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Development of a 2D Educational Animation on the Adverse Health and Mental Effects of Excessive Gaming

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Abstract

Online video games are one of the popular entertainment media among young people. However, it can increase the phenomenon of game addiction among students which has the potential to cause health and mental problems. This study aims to develop educational media in the form of 2D animated videos about the adverse health and mental effects of excessive gaming. The method used in this research is the Research and Development (R&D) approach with the Multimedia Development Life Cycle (MDLC) framework. Consisting of six stages: concept, design, material collecting, assembly, testing, and distribution. The final product is a 2–3-minute animated video published on social media platforms such as YouTube and Instagram Reels. Validation was conducted through assessments by 81 respondents (students/teenagers) as users. The results show that this 2D educational animation received an average score in the “very good” category in terms of visual appearance, narration, content, and overall appeal. Thus, the media is considered an effective and engaging digital learning tool for increasing student and youth awareness about the harmful effects of game addiction.

Keywords:

2D Animation, Gaming Addiction, Video Education, R&D, MDLC

Introduction

The development of information and communication technology today has brought about significant changes to people's lifestyles, including in the fields of entertainment and education. One of the most popular forms of entertainment among children and teenagers today is playing video games (Ndun, 2024). This phenomenon shows that video games not only serve as a form of entertainment, but have also become part of the digital lifestyle of today's children. Therefore, it is important to study the impact of intense gaming activities, especially in relation to students' physical and mental health.

However, behind its popularity, various problems have arisen related to the high level of addiction to video games. Excessive video gaming without adequate time control certainly has negative effects, both physically and mentally. (Wrzesińska et al., 2021) argue that decreased physical activity, sleep disturbances, and emotional disturbances are some of the consequences of uncontrolled gaming habits. Based on the findings of several studies, gaming time that exceeds reasonable limits (more than 3 hours per day without breaks) is associated with the risk of addiction and mental and physical health disorders (Fitrajaya et al., 2022; Waluyo & Deska, 2024).

Although video games can provide entertainment and enjoyment for many individuals, it is important to recognize that excessive use can trigger a condition known as gaming disorder (Fathi et al., 2022). The World Health Organization (WHO) has classified gaming disorder as a form of mental health disorder, demonstrating the seriousness of this issue if it is not addressed immediately (Mais et al., 2020). This gaming disorder can occur when

a person loses the ability to control their gaming habits, thereby disrupting their daily activities, whether in the context of education, work, or social relationships.

To overcome this problem, an educational approach through interactive visual media is one effective solution. One such approach is the use of 2D animation-based educational videos. This medium has advantages in terms of visual appeal, simplicity of delivery, and effectiveness in explaining concepts interactively (Kurniansyah et al., 2023; Maharani et al., 2024). Digital platforms such as YouTube and Instagram, which are familiar to students, can also be used to distribute educational content more widely and easily (Tinambunan & Siahaan, 2022)(Yulistian et al., 2023)(A. D. Sari, 2021). Based on existing references, the use of animation as an educational medium has been proven to improve students' understanding and awareness of important issues, including digital health.

This study aims to develop educational videos in the form of 2D animated videos that convey information about the adverse effects of excessive gaming on students' health and mental health. These educational videos will be developed systematically using the Multimedia Development Life Cycle (MDLC) model, from the conceptualization stage to the distribution stage, to ensure that the production process is structured and optimal. The benefits of this research include serving as a preventive measure to raise students' awareness of the importance of managing gaming time in a healthy manner, while also providing an innovative, engaging, and easily accessible alternative learning medium in the context of current digital learning.

Literature Review

Research on the negative effects of gaming has been conducted by (Waluyo & Deska, 2024), who found that gaming addiction can cause physical complaints such as pain in the neck, back, and shoulders, especially in children who play games for long periods without rest. (Fitrajaya et al., 2022) added that continuous screen exposure also causes eye irritation and decreased cognitive function due to lack of physical activity. From a mental perspective, (Kibtyah et al., 2023) examined that gaming addiction in adolescents causes learning focus disorders and anxiety when they cannot play, which impacts academic achievement. (Marta et al., 2022) also showed that games can cause stress due to the competitive pressure involved, and reduce students' social skills.

