

# 2D Motion Graphics via Cartoon Style on "The Dangers of Blue Light"

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## ABSTRACT

Abstract— This research aims 1) to create 2D motion graphics via cartoon style on "The Dangers of Blue Light." 2) to evaluate the quality of 2D motion graphics via cartoon style on "The Dangers of Blue Light" by experts. 3) to assess the knowledge and understanding before and after watching the 2D motion graphics via cartoon style on "The Dangers of Blue Light" 4) to assess the satisfaction towards the 2D motion graphics via cartoon style on "The Dangers of Blue Light" among the sample group. The sample group consists of 100 students from the 1st grade of Satri Si Suriyothai School in the academic year 2021, selected through simple random sampling. The quality evaluation by experts found that the 2D motion graphics via cartoon style on "The Dangers of Blue Light" has a very good quality with an average score of 4.37 and a standard deviation of 0.55. The assessment of knowledge and understanding before and after watching the media showed statistically significant differences with a significance level of 0.01, indicating that the sample group's knowledge of blue light dangers increased after watching the media. The evaluation of satisfaction among the sample group showed that the satisfaction level was the highest, with an average score of 4.56 and a standard deviation of 0.52. The 2D motion graphics via cartoon style on the topic of the dangers of blue light can help improve the understanding of the effects of blue light.

## CCS CONCEPTS

• **Applied computing** → Computer-assisted instruction.

## KEYWORDS

motion graphics, 2D cartoon, blue light

### ACM Reference Format:

Chanin Tungpantong, Charit Bonnkajai, and Tinnapat Tharasirameth. 2023. 2D Motion Graphics via Cartoon Style on "The Dangers of Blue Light". In *The 7th International Conference on Education and Multimedia Technology*

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ICEMT 2023, August 29–31, 2023, Tokyo, Japan  
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ACM ISBN 979-8-4007-0914-2/23/08.  
<https://doi.org/10.1145/3625704.3625761>

(ICEMT 2023), August 29–31, 2023, Tokyo, Japan. ACM, New York, NY, USA, 7 pages. <https://doi.org/10.1145/3625704.3625761>

## 1 INTRODUCTION

Currently, accessing the internet is easy and has wide network coverage. Including the need to use the Internet more. Various daily life services can be done online. While the impact of COVID-19 is also another factor that stimulates people to choose to do more activities online, instead of traveling or avoiding meeting people, especially in public places. As well as learning and working that are affected by COVID-19, which increases the use of the internet on a regular day. Gen Z and Gen Y, who are in school, have the highest average number of hours of internet use per day, at 12 hours and 43 minutes [1], while working age groups use the internet less per day than school age groups. This is partly due to the COVID-19 situation that has measures to close educational institutions to conduct online learning and most workplaces have work-from-home policies. This makes many people change their learning and working styles to be more online, which requires using digital devices for a long time. The impact of blue light emitted from digital devices is dangerous for the body, and most people are not aware of it.

The direct impact of blue light affects the eyes because it is visible light. It can penetrate through the eye lens and cornea to reach the retina. Prolonged exposure to blue light can lead to initial symptoms such as eye fatigue, eye pain, eye irritation, eye redness, excessive tearing, blurred vision, difficulty sleeping, and waking up with discomfort. These symptoms are often overlooked by most people as they are not severe. However, continuous and prolonged exposure to blue light can penetrate through various eye structures, including the cornea, eye lens, and reach the deep structures, especially the retina, which is essential for vision. This can result in a Blue Light Hazard and lead to the development of various ocular neuropathies that can cause visual impairment [2]. The current situation, especially among adolescents, particularly early high school students who heavily rely on the internet and digital devices for work, has increased the demand for visual tasks and significantly increased eye strain. This has led to an increase in eye-related conditions among children.

In today's society, school-age children are drawn to short and fast-paced video content, which competes with their busy lives and active minds [3]. This aligns well with the popular use of motion graphics in presenting content, as motion graphics can captivate and engage the target audience more effectively through vibrant and lively visual graphics. It provides a dynamic and immersive

experience by incorporating moving visuals, colorful imagery, musical sounds, and various elements that make it enjoyable, engaging, and less boring. Motion graphics also enhance storytelling and facilitate clear and concise communication, allowing the creators to choose the "motion graphics" format for their media.

