Jurnal KARMA (Karya Ilmiah Mahasiswa)
Vol 1, Number 1, April 2025 , pp. 22-29
P-ISSN: 3072-XXXX | E-ISSN: 3052-XXXX
DOI: 10.70103/karma.v1i2
Publisher: Institut Bisnis dan Teknologi Indonesia

2D Animation Learning Media: A Digital Solution to Support the Mathematics Learning Process at SD Triamarta Tabanan

Rizkita Ayu Mutiarani[1], Daniel Goniansyah Libroto[2*], Ni Putu Suci Meinarni[3]

[1*,2,3] *Institut Bisnis dan Teknologi Indonesia, Denpasar, Indonesia*
[2*] *danielganiansyah24@gmail.com*

ARTICLE INFO

Article history:
Received 17 February 2025
Accepted 27 March 2025
Published 8 April 2025

ABSTRACT

The development of digital technology has opened up significant opportunities to enhance the quality of education through more interactive and engaging media. This study aims to design a 2D animation-based learning media for the topic of number lines, specifically for grade 3 students at SD Triamarta Tabanan. The design process involves three main stages: pre-production, production, and post-production, integrating appealing visual elements, clear narration, and interactive animations. The media is designed with a flat design approach to create visuals that are simple yet effective, utilizing bright colors, sans-serif typography, and friendly characters. This study concludes that 2D animation can serve as an innovative solution in education, with the potential to be applied to other topics in basic education.

Keywords: *2D Animation, Learning Media, Number Lines, Digital Learning*

1. Introduction

The advancement of digital technology has provided significant opportunities in the field of education, enabling the development of more innovative and interactive learning media. One promising innovation is 2D animation-based learning media. This type of media has the ability to integrate visual elements, narration, and movement, making abstract concepts more engaging and easier for students to understand (Biassari et al., 2021). In the context of primary education, particularly in subjects requiring conceptual visualization like mathematics, 2D animation serves as an effective solution to address the limitations of conventional teaching methods (Sugitra et al., 2022).

Mathematics is often regarded as a challenging subject, especially for elementary school students. One topic that demands deep understanding is number lines, which involves operations such as addition, subtraction, and mixed calculations (Nurkhafid et al., 2024). At SD Triamarta Tabanan, interviews with teachers revealed that grade 3 students face significant difficulties in grasping this material. Data collected indicates that more than 60% of students find the topic challenging. This is reflected in the average pretest scores, which only reached 23.08 for class 3A and 10.4 for class 3B, far below the Minimum Competency Criteria (KKM) of 70.

The lack of digital learning media used at SD Triamarta Tabanan is one of the main reasons students struggle with the material. Until now, teaching has been dominated by conventional methods that tend to be less engaging and interactive, such as textbook-based instruction and lectures. Consequently, students are more likely to feel bored, leading to a lower level of understanding. To overcome this challenge, an innovative approach to learning that meets the needs of students is necessary, particularly through media capable of presenting abstract concepts in a concrete and engaging way .

2D animation-based learning media is designed to address this need. This type of media helps improve students' understanding by visualizing concepts dynamically and interactively (Rachmawati, 2024). The design process involves several critical stages, including the development of ideas and storyboards,

Daniel Goniansyah Libroto
*Email Address: danielganiansyah24@gmail.com

character and visual asset design, as well as the preparation of narration and supporting audio. Each stage requires careful attention to detail to ensure that the resulting media effectively delivers the material (Awalia et al., 2019).

This article focuses on the design process of 2D animation-based learning media for number lines at SD Triamarta Tabanan. The media is systematically designed, prioritizing visual elements and interactivity to capture students' attention and help them better understand the concept of number lines. By combining visual communication design theories and basic animation principles, this article aims to produce learning media that is relevant, engaging, and aligned with the needs of primary education (Wijayanti et al., 2024). Additionally, this article is expected to serve as a reference for the development of other digital learning media.