According to (Ulya et al., 2021), education plays an important role in overcoming the negative impacts of excessive gaming. Parents and educators play a crucial role in providing an understanding of the dangers of uncontrolled gaming and in supervising students' use of digital devices. This supervision aims to help students stay focused on their studies, preventing them from being distracted by gaming activities that could potentially hinder their academic performance.

Furthermore, social media is considered an effective means of conveying educational information. (Tinambunan & Siahaan, 2022) state that social media has become a platform widely used by the public, including students, due to its ability to disseminate information quickly and widely. One of the most popular social media platforms among students is YouTube. (Yulistian et al., 2023) revealed that YouTube can be used as a learning medium because it allows material to be delivered in the form of videos that are easily accessible and understandable.

In addition to YouTube, Instagram is also a social media platform that is very popular among young people today. (Laily et al., 2022) explains that with devices such as smartphones, computers, and laptops, students can access Instagram anytime. This platform has various features such as Direct Message, Story, Reels, Live, and others. (Syahrul et al., 2024), which can be utilized in the context of education. (A. D. Sari, 2021) adds that Instagram Reels, which allows users to create videos with music, effects, makeup, speed, and customizable transitions, has great potential as a creative, innovative, and effective learning medium.

In terms of educational solutions, (Wahyuni et al., 2021) designed 2D animations as a learning medium for educational themes, and it was proven that animations provide a fun and easy-to-understand learning experience. (Sakinah et al., 2024) and (Amri, 2023) argue that YouTube is an effective visual learning tool because it allows students to learn through educational videos. Meanwhile, (A. W. Sari et al., 2021) shows that Instagram Reels

features can be used as a communicative learning medium, with attractive visuals and music that are easily accessible.

Furthermore, research (Putri, 2024) recommends non-digital activities as an alternative to excessive gaming, such as sports and direct social interaction. These activities are believed to improve physical fitness and reduce mental stress caused by excessive digital exposure. Research (Hijriyani & Aswan, 2024) also emphasizes the importance of digital education by teachers in shaping healthy learning habits amid the massive influx of digital technology.

Unlike previous studies that focused solely on educational aspects or the impact of gaming separately, this study combines a visual multimedia approach (2D animation) with content distribution strategies through social media (YouTube and Instagram Reels) to educate about the negative effects of excessive gaming. The novelty of this study lies in the application of the Multimedia Development Life Cycle (MDLC) model in the production of educational videos specifically developed for students and teenagers, featuring content based on everyday narratives and visually accessible solutions. This study also offers an innovative digital learning medium that is not only informative but also preventive in fostering healthy digital behaviour among students.

Research Methods

This research method uses the Research and Development (RnD) method, followed by the Multimedia Development Life Cycle (MDLC) model, which has six stages: Concept, Design, Material Collecting, Assembly, Testing, and Distribution. This method is used to help implement 2D animation on social media.

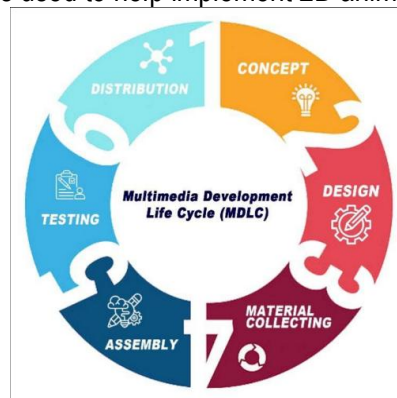


Figure 1. Stages of MDLC Development

1. Concept

At this stage, researchers conducted preliminary research through literature reviews and basic observations related to the problems faced by students/adolescents regarding gaming habits. Through the results of observations and existing references, it was found that students/adolescents experienced a decline in focus in learning, physical fatigue, and disturbances in social interaction due to excessive involvement in gaming. Therefore, the researchers developed an educational solution in the form of a 2D educational animation on the adverse health and mental effects of excessive gaming.

