Contemporary Visual Culture and Art
https://journals.zycentre.com/cvca

ARTICLE

An Exploration of the Impact of Generative AI Video on Historical Learning Motivation in Digital Textbooks

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ABSTRACT

This research focused on examination of the advantages and possibilities of AI digital textbooks using Generative AI at the present time when printed textbooks are completely replaced by the digital textbooks. Previous studies have proposed that historical content games have a positive effect on intellectual curiosity and acquiring knowledge, and the visual stimuli of dynamic images of games have an effect on improving concentration. Accordingly, this research aims to determine whether there is an effect on the learning motivation when the Generative AI presents history-related images as videos on the AI digital textbooks of Korean history, which are both national and modern history. The concept digital textbook was used videos, which were made by generative AI, that utilized images from official history textbooks. Additionally, the experiment evaluated the factors of 'media art' and 'learning motivation' after using the concept design as above. Then, multiple regression analysis was performed to confirm the relationship between the above two factors. As a result of the experiment, it was found that the media art of the video composed through the Generative AI has a positive (+) effect on the motivation to learn history Furthermore, this concept was examined as an acceptable level of usability through the SUS (System Usability Scale) test. In conclusion, it was examined that it can be a positive textbook plan if an image in which a story in history is recorded is implemented as a video using Generative AI in the AI digital textbook.

Keywords: Generative AI; Text Book; History; User Experience; Digital Contents

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ARTICLE INFO
Received: 18 January 2025 | Revised: 10 March 2025| Accepted: 15 March 2025 | Published Online: 20 March 2025
DOI: https://doi.org/10.63385/cvca.v1i1.88

CITATION
Jang, S., Ha, M., Kim, D., et al., 2025. An Exploration of the Impact of Generative AI Video on Historical Learning Motivation in Digital Textbooks. Contemporary Visual Culture and Art. 1(1): 23–36. DOI: https://doi.org/10.63385/cvca.v1i1.88

1. Introduction

The textbook has been printed with materials used in basic education and is a book containing a comprehensive compilation of study content with the objective of explaining it. Nowadays, the textbook is utilized on a digital device. Accordingly, some textbooks based on digital devices have incorporated videos and music composed of electronic materials for studying. As above, these digital textbooks are in some technical, educational, and functional demand for generations accustomed to using digital devices [1,2]. This is able to induce academic interest in a generation of students who are familiar with the use of digital tools, and it also has a more positive effect on students with low academic achievement [3]. However, there was a negative reaction to the change in digital textbooks. This is because previous studies on the efficacy and effectiveness of digital textbooks also have negative effects. These problems, which are the use of digital devices as official textbooks in class, are technostress-inducing problems, legal response to education to digital tools, and recognition of textbooks with digital devices for fun [4–6]. Due to issues as above, discussions about the use of digital textbooks continue to this day.

Nevertheless, digital device-centered education plans will not only have negative effects. There is the case of intellectual curiosity and knowledge accumulation with digital content such as games. This is because game content has a more positive motivational effect compared to non-gaming approaches to studying, and this effect can be utilized as an effective and motivational learning tool, regardless of students' gender [7]. As the case as above, there are cases about acquired knowledge and induced curiosity knowledge through history-based games, which are Sid Meier's civilization, a game set during the Middle Ages of Koei, Japan, and a simulation game that makes up the growth and history of ancient cultural stars, as the positive effect to study of history [8]. The positive influence and important aspect of history education through digital games is in the description of the main changes and influence of a historical fact [9]. Besides, the game contents are able to enhance students' learning motivation and academic performance [10,11]. The Visual elements are a factor that positively influences these games on the concentration and motivation of education [12]. Among the visual elements of games, the 'motion' as the visual factor appeared to have an effective effect on the user's concentration [13].

In this circumstance, the Ministry of Education of Korea announced that it will abolish printed textbooks and introduce AI digital textbooks based on tablet devices by 2025. In this situation, this research focuses on the history subject in the AI digital textbooks. The aim of this research is to examine how the visual elements that implement pictures and photos in history textbooks as motion graphics affect students' learning and experience. As the above exploration, this research would like to suggest ways to proposal of the building AI digital textbooks. According to this situation, this research aims to examine how to help AI digital textbooks. To this end, we investigate how the videos and images composed of Generative AI will affect students' studies if they are used in textbooks.

In 2025, Korean AI digital textbooks only consisted of functions in which students and AI communicate and answer questions. Therefore, the function of the Generative AI was to create content such as images and videos, but this function was not utilized. Accordingly, this research aims to examine how to help AI digital textbooks. To this end, we investigate how the videos and images composed of Generative AI will affect students' studies if they are used in textbooks. For the examination, videos designed by Generative AI were used in the concept digital textbooks. The video above was composed like a short preview. And the experiment was constructed to investigate whether this video affects curiosity and academic interest. This study was intended to be a useful direction for a design perspective strategy for using AI technology in digital textbooks through experimental results.

2. Background

2.1. The History of Changes in Korean School-Essential Textbooks

The contents and design of Korean textbooks have changed according to the policy of the Ministry of Education. The history of Korean textbooks began with the establishment of the Korean government in 1945 and changed until the revised curriculum in 2022. The history and changes of Korean textbooks are organized in **Figure 1**.

Figure 1. History of Change in Korean Basic Textbooks [14]

Currently, the Ministry of Education of Korea is gradually converting digital textbooks introduced in 2022 to AI digital textbooks by 2028, and ultimately aims to abolish printed textbooks. Through this, it can be seen that the Ministry of Education is aiming to convert the textbook environment to full-scale digital in line with the AI era.

2.2. Social Concern About the Circumstance of Digital Textbook Full Replacement

Recently, research and opinions on the educational effect of digital textbooks have been presented. Digital media has an effective influence as a positive tool for changing the culture of learning as a tool to connect various knowledge and information [15]. In addition, AI technology that can be used in digital textbooks will have a positive impact on constructing a customized educational environment for each student [16]. This is because digital textbook is able to have an effective effect on improving literacy and concentration by applying a customized font for each student in different concentrations [17]. However, previous research dealing with negative effects on digital textbooks has also appeared. This is because textbooks based on digital media have a limited positive impact as a tool to assist printed textbooks [18]. Furthermore, AI digital textbooks, which can search information indefinitely, have limitations that can lead to meaningless knowledge and information because it is difficult to limit information in the category of 'textbooks' [19].

As above, changes in the environment and form of textbooks in this developing digital and AI technology may be the trend of the times, but since it can be influenced as an auxiliary tool for printed materials, strategies that will have a positive impact on learning based on the strengths of digital textbooks will be needed.

2.3. Content Generation Status with Generative AI

As the variety of ways to make good use of the results of Generative AI, there is a recent Coca-Cola advertisement composed of Generative AI. Coca-Cola produced Christmas advertisements in 2024 only with image-generated AI. For this, Generative AI Luma, Runway, and Kling were used. The above advertisement