Based on the abovementioned background and significance, the researchers have developed a 2D cartoon motion graphics titled "Danger from Blue Light" to help viewers understand the dangers of blue light that should not be overlooked. It aims to raise awareness about the potential health risks and optical effects associated with prolonged exposure to digital devices. Furthermore, it provides simple ways to protect one's eyes from these hazards.

## 2 OBJECTIVES

- To create 2D motion graphics via cartoon style on "The Dangers of Blue Light."
- To evaluate the quality of 2D motion graphics via cartoon style on "The Dangers of Blue Light" by experts.
- To assess the knowledge and understanding before and after watching the 2D motion graphics via cartoon style on "The Dangers of Blue Light"
- To assess the satisfaction towards the 2D motion graphics via cartoon style on "The Dangers of Blue Light" among the sample group.

## 3 METHODOLOGY

### 3.1 Population and Sample

- 1. Population

The population is 319 first-year high school students from Satri Si Suriyothai School, for the academic year 2021.

### 4 SAMPLE

The sample comprised of 100 first-year high school students will be selected from Satri Si Suriyothai School, for the academic year 2021, using a simple random sampling method.

#### 4.1 Research Instruments

1. 2D motion graphics via cartoon style on "The Dangers of Blue Light."
2. Expert evaluation form for the quality of 2D motion graphics via cartoon style on "The Dangers of Blue Light."
3. Pre-viewing and post-viewing assessment form for the knowledge and understanding of 2D motion graphics via cartoon style on "The Dangers of Blue Light."
4. Sample group satisfaction evaluation form for 2D motion graphics via cartoon style on "The Dangers of Blue Light."

#### 4.2 Development of 2D motion graphics

The process of creating motion utilizes the principles of the 3P framework [4][?] , which include:

- 1. Pre-production

This step involves the development of a clear concept for graphic motion, which includes gathering information, defining the concept, identifying the core message to be communicated, writing detailed scripts for each scene, and storyboarding the narrative.



Figure 1: Shows the characters sketch.

- 2. Production

This step involves defining the visual style, color palette, typography, and overall design elements. This helps create a cohesive and visually appealing look for the motion graphics, as well as creating illustrations, graphics, characters, and backgrounds. It also includes creating 2D cartoons, and finally, animation, the static assets are brought to life through animation by defining keyframes, transitions, timing, and movement to create dynamic and engaging motion sequences.

- 3. Post-production

This step involves enhancing and adding other elements to make the graphic motion more attractive. This includes incorporating voiceovers, music, and sound effects to enhance the visuals and create a better learning atmosphere. Once the animation and effects are complete, the various components are integrated and edited together, including time adjustments, sequencing, and fine-tuning the overall presentation. The final step is exporting the graphic motion in the desired format, making it suitable for online platforms and social media presentations.

## 5 RESULT

### 5.1 Results of creating 2D motion graphics via cartoon style on "The Dangers of Blue Light."

In the study conducted to create 2D motion graphics via cartoon style on "The Dangers of Blue Light", researchers have utilized presentation formats and techniques that enable viewers to better understand the content. The content includes origin of blue light, its dangers and the diseases it can cause, as well as ways to protect oneself from it. The researchers developed the motion graphic using 2D cartoon graphics, and disseminated it through YouTube and social media platforms, thereby enhancing the accessibility of the media to the intended audience.

### 5.2 Results of evaluating the quality of 2D motion graphics via cartoon style on "The Dangers of Blue Light" by experts.

From Table 1, it was found that the quality of content evaluation for 2D motion graphics via cartoon style on "The Dangers of Blue Light" was good quality, with an average score of 4.40 and standard deviation of 0.51. The topic that has a very good quality rating is

**Table 1: Evaluation of the quality of 2d motion graphics via cartoon style on "The Dangers of Blue Light" in the content aspect**

Item	Mean	S.D.	Quality level*
<b>Content</b>			
1. The content is in line with the objectives of creating motion graphics media.	4.67	0.58	Very good
2. The content is appropriate for the target audience of the motion graphics.	4.33	0.58	Good
3. The ability to narrate a story can clearly explain the content.	4.33	0.58	Good
4. Presenting content using motion graphics helps to attract the interest of the target audience.	4.33	0.58	Good
5. The narrative is interesting and worth following.	4.33	0.58	Good
<b>Total Average</b>	<b>4.40</b>	<b>0.51</b>	<b>Good</b>