The purpose of creating this media is to convey information to students/teenagers in an interesting and easy-to-understand manner, using visual and narrative approaches that are appropriate for their stage of development. To ensure that this media is created to truly meet the needs of users, an analysis was conducted on the necessary functionality, namely the main features that must be included for the media to function efficiently.


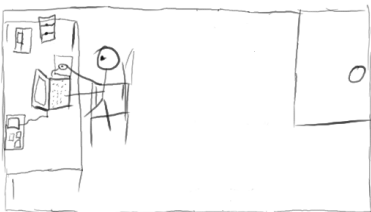


The results of the analysis of functional requirements at this conceptual stage are the delivery of clear and targeted educational messages, visualization of characters and stories that are relevant to the lives of teenagers, a concise and coherent storyline such as introduction – conflict – solution – moral message, utilization of audio-visual elements, effective and engaging duration, and a flexible distribution format.




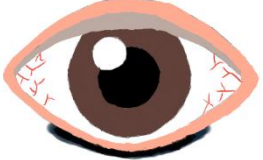

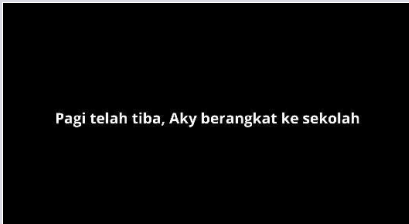
By defining these needs, the concept stage builds a strong foundation for the steps involved in designing learning media, while ensuring that the animations created are truly appropriate, interesting, and useful for students and teenagers as the main audience.

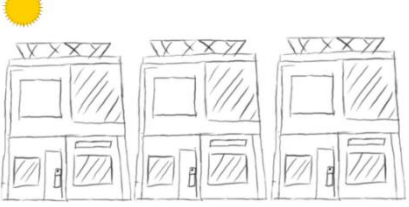
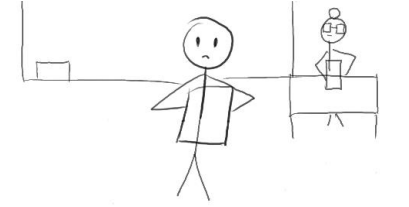
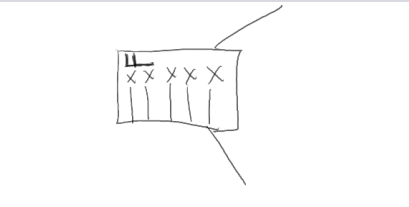

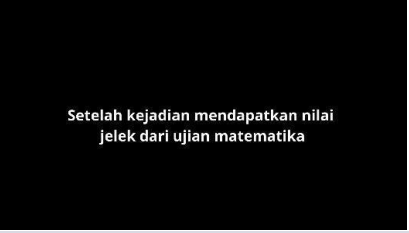
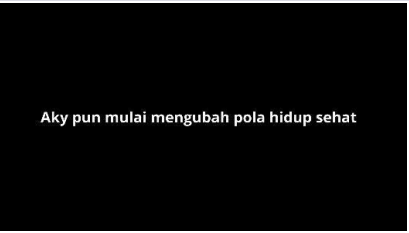

2. Design




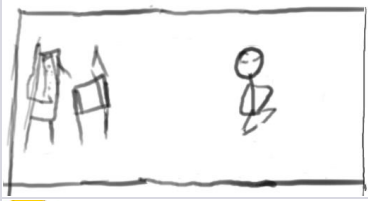



At this stage, researchers design storyboards in accordance with the concept stage to determine the visual representation of the storyline, characters, duration, and dialogue. Since 2D animation requires a well-structured story that can convey the message and content in accordance with the storyboard that has been produced, researchers use Storyboarder to create storyboards.


