. Safitri and Titin (2021). The CLO diagram along with the learning materials is presented in Figure 2.

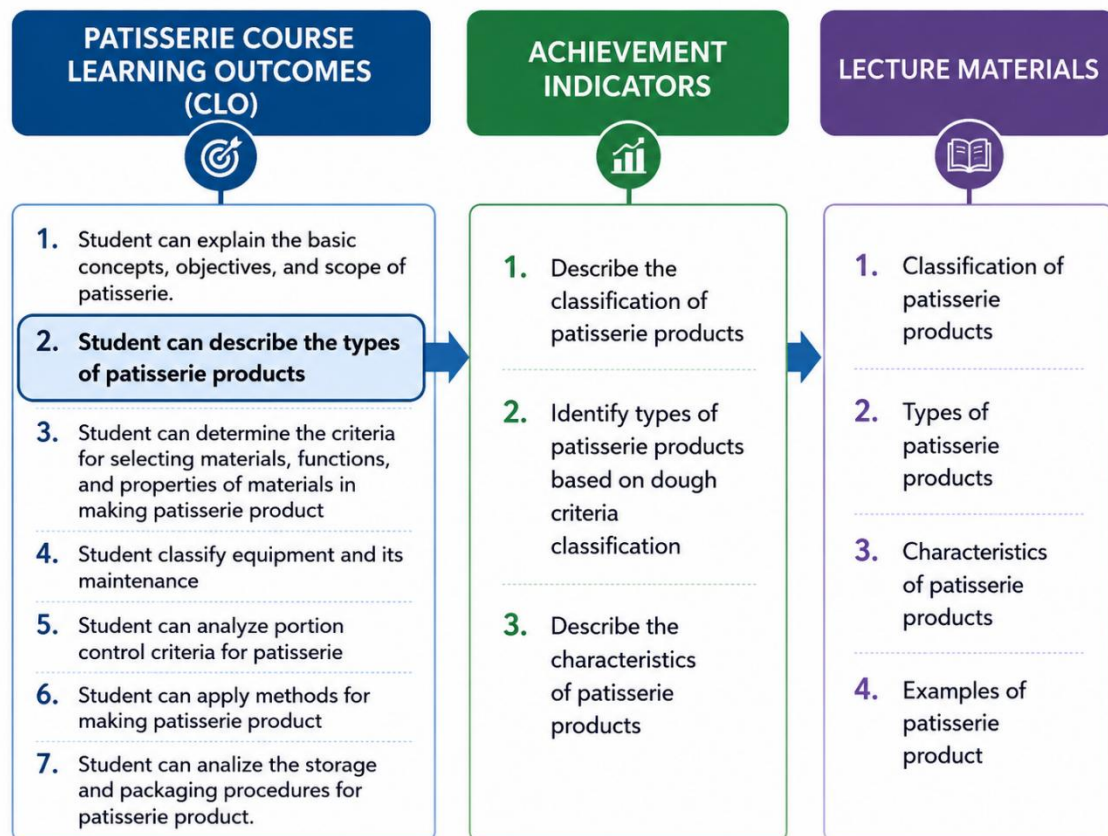


Fig 2: Patisserie Course Learning Outcome

Because animation may make difficult or complicated concepts easier for children to understand, it has a strong visual appeal Afrilia et al (2022). With the presence of animated video media, one can listen and directly see the text reading as well as the animated movements in the form of images that correspond to the material to be delivered by the teacher Alifa (2021). In the context of culinary education, visually appealing and interactive content is essential for helping students comprehend the classification of pastry and bakery products. Recent studies emphasize that digital media such as animations and interactive videos significantly enhance students' conceptual understanding and retention by providing contextualized and engaging visual representations (Alqahtani and Rajab, 2021; Weng et al., 2022). Furthermore, analysis results are also used to establish clear and measurable Learning Outcomes, ensuring that instructional strategies are aligned with competency-based education frameworks (OECD, 2021). This stage underlines the necessity of adopting media that not only delivers content effectively but also fosters analytical and creative abilities, preparing students for real-world professional challenges in the culinary field Putra and Sari (2023).

The design phase is the stage where flowcharts, storyboards, and media components such as images, text, videos, and animations are created, complete with sound backgrounds and music. The software used in the creation of these components is the Canva website. The flowchart used in this research is presented in Figure 3.