\* Legend: 4.50-5.00 = Very good; 3.50-4.49 = Good; 2.50-3.49 = Acceptable; 1.51-2.49 = Poor; 1.00-1.50 = Very poor

**Table 2: Evaluation of the quality of 2d motion graphics via cartoon style on "The Dangers of Blue Light" in graphics and visual elements**

Item	Mean	S.D.	Quality level*
<b>Graphics and visual elements</b>			
6. Characters are intriguing and encouraging follow-through.	4.00	0.00	Good
7. Sequencing of events creates interest for the target audience.	4.33	0.58	Good
8. Appropriate graphics are used to enhance the story for the target audience.	4.33	0.58	Good
9. Scene design is suitable for the target audience.	4.67	0.58	Very good
10. Placement of visual elements is appropriate for content presentation.	4.00	0.00	Good
11. Selection of color tones in graphic design is appropriate for the target audience.	4.33	0.58	Good
<b>Total Average</b>	<b>4.28</b>	<b>0.46</b>	<b>Good</b>

\* Legend: 4.50-5.00 = Very good; 3.50-4.49 = Good; 2.50-3.49 = Acceptable; 1.51-2.49 = Poor; 1.00-1.50 = Very poor

**Table 3: Evaluation of the quality of 2d motion graphics via cartoon style on "The Dangers of Blue Light" in motion graphic**

Item	Mean	S.D.	Quality level*
<b>Motion graphic</b>			
12. The storytelling of motion graphics media is continuous.	4.67	0.58	Very good
13. Sequencing images makes content easier to understand.	4.33	0.58	Good
14. Images and sounds are related and consistent.	4.67	0.58	Very good
15. Clear and well-produced voiceover encourages engagement.	4.67	0.58	Very good
16. Graphic media has high resolution and is suitable for online distribution.	4.67	0.58	Very good
17. The length of graphic media is appropriate for the content.	4.33	0.58	Good
18. The length of graphic media is appropriate for the target audience.	4.67	0.58	Very good
19. Distributing media via YouTube allows easy access.	5.00	0.00	Very good
20. The format of media is suitable for distribution via YouTube.	4.67	0.58	Very good
<b>Total Average</b>	<b>4.63</b>	<b>0.49</b>	<b>Very good</b>

\* Legend: 4.50-5.00 = Very good; 3.50-4.49 = Good; 2.50-3.49 = Acceptable; 1.51-2.49 = Poor; 1.00-1.50 = Very poor

"The content is in line with the objectives of creating motion graphics media," with an average score of 4.67 and a standard deviation of 0.58. Other topics are of good quality with an average score of 4.33 and a standard deviation of 0.51.

From Table 2, it was found that the quality of graphics and visual elements evaluation for 2D motion graphics via cartoon style on "The Dangers of Blue Light" was good quality, with an average score of 4.28 and standard deviation of 0.46. The topic that has a very good