2. Research Method

This article uses a qualitative approach, focusing on the design of 2D animation-based learning media for number line material. The stages include needs analysis and media design. The research was conducted at SD Triamarta Tabanan, involving grade 3A and 3B students as subjects, who were identified as having difficulties understanding number line material based on interviews and observations. Classroom teachers were also involved as respondents to provide detailed insights into the challenges faced during the learning process (Ardiansyah et al., 2023; Nurjanah & Mukarromah, 2021).

Needs Analysis

This stage was conducted using several data collection methods. Direct classroom observations were carried out to examine the teaching methods used and students' responses to conventional learning approaches. Subsequently, interviews were conducted with the grade 3A and 3B teachers to identify the main challenges in delivering number line material, particularly concerning the limitations of using interactive learning media. Additionally, questionnaires were distributed to students to explore the level of difficulty they experienced in understanding the material and their preferences for more engaging types of learning media.

Design of Learning Media

The learning media design process was carried out in three main stages: pre-production, production, and post-production.

In the pre-production stage, the process began with developing the concept idea, titled "Basic Concepts of Number Lines," designed using a flat design visual approach to capture students' attention. A storyboard was created to illustrate the storyline, visualize material elements, and show character interactions. The visual strategy was planned by selecting bright colors to create visual appeal, sans-serif typography for easy readability, and animated characters resembling teachers to foster a sense of familiarity with students.

In the production stage, the 2D animation was developed using Adobe After Effects and Adobe Illustrator. This stage involved creating visual assets, animations, and voice narration. Dubbing was done using a female voice to deliver clear explanations, accompanied by sound effects and background music to support a conducive learning atmosphere. The video was designed in HD resolution (1280x720 pixels) to ensure high visual quality when projected in the classroom.

The post-production stage included final editing, where all visual elements, narration, and audio were combined to produce a complete animated video. The rendering process ensured the video was saved in MP4 format, compatible with the equipment available at the school. Finally, the media was tested to ensure its quality and relevance for the learning context.

The collected data was analyzed descriptively. The analysis focused on identifying the success of the media design process, the alignment of the media with students' needs, and feedback for further improvement. The outcomes of each stage were examined to ensure that the resulting learning media achieved its primary objective: presenting the number line material in an engaging, interactive, and easily understandable manner for students.

3. Result and Discussions

Concept Idea

This stage focuses on determining the concept and idea for the 2D animation learning media, which adopts the theme "Mathematics Adventure." The animation is designed in a flat design style, inspired by references from YouTube channels such as "Ylips Design" and "Kok Bisa." These references were chosen because of their engaging animations and clear, easy-to-understand delivery of educational content.

Synopsis

The next step is creating the synopsis, which summarizes the flow of the 2D animation learning media to provide a general overview of its structure and purpose. The opening scene features the logo of SD Triamarta Tabanan, followed by the appearance of the main character who greets and introduces themselves to the audience. After the introduction, the main character transitions to explaining the number line material, covering addition, subtraction, and mixed operations. For each topic, the character provides clear explanations accompanied by examples for better understanding. After the explanation of each topic, the main character presents example problems and demonstrates how to solve them. Each session includes practical examples derived from formulas related to the number line material. Once all the content is delivered, the main character concludes by thanking the audience and closing the animation with a credit scene.

Visual Strategy

The creation of 2D animation learning media relies heavily on a well-thought-out visual strategy that supports the animation. This strategy involves visualizing the design based on the previously established concept idea. The goal of the visual strategy is to attract students' interest while ensuring that the information delivered in the animation is effectively conveyed. This includes the design of characters, selection of colors, dubbing, background music, typography, and other graphic assets.

Illustrative Assets

The assets in the 2D animation include characters designed to resemble students in a classroom setting, enhancing relatability and engagement. Other assets represent classroom items such as a chalkboard, books, pencils, a megaphone, and more. The background is designed with a combination of flat design elements, emphasizing simplicity and a futuristic feel to create a visually appealing and modern learning environment.