Table 1. Storyboard: The Negative Effects of Excessive Gaming on Health and Mental Well-being

Scene	Illustration	Description	Sequence	Duration
1	<i>dampak buruk bermain game terlalu lama bagi kesehatan dan mental</i>	The title appears and then slowly disappears. (Medium Shot)	1	5 second
2		From the view outside the house, the camera slowly zooms to the window to enter the main character's room named Aky. (Close Shot)	2	5 second
3		From inside the room, we can see Aky who is playing games. (Medium Shot)	3	10 second
3		Aky plays the game for hours, with the wall clock showing the time moving fast. (Medium Shot)	4	15 second
4		At noon, Aky's friends Shin and Rayon came to Aky's house to invite Aky to play football together. (Wide Shot) Script: Shin: "Aky, let's play soccer" Shin: "Aky oh Aky" Shin: "Aky"	5	10 second

5		Aky scolded his friends because Aky was playing a game and was disturbed by the sound of his friend's call from the front of the house. (Medium Shot) Script: Aky: "Why are you yelling, you know I'm playing a game, you're disturbing me?" Shin: "Let's play soccer Aky" Aky: "I don't want to, I want to play a more exciting game, leave you guys I want to continue playing the game first, whus whus"	6	15 second
6		After Aky chased his friends away, Aky continued playing the game until the evening. (Medium Shot)	7	15 second
7		Time has passed into the night, the moon is slowly rising. (Wide Shot)	8	18 second
8		Aky has physical effects of eye fatigue from playing games for too long. (Close Up)	9	5 second
9		Aky has the mental impact of sleep disorders because his brain keeps thinking about games. (Medium Shot)	10	10 second
10	 <p>Pagi telah tiba, Aky berangkat ke sekolah</p>	The words "morning has come, I'm off to school" appear and then slowly disappear. (Medium Shot)	11	3 second

11		The next day, the sun rises. (Wide Shot)	12	8 second
12		Aky experienced the mental impact of a decline in academic performance, due to too much gaming. (Medium Shot)	13	10 second
12		Aky's low-scoring zoom camera. (Close Shot)	14	3 second
12		Aky's character experiences the mental impact of stress and anxiety. (Medium Shot)	15	8 second
13		The words "After the incident of getting a bad grade from the math exam" appear and then slowly disappear. (Medium Shot)	16	3 second
14		The words "Aky began to change his healthy lifestyle" appear and then slowly disappear. (Medium Shot)	17	3 second
15		The next day, the sun rises. (Wide Shot)	18	10 second

16		Aky found a solution by using a timer to limit gaming time with the wall clock spinning very fast. (Medium Shot)	19	5 second
16		After the timer rings, the character does not play the game and starts to stretch. (Medium Shot)	20	10 second
17		The next day, the sun rises. (Wide Shot)	21	5 second
18		Aky found a solution by managing stress by doing breathing exercises and meditation in his room. (Medium Shot)	22	5 second
19		Aky's friends call Aky again because his friends want to invite Aky to play football. (Wide Shot) Script: Shin: "Aky, let's play soccer"	23	5 second
20		Aky found a solution by playing with his friends instead of playing games alone. (Medium shot)	24	8 second
21		The words "Aky's life is getting healthier and Aky's grades are getting better" appear and then slowly disappear. (Medium Shot)	25	3 second

22		Above Aky's head appeared the words "Thank you for watching. don't get addicted to playing games, remember to stay healthy" then slowly disappeared. (Medium Shot)	26	15 second
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3. Material Collecting

At this stage, researchers collect materials according to the storyboard that has been created. The collection of materials includes characters, backgrounds, objects, dubbing, sound effects, and others. The author uses the Krita application to draw the materials and the Camtasia application for dubbing.