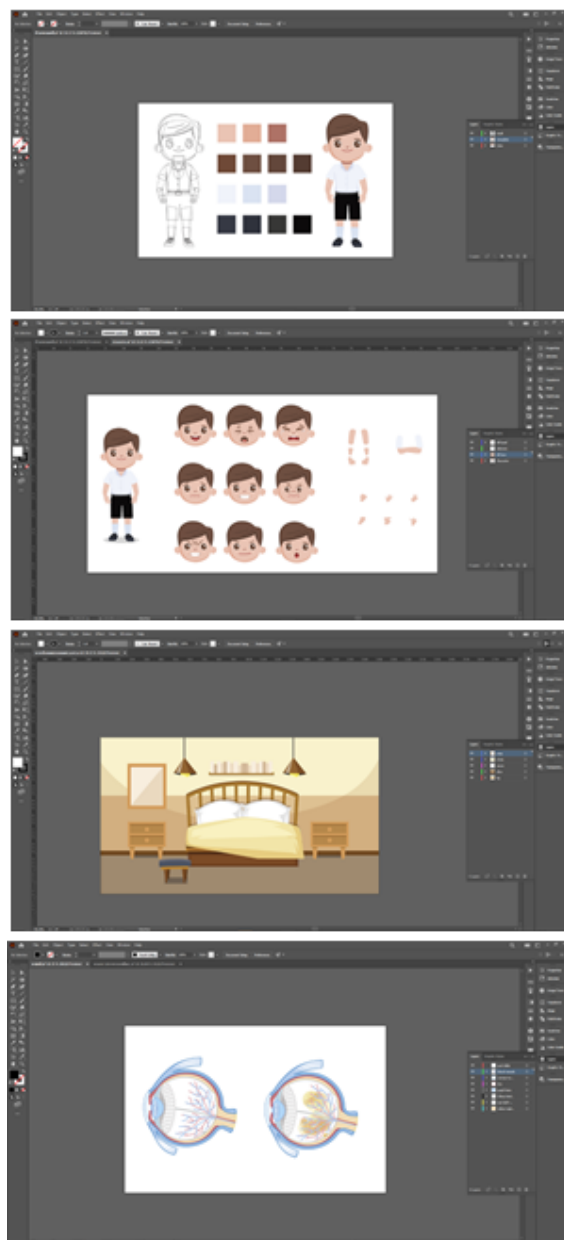


Figure 2: Shows the digital drawing of the characters and the scenes.

quality rating is "Scene design is suitable for the target audience," with an average score of 4.67 and a standard deviation of 0.58. Other topics that were of high quality include two topics with an average score of 4.00 and a standard deviation of 0, which were "Characters are intriguing and encouraging follow-through" and "Placement of visual elements is appropriate for content presentation". The remaining topics have an average score of 4.33 and a standard deviation of 0.51.

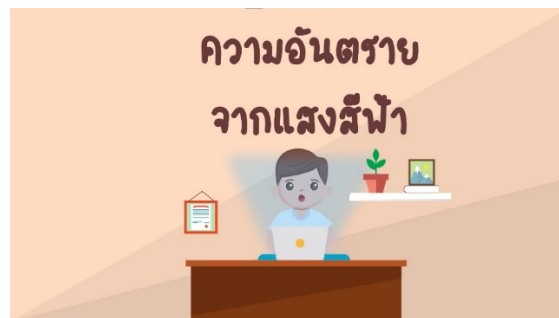


Figure 3: Shows the start page of motion graphics media.



Figure 4: Shows the sources of blue light.

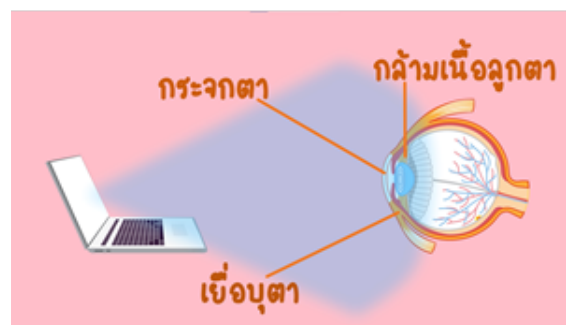


Figure 5: Explains the effects of blue light on the eyes.



Figure 6: Shows one of the blue light protection methods.

**Table 4: Evaluation of the quality of 2d motion graphics via cartoon style on "The Dangers of Blue Light" in knowledge achieved**

Item	Mean	S.D.	Quality level*
<b>Knowledge achieved</b>			
21. Motion graphic helps the target group learn about the origin of blue light.	4.00	1.00	Good
22. Motion graphic helps the target group learn about the hazards of blue light.	4.67	0.58	Very good
23. Motion graphic helps the target group learn about protection against blue light.	4.00	0.00	Good
24. After viewing the motion graphic media, the target group is able to understand the dangers of blue light.	4.00	1.00	Good
<b>Total Average</b>	<b>4.17</b>	<b>0.72</b>	<b>Good</b>

\* Legend: 4.50-5.00 = Very good; 3.50-4.49 = Good; 2.50-3.49 = Acceptable; 1.51-2.49 = Poor; 1.00-1.50 = Very poor

**Table 5: Evaluation of the quality of 2d motion graphics via cartoon style on "The Dangers of Blue Light" by experts**

Item	Mean	S.D.	Quality level*
1. Content	4.40	0.51	Good
2. Graphics and visual elements	4.28	0.46	Good
3. Motion graphic	4.63	0.49	Very good
4. Knowledge achieved	4.17	0.72	Good
<b>Total Average</b>	<b>4.42</b>	<b>0.55</b>	<b>Good</b>