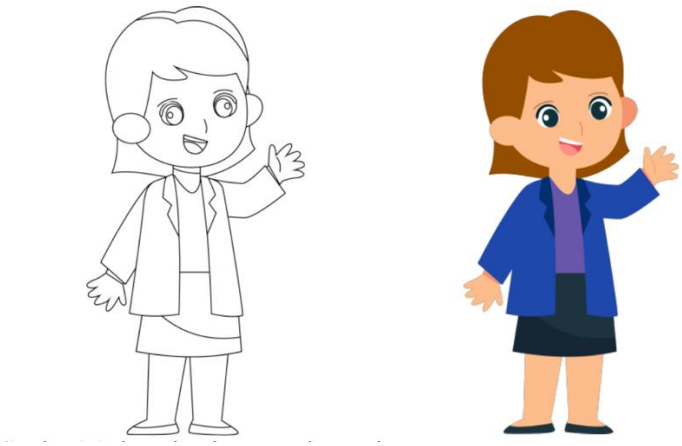

Figure 1. Character Asset

Based on figure 1, there is an asset character from the teacher who explains the subject matter.

Figure 2. Classroom Object Assets

Based on figure 2 there is an asset object from the classroom that can display the lesson material.

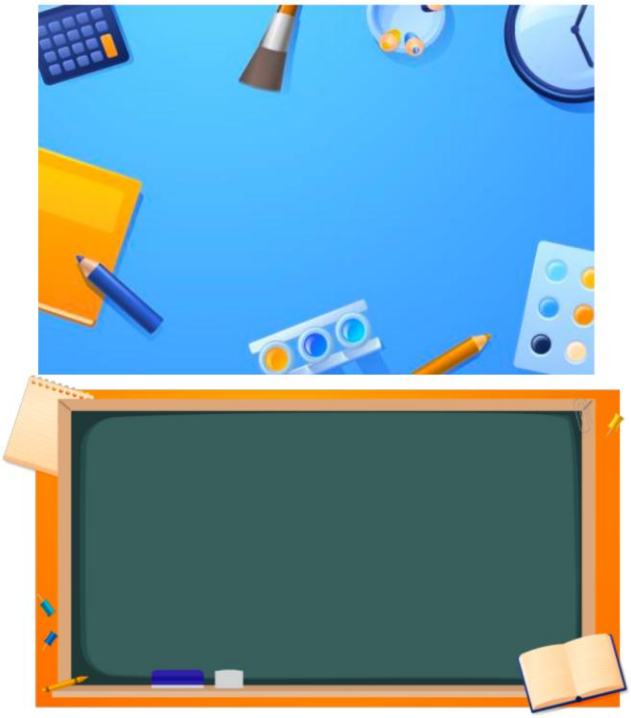

Figure 3. Background Assets

Based on figure 3, there are background assets displayed in the multimedia application for displaying subject matter.

Typography

The typography used in the 2D animation learning media incorporates sans-serif fonts to ensure clarity and readability. The font Komika Axis is applied to the title of each scene, providing a bold and engaging appearance. Meanwhile, Hey Comic is used for explanatory text, offering a friendly and approachable style that aligns with the animation's overall playful and educational tone. This combination ensures both visual appeal and ease of understanding for students.

Figure 4. Komika Axis and Hey Comic Font Assets

Audio

The audio used in this 2D animation includes sound effects, dubbing, and background music. The background music follows an arcade pixel game theme, creating a playful and energetic atmosphere that keeps students engaged. The dubbing features the voice of a young girl to portray the main character, adding relatability and warmth to the character's role. The sound effects complement the visuals by enhancing interactivity and emphasizing key moments in the animation. Together, these audio elements create an immersive and dynamic learning experience.

Color Scheme

The 2D animation learning media adopts a bright color palette to align with the "Mathematics Adventure" concept. The use of vivid and memorable tones aims to capture students' attention and create an engaging visual experience. The chosen colors are designed to evoke enthusiasm and maintain focus, ensuring the animation remains appealing and easy to follow for young learners watching the educational video.