Figure 2. The character Aky

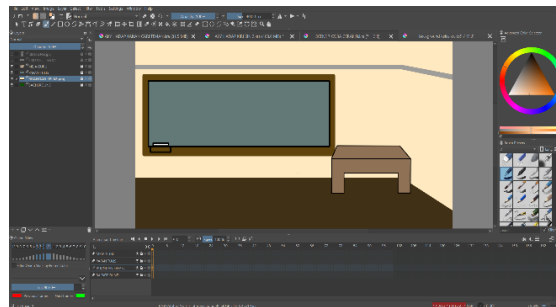


Figure 3. Class Background

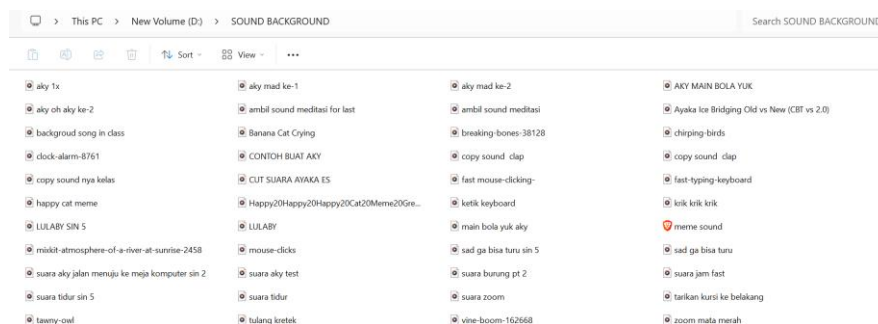


Figure 4. Voice recording and sound effects

4. Assembly

At this stage, all materials from the Material Collection stage will be combined into a 2D animated video based on the storyboard that has been created. This material combination process uses Adobe Premiere Pro 2020, Adobe After Effects 2020, and Krita. Adobe Premiere Pro 2020 serves as the application that combines all the dubbing and sound effects with the 2D animation created in Krita. Meanwhile, Adobe After Effects 2020 is used to add various effects to the 2D animated video.

5. Testing

At this stage, the researcher ensures that the storyboard and 2D animated video that have been created are the same. In other words, all image sequences and durations in the planned storyboard are the same as the designed results. When everything is complete, the researcher will perform rendering so that it can be played in MP4 format. To ensure the quality of the 2D animated video is clear, the researcher renders the video at a resolution of 1080p at 30fps. After the 2D animated video is rendered, the researcher carefully reviews the video to check for any errors or shortcomings. Upon identifying any shortcomings in the 2D animated video, the researcher immediately revises them before the 2D animated video is published.

6. Distribution

After the revised testing phase is ready for viewing, the 2D Educational Animation On The Adverse Health And Mental Effects Of Excessive Gaming will be distributed on social media platforms such as YouTube and Instagram Reels. Here is the link to the animated video on YouTube: <https://youtu.be/VU1jaEWHXT8?si=serd0-0KXR8IryaT>

And the animated video link that can be accessed via Instagram Reels: <https://www.instagram.com/reel/DE3qMcbv4JmQXscwcY1xPB4liKeMXgrXMxiWks0/?igsh=MTdoN242NTY2OXNm>

Results and Discussion

At the final stage of the Development of a 2D Educational Animation on the Adverse Health and Mental Effects of Excessive Gaming will be explained as follows:



Figure 5. Title Opening

In the first scene, the title of the 2D animated video appears. Then, using the Fade-out effect, the title slowly disappears and moves on to the next scene.

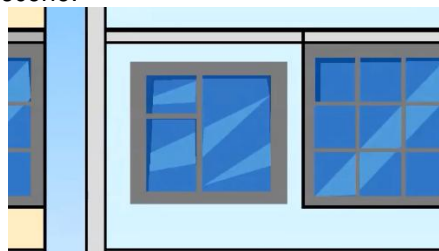


Figure 6. Main character's room

In the second scene, from outside the main character's house, the camera will zoom in on the window to transition into the next scene.