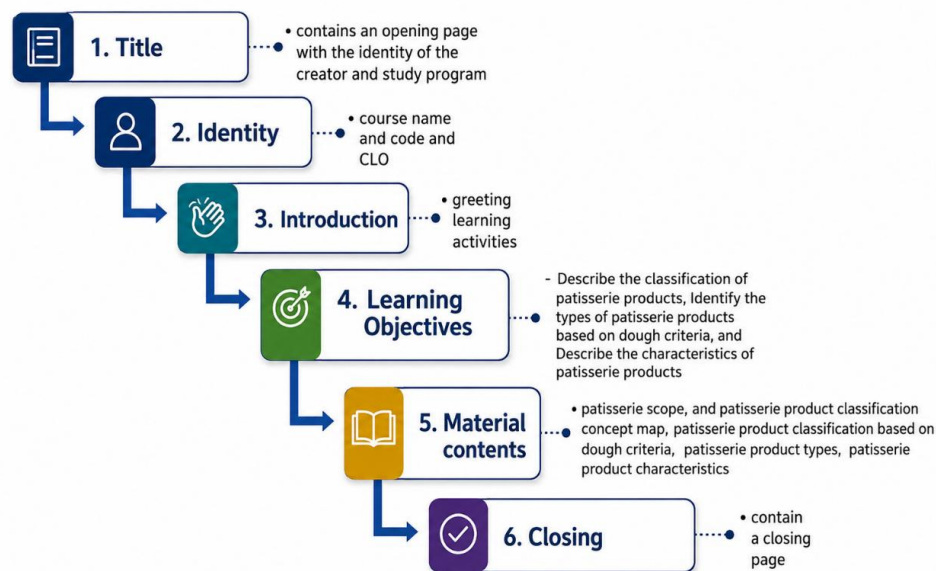


Fig 3: The flowchart contains the flow of media to be presented

Figure 3 showed the flowchart contains the flow of media to be presented, such as the media title, identity, introduction, learning objectives, the content of the learning material until closing. The storyboard in this research illustrates the visualization of each part of the page in the Canva animation video project, from the main page, to the content, and the conclusion that integrates media components such as images, text, video, and animation complemented by sounds and musics. The Example of a storyboard at the beginning of the video page presented in Figure 4.

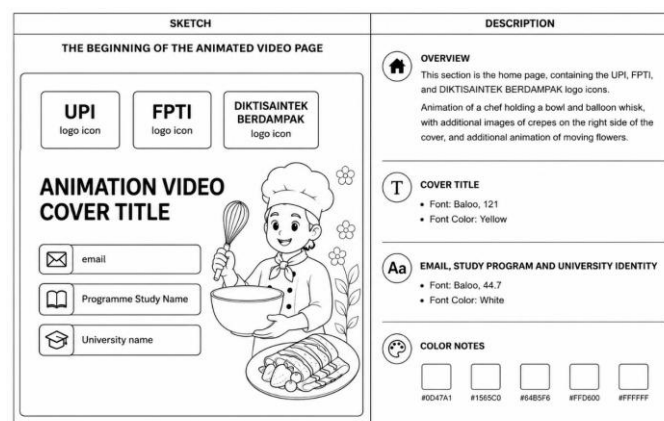


Fig 4: The beginning of the animated video page Storyboard

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Website : <http://journal2.uad.ac.id/index.php/joves>

Students can visualize things that are hard to teach verbally or statically through animation, which uses motion elements, colors, and noises. Students are better able to absorb the course materials and get a deeper comprehension as a result. Animation also provides an interactive educational experience. According to the literature review, interactive animation can boost students' interest in what they are learning Sunami and Aslam (2021).

At the development stage, the creation of media components is carried out, such as text that includes the content to be included in the animated video, images in the form of various types of examples of pastry products from each classification of pastry types represented as images, animations such as movements on images or text, audio as background music and audio in delivering material, and videos that demonstrate the characteristics of pastry dough linked to templates. In addition to using Canva, the author also utilizes the assistance of the application <https://www.remove.bg/>. The development process presented in Figure 5.