\* Legend: 4.50-5.00 = Very good; 3.50-4.49 = Good; 2.50-3.49 = Acceptable; 1.51-2.49 = Poor; 1.00-1.50 = Very poor

From Table 3, it was found that the quality of motion graphic evaluation for 2D motion graphics via cartoon style on "The Dangers of Blue Light" was very good quality, with an average score of 4.63 and standard deviation of 0.49. Most of the topics were of very good quality with an average of 4.67 and a standard deviation of 0.58. The topic of "Distributing media via YouTube allows easy access" with an average rating of 5.00. All experts agreed on this point. Additionally, there are two topics that are rated deemed to be of good quality, namely the topic of "Sequencing images makes content easier to understand" and the topic of "The length of graphic media is appropriate for the content" with an average score of 4.33 and a standard deviation of 0.58.

From Table 4, it was found that the quality of knowledge achieved evaluation for 2D motion graphics via cartoon style on "The Dangers of Blue Light" was good quality, with an average score of 4.17 and standard deviation of 0.72. The topic that has a very good quality rating is "Motion graphic helps the target group learn about the hazards of blue light," with an average score of 4.67 and a standard deviation of 0.58. Other topics are of good quality with an average score of 4.00.

From Table 5, the quality of 2d motion graphics via cartoon style on "The Dangers of Blue Light" showed that the expert evaluation was of good quality with an average score of 4.42 and a standard deviation of 0.55. The aspect that the experts considered to be of very good quality was "Motion graphic," with an average score of 4.63 and a standard deviation of 0.49. The remaining aspects were evaluated as being of good quality, including content with an average score of 4.40 and a standard deviation of 0.51, graphics

and visual elements with an average score of 4.28 and a standard deviation of 0.46, and knowledge achieved with an average score of 4.17 and a standard deviation of 0.72.

### 5.3 Results of assessment of the knowledge and understanding before and after watching the 2D motion graphics via cartoon style on "The Dangers of Blue Light."

From Table 6, the pre-test score has an average of 3.53 with a standard deviation of 0.37, while the post-test score has an average of 5.00 with a standard deviation of 0.00. A t-test was conducted to determine the statistical significance of the difference between pre-test and post-test scores, and it was found to be significant at the 0.01 level. This indicates that the sample group has achieved knowledge about the danger of blue light after viewing the 2D motion graphics via cartoon style on "The Dangers of Blue Light."

### 5.4 Results of satisfaction evaluation for 2D motion graphics via cartoon style on "The Dangers of Blue Light."

From Table 7, the satisfaction level of 2D motion graphics via cartoon style on "The Dangers of Blue Light" is the highest with an average score of 4.56 and a standard deviation of 0.52. When considering the responses to the 13 questions, it is found that there are 9 topics with the highest level of satisfaction. When ranked from the highest average value, they are as follows: The format of the media is suitable for dissemination through YouTube, with an

**Table 6: Assessment of the knowledge and understanding before and after watching the 2d motion graphics via cartoon style on "The Dangers of Blue Light."**

Item	n	Mean	S.D.	t	Sig.
Before watching	100	3.53	0.37	24.07	0.00**
After watching	100	5.00	0.00		

**Table 7: Evaluation of the satisfaction of 2d motion graphics via cartoon style on "The Dangers of Blue Light" by the sample group**

Item	Mean	S.D.	Quality level*
<b>Motion graphic</b>			
1. Storyline is intriguing and worth following.	4.63	0.49	Very satisfied
2. Characters make the content more interesting.	4.63	0.49	Very satisfied
3. Narration voice is clear and easy to understand.	4.37	0.60	Satisfied
4. Content of the motion graphic media is enjoyable.	4.62	0.49	Very satisfied
5. Motion graphic is visually appealing and captures attention.	4.64	0.48	Very satisfied
6. Animation techniques used in storytelling make the media more interesting.	4.36	0.59	Satisfied
7. Motion graphic helps to understand the content of the danger of blue light more easily.	4.63	0.49	Very satisfied
8. The length of the motion graphic is appropriately concise.	4.62	0.49	Very satisfied
9. The media helps to understand the origins of blue light.	4.43	0.52	Satisfied
10. The media helps to understand the harmful effects of blue light.	4.61	0.49	Very satisfied
11. The media helps to understand the protection against blue light.	4.41	0.51	Satisfied
12. Publishing media through YouTube facilitates easy accessibility.	4.66	0.48	Very satisfied
13. The format of the media is suitable for dissemination through YouTube.	4.67	0.47	Very satisfied
<b>Total Average</b>	<b>4.56</b>	<b>0.52</b>	<b>Very satisfied</b>