Figure 7. Aky wants to play a game

In the third scene, the main character named Aky is walking toward his desk and chair to play a games. Aky plays the game for hours, with the clock on the wall showing the time passing quickly he experiences pain in his neck and back, resulting in poor posture.



Figure 8. Shin shout out to Aky

In the fourth scene, Aky's friends Shin and Rayon come to Aky's house to invite him to play soccer together in the afternoon. Shin tries to call out to Aky in front of his house several times, but there is no response from Aky.

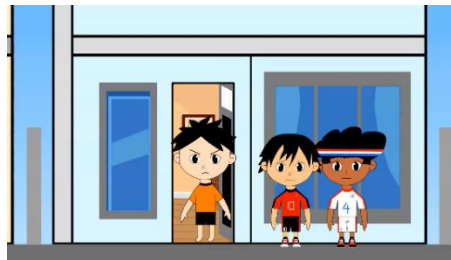


Figure 9. Aky leaves the house with an angry expression.

In the fifth scene, a few hours after Shin shouted for Aky, Aky finally opened the door and immediately scolded his friends because he was annoyed by their shouting, especially since he was in the middle of playing a game. This shows that Aky doesn't want to interact socially with his friends.



Figure 10. Aky playing a game

In the sixth scene, after Aky kicks out his two friends, he continues playing the game and ignores the discomfort he is experiencing. The clock on the wall is also spinning rapidly, indicating that Aky is becoming addicted to the game.



Figure 11. Night has fallen

In the seventh scene, time has passed and it is now nighttime, with the moon slowly rising. And Aky neighborhood is quiet.



Figure 12. Red eyes and dark circles under the eyes

In the eighth scene, Aky experiences physical problems: his eyes are red and his eye bags are very dark because he has been playing game for too long due to his addiction.

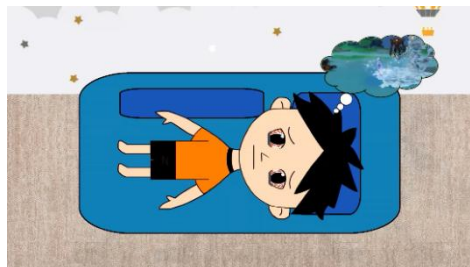


Figure 13. Aky is addicted to game

In scene nine, Aky experiences mental distress in the form of insomnia, as he continues to think about the game to the point that he cannot sleep well in his bed.

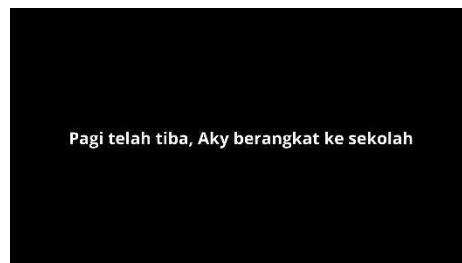


Figure 14. In the morning, Aky leaves for school

In the tenth scene, this shows the transition that Aky has gone to school in the morning.



Figure 15. in the morning

In the eleventh scene, the atmosphere of Aky's neighborhood on a bright morning is filled with birds flying around.

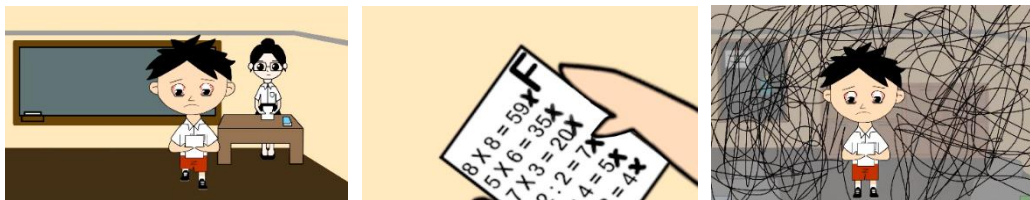


Figure 16. Aky's education declines

In the twelfth scene, Aky receives a very low math test score because he spends too much time playing game. Here, we can see that Aky is experiencing mental effects, namely a decline in academic performance, causing him to feel stressed and anxious about his low test score.