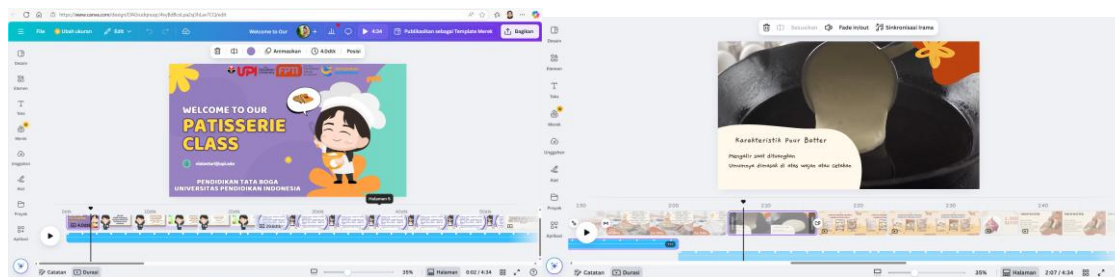


Fig 5: Opening Video and material content

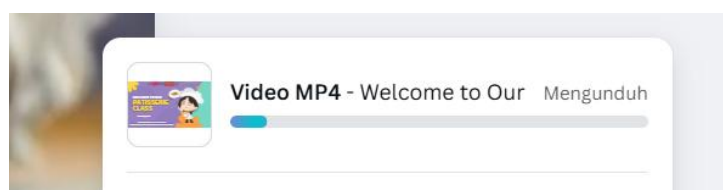


Fig 5: Download Process

The final process of development involves validation by expert panelists regarding the content and media aspects. Feedback from these experts is used to refine the content and ensure that the video is accessible, engaging, and suitable for use as a learning medium. The animated video created is reviewed by subject matter experts from academia (lecturers in Culinary Education) and practitioners (expert panelists who work as executive chefs at GH Universal Hotel). Improvements to the content aspects of the media are made based on the sequence of pages presented. These improvements are made to meet the information needs of students. This validation reinforces the importance of the alignment of media content with learning outcomes, as stated by Nasir et al

(2022), which indicates that the creation of media content must refer to learning achievements. This is also reinforced by Sutisnawati (2022) who stated that the material in the developed media must align with the learning achievement objectives so that the media created meets the aims and targets of the users.

Media validation was carried out by one of the lecturers of ICT Literacy and learning media at the Indonesian Education University. The results of the media validation received input in the form of adding study program identities to the home page of the video, adjusting the colors, descriptions of dishes that were originally in English were revised by standardizing them using Indonesian, using images that were not personal documentation so that it was suggested to be supplemented with sources, and at the end of the content page the material did not display examples of soft dough products. After improvements were made based on this input, further validation showed that the media was suitable for use after making revisions including visual appearance and suitability of illustrations to the material. Studies of the literature show that the use of animation as a teaching tool is still evolving and innovating. For example, it is crucial to pay attention to the quality of animation content, including information correctness and curriculum fit, and connectedness to students' real lives Winastiti et al (2012). reinforced by Fridayanti et al (2022) who stated that the appearance of the media including the background and colors used must be in accordance with the learning theme because these are important components in the media development process.

The implementation stage was carried out after the product revision at the development stage based on input from expert panelists until the media was declared feasible to be implemented in real classes. A discussion session and an online quiz using Google Form were used to reinforce learning after the video, which was made available online via a shared link for students to view whenever it was convenient for them. Students in the experimental group showed a high degree of engagement, with many willingly taking part in post-video conversations and showing interest in the material. Observations in the classroom showed that the participatory aspects of the movie, which appeared to be more effective in holding students' attention than more conventional approaches, greatly inspired the pupils. This is in line with earlier research that indicates multimedia-rich and interactive content is more captivating and successful at promoting active learning. (Housner and Griffey, 1985; Jang, 2010; Zacharia, 2005).

The final stage in the development process in this study is the evaluation of the product, namely the Patisserie Learning Animation Video media. The evaluation aspect is seen from the perception or response of students, student learning outcomes and aspects of student attitudes/behaviors in