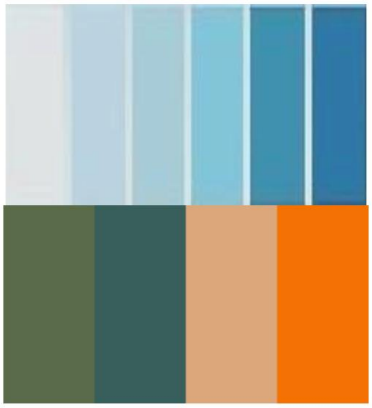

Figure 5. Color Palette

Media Visualization

The media visualization in this animation is designed to deliver number line material interactively and engagingly. Using a flat design approach that is simple yet effective, visual elements such as number lines, numbers, and mathematical symbols are dynamically animated to make it easier for students to understand the concepts. Bright colors, a friendly guide character, and supportive narration and background music work together to create an enjoyable learning environment. This design aims to enhance student engagement and help them grasp concepts visually and concretely. Below are visual representations from the 2D animation learning media on number lines.

Figure 6. Opening Scene of 2D Animation

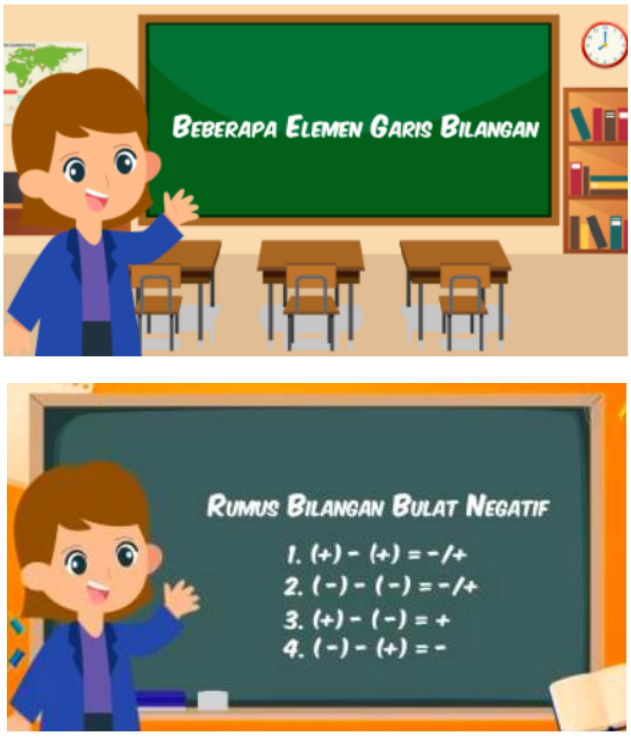

Figure 7. Learning Material Display

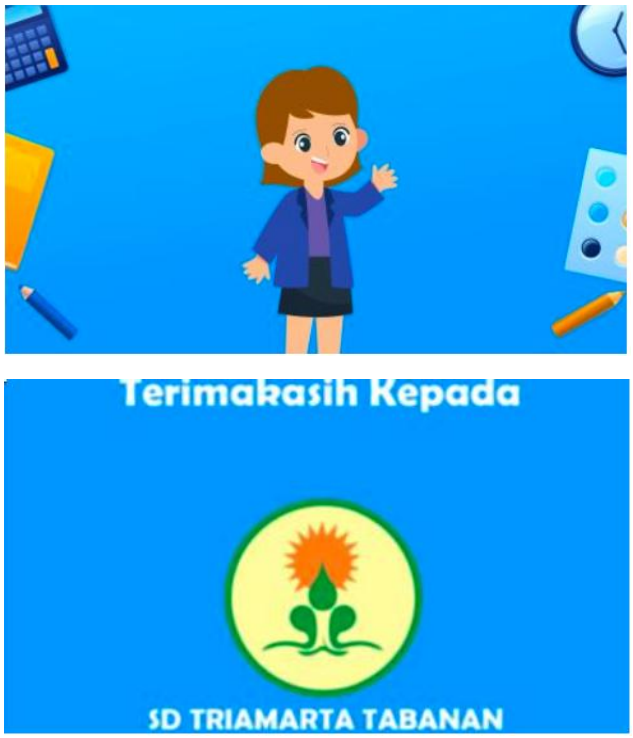

Figure 8. Closing Scene of 2D Animation

4. Conclusion

The 2D animation-based learning media for the number line material has successfully met the learning needs of grade 3 students at SD Triamarta Tabanan. By integrating engaging visual elements, clear narration, and interactive animations, this media effectively presents the number line concept in a concrete and easily understandable manner. The design process, which included needs analysis, the development of visual assets, and the creation of the 2D animation media, aligns with the characteristics of the students and the applicable curriculum. This animation media not only enhances students' understanding of the number line material but also provides a fun and motivating learning experience. The implementation results indicate that this media serves as an innovative solution to overcome the limitations of conventional teaching methods in primary schools. This success provides a solid foundation for the development of similar media in the future, with the potential to be applied to other learning materials.