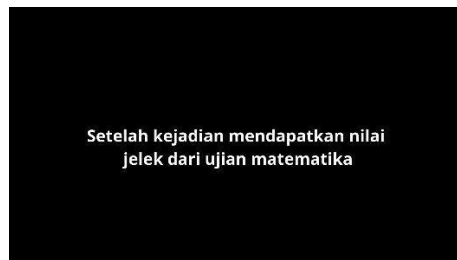


Figure 17. After Aky's education declined

In the thirteenth scene, there is a transition showing that after Aky's incident at school.

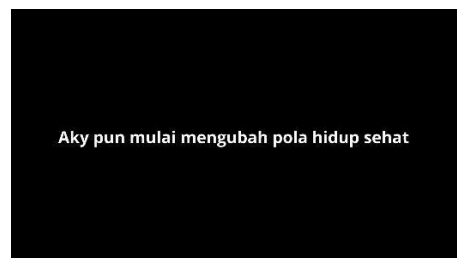


Figure 18. Aky begins to change himself

In the fourteenth scene, we see a transition where Aky begins to change his lifestyle to a healthier one after all the events he has experienced.



Figure 19. Sunrise

In the fifteenth scene, where the transition of the sun rising indicates that the day has changed.



Figure 20. Aky playing games and stretching

In scene sixteen, in the morning, Aky plays game as usual, but this time Aky manages to find a solution by using a timer to limit his gaming time. When the timer rings, Aky stops playing and starts stretching his body to maintain good posture while gaming.



Figure 21. Sunrise

In the seventeenth scene, where the transition of the sun rising indicates that the day has changed.



Figure 22. Aky meditating

In the eighteenth scene, Aky finds a solution, which is to manage stress by doing reathing exercises and meditation in his room. This is so that Aky's mental state remains stable.



Figure 23. Shin shout out to Aky

In the nineteenth scene, during the day, Shin and Rayon come to Aky's house and shout for Aky again to invite him to play soccer.



Figure 24. Aky playing soccer

In the twentieth scene, Aky plays soccer with his friends instead of playing game by himself. This shows that Aky is beginning to want to interact socially with his friends.



Figure 25. Aky successfully changed his lifestyle

In scene twenty-one, it shows that after Aky begins to find solutions to all the events he has experienced, he is finally able to become a better person.



Figure 26. Aky is happy

In scene twenty-two, and finally, Aky succeeds in becoming someone who is no longer addicted to gaming.

After the 2D animated educational video was distributed, a questionnaire was given via Google Forms to 81 respondents aged 15–18 years namely students and teenagers in Bengkalis, Riau to evaluate its effectiveness as an educational medium on the dangers of excessive gaming.

Table 2. Results of the Assessment of 2D Animation Video Quality by Respondents

Indicator	Average Score	Category
Visual design of animation	4.30	Very Good
Audio quality and narration	4.20	Very Good
Clarity of information and content	4.15	Good
Content flow structure	4.25	Very Good
Overall appeal	4.28	Very Good
Color, text, and image compatibility	4.35	Very Good
Accuracy of information	4.32	Very Good
Ease of understanding the flow	4.26	Very Good

Based on the table above, Using a Likert scale and eight evaluation indicators, results showed that the video received “Very Good” scores in most categories. Average ratings ranged from 4.15 to 4.35, with the highest score in color, text, and image compatibility (4.35). This suggests that the video is highly suitable and effective as a digital learning tool for students and teenagers.

Conclusions

This study successfully created and developed educational media in the form of 2D animated videos that discuss the negative effects of excessive gaming on health and mental well-being. The development process followed the MDLC stages systematically up to the distribution stage through digital platforms. Based on a pilot study involving 81 students and teenagers, the video received very positive ratings across various aspects, such as visual presentation, narrative, and content. These results demonstrate that 2D animation is effective as an engaging digital learning medium and can enhance audience understanding and awareness of the risks of gaming addiction.

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