learning with an assessment of student activity observations. In terms of student perceptions of the media, 91.92% of students stated that they agreed that the media makes it easy to understand the subject matter, using examples, photos, and illustrations is one way to help students grasp the subject. Students learn new things as a result of the media's sophisticated content. Easy-to-understand language is used in learning media, and the media's main concept aligns with the learning objectives that must be met, the terms in the media are easy to understand, the existence of media is important for mastering learning. 3.58% of students answered neutrally to the media's general concept aligns with the desired learning outcomes. The media's vocabulary is simple to comprehend, and its existence is crucial for learning mastery. As many as 4.52% stated that they did not agree that media makes it easier to understand learning materials, the use of illustrations, pictures, and examples is one of the supports in mastering the material, the up-to-dateness of information in the media makes it easier to understand something new, and the existence of media is important for mastering learning. In the observation assessment, the level of engagement among students in the experimental group was high, with many students voluntarily participating in the post-video discussion. Students related the material to real life and conducted Q&A to get the concept and were enthusiastic in working together on the practice questions of the patisserie product development project assignment based on its classification and dared to present the results of the discussion in front of the class, participate in discussing the answers, and conclude the material. The third aspect is seen from student learning outcomes. Assessment is a way of making decisions that are made by utilizing data acquisition through learning outcome measures, both non-tests and tests Mahirah (2017). It can be concluded that learning assessment is the process of collecting data/information used to measure the quality and achievement of student goals. To see the effectiveness of learning media, a post-test was conducted to see the learning outcomes of students who used patisserie learning animation video learning media, data analysis of student learning outcome tests was by looking at the percentage of student completion whose learning process used patisserie learning animation video learning media. Statistical Description Table of Pre-Test and Post-Test Results explain in Table 1.

Table 1. Statistical Description Table of Pre-Test and Post-Test Results

Class	N	Pre-test (mean)	Post Test (Mean)	Increase	N-Gain
Experiment	20	74,3	95,7	21,4	0,83
Control	20	73,8	81,2	7,4	0,28

The results of this study provide strong evidence regarding the effectiveness of animated videos in improving students' critical thinking skills in classifying types of patisserie products. The experimental group's post-test scores significantly increased, suggesting that using interactive and multimedia components in the classroom can significantly improve students' capacity to evaluate various patisserie product categories. The N-Gain analysis showed a stark contrast between the two classes. The experimental class obtained an N-Gain value of 0.83, which is considered high based on Hake's (1999) criteria. In the experimental class, the t-test results showed a value of $t(19) = 14.72$ with $p = 0.000$ ($p < 0.05$), which means that the increase from pre-test to post-test in the experimental class was statistically significant. In the control class, the t-test results showed a value of $t(19) = 4.38$ with $p = 0.000$ ($p < 0.05$), which shows that the control class also experienced a significant increase, but the magnitude of the increase was much smaller than the experimental class.

In multimedia learning environments, learners can benefit from animation over text-based graphics, as animation facilitates knowledge construction by visually representing complex concepts. Traditional classroom learning has long been characterized by teacher-centered, lecture-based delivery, resulting in low retention rates and limited critical thinking development. Animated videos fundamentally change the way students discover and process knowledge, offering several distinct cognitive and pedagogical advantages. According to research by Mou (2023), using animation as a unit review raised students' understanding levels. Animation increased learning satisfaction and active learning behavior, according to a combination of quantitative and qualitative data. Students particularly appreciated the dynamic simulation features and animated visualizations, which enhanced their understanding. Animation has been shown to be a successful supplemental learning resource because it fosters the growth of students' higher-order thinking abilities through dynamic visual representations, according to a literature review on HOTS Hwang et.al (2012).

In conclusion, the superiority of animated videos over traditional learning in fostering critical thinking skills can be attributed to their alignment with the way the human brain processes information Mayer (2021), their ability to simultaneously activate visual and verbal cognition Lin and Atkinson (2011), active learning is defined as students intentionally engaging in an activity, making purposeful observations, and thinking critically about what they are doing Doolittle et al (2023), and their ability to make abstract content seem tangible and discussable Mou (2023). Where conventional learning limits students to low-level cognitive tasks such as remembering and

reproducing, animated videos create the conditions for engagement, visualization, and conceptual depth that allow critical thinking skills to truly develop (Sari et al., 2023; Fakhri et al., 2025).

Conclusion

This study shows that the development of interactive animated video-based learning media can contribute to providing effective and relevant media alternatives in the digital learning era. The resulting media meets the eligibility criteria for material content and flexibility in use, especially in supporting independent learning processes outside of classroom hours. The alignment between the content of the material developed and the Learning Achievements of the Patisserie Course on the material on the classification of types of patisserie products shows that there is integration between learning objectives, teaching materials, and the use of digital technology. Media components such as images, animations, audio, and videos in this media support the presentation of information. The results of the assessment of the developed media have been declared feasible based on aspects of material, language, and media. The effectiveness of animated videos in improving students' critical thinking skills in classifying types of patisserie products. The experimental group's post-test scores significantly increased, suggesting that using interactive and multimedia components in the classroom can significantly improve students' capacity to evaluate various patisserie product categories.

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