\* Legend: 4.50-5.00 = Very good; 3.50-4.49 = Good; 2.50-3.49 = Acceptable; 1.51-2.49 = Poor; 1.00-1.50 = Very poor

average value of 4.67 and a standard deviation of 0.47. Publishing media through YouTube facilitates easy accessibility, with an average value of 4.66 and a standard deviation of 0.48. Motion graphic is visually appealing and captures attention, with an average value of 4.64 and a standard deviation of 0.48. Storyline is intriguing and worth following, Characters make the content more interesting and Motion graphic helps to understand the content of the danger of blue light more easily, with an average value of 4.63 and a standard deviation of 0.49. Content of the motion graphic media is enjoyable and the length of the motion graphic is appropriately concise, with an average value of 4.62 and a standard deviation of 0.49. 10. The media helps to understand the harmful effects of blue light, with an average value of 4.61 and a standard deviation of 0.49. Among the topics with a high level of satisfaction, there are 4 topics with the highest average value, ranked from highest to lowest: The media helps to understand the origins of blue light, with an average value of 4.43 and a standard deviation of 0.52. The media helps to understand the protection against blue light, with an average value of 4.41 and a standard deviation of 0.51. Narration voice is clear and easy to understand, with an average value of 4.37 and a standard deviation of 0.60. Animation techniques used in storytelling make the media more interesting, with an average value of 4.36 and a standard deviation of 0.59.

## 6 DISCUSSION

The evaluation of the quality of 2d motion graphics via cartoon style on "the dangers of blue light" by experts indicates a high level of quality. Researchers have developed graphic communication media by using animated visuals, sound, and 2D cartoon-style formats to create engaging content for audiences. The researchers studied the content related to the origins of blue light, the hazards of blue light, and methods of protection from blue light to incorporate them into the script [2] [5]. In addition, the principles of cartoon line drawing [6] and character design [7] [8] to apply in the creation of graphic communication media [9], as well as the process of creating [4] [10] and arranging components for graphic design [11]. This resulted in the highest level of satisfaction from the sample group in regards to 2D motion graphics via cartoon style on "The Dangers of Blue Light". This research is align with the research conducted by Thawatchai S. and Siriluk J. [12], who researched the development of motion graphic contact lens, focused on assessment the satisfaction of the sample to the motion graphic. The research found that the example group has satisfaction to motion graphics is high level, which coincides with the study conducted by Nattapon S., Anat P., Nutchapon B. and Pheeranat K. [13], who researched motion graphic production: The Good Citizen in a Democracy for Prathom 6 Students, found that the satisfaction was at a high level.

Because the motion graphics media have a concise timeline suitable for the content causing interest and inviting followers to learn the content. The researcher is able to communicate the story in the important content in a concise time and using 2D cartoon drawing with character design Helps to stimulate interest in viewing for the sample group. Moreover, the assessment of the knowledge and understanding before and after watching the 2D motion graphics via cartoon style on "The Dangers of Blue Light." by the sample group found that the score before and after watching the media was significantly different at the 0.01 level, indicating that the sample group had increased knowledge about blue light after watching the motion graphic media, which coincides with the study conducted by Wantipha T. [14], who researched the development of motion graphics learning materials for SOC22101 course learning social studies, religions, and cultures on the Buddha, the Dhamma, and the Sangha for Mattayomseuksa 2 level, focused on compare the achievements from before and after trying out the developed motion graphic learning materials. The research found that learning achievement of before and after studying on the Buddha, the Dhamma, and the Sangha using motion graphics learning materials were different with a statistical significance level of 0.05 the after scored higher and the students of Mattayomseuksa 2 level were satisfied with the learning management using the developed motion graphics learning materials on the Buddha, the Dhamma, and the Sangha at high level.

## ACKNOWLEDGMENTS

The researchers would like to thank the Satri Sri Suriyothai School which supported location for the research and Faculty of Industrial

Education and Technology, King Mongkut's University of Technology Thonburi which supported the materials,

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