References

Ardiansyah, Risnita, & Jailani, M. S. (2023). Teknik Pengumpulan Data Dan Instrumen Penelitian Ilmiah Pendidikan Pada Pendekatan Kualitatif dan Kuantitatif. *IHSAN: Jurnal Pendidikan Islam*, *1*(2), 1–9. http://ejournal.yayasanpendidikandzurriyatulquran.id/index.php/ihsan

Awalia, I., Pamungkas, A. S., & Alamsyah, T. P. (2019). Pengembangan Media Pembelajaran Animasi Powtoon pada Mata Pelajaran Matematika di Kelas IV SD. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *10*(1), 49–56. https://doi.org/10.15294/KREANO.V10I1.18534

Biassari, I., Putri, K. E., & Kholifah, S. (2021). Peningkatan Hasil Belajar Matematika pada Materi Kecepatan Menggunakan Media Video Pembelajaran Interaktif di Sekolah Dasar. *Jurnal Basicedu*, *5*(4), 2322–2329. https://doi.org/10.31004/BASICEDU.V5I4.1139

Nurjanah, N. E., & Mukarromah, T. T. (2021). Pembelajaran Berbasis Media Digital Pada Anak Usia Dini Di Era Revolusi Industri 4.0 : Studi Literatur. *Jurnal Ilmiah Potensia*, *6*(1), 66–77. https://doi.org/10.33369/jip.6.1

Nurkhafid, R. E., Sagala, A. C. D., & Prasetyo, S. A. (2024). PENGEMBANGAN MEDIA PEMBELAJARAN VIDEO ANIMASI UNTUK MENINGKATKAN KEMAMPUAN BERHITUNG SISWA KELAS II SEKOLAH DASAR. *IJES (Indonesia Journal of Elementary School)*, *4*(1), 48–57. https://doi.org/10.26877/ijes.v4i1.17962

Rachmawati, R. (2024). Pengembangan media video animasi pembelajaran pada materi garis dan sudut. *Cakrawala*, *3*(2), 77–84. https://doi.org/10.28989/CAKRAWALA.V3I3.2692

Sugitra, K., Wiarta, I. W., & Ganing, N. N. (2022). Media Pembelajaran Kartun Animasi 2D Berorientasi Kontekstual Learning pada Mata Pelajaran Matematika. *Journal for Lesson and Learning Studies*, *5*(1), 96–105. https://doi.org/10.23887/JLLS.V5I1.45491

Wijayanti, R., Waitaby, M., & Utomo, I. B. (2024). PENGEMBANGAN MEDIA PEMBELAJARAN BERBASIS ANIMASI UNTUK MENINGKATKAN MINAT BELAJAR SISWA PADA MATERI POLA BILANGAN. *Jurnal Ilmiah Matematika Realistik (JI-MR)*, *5*(1), 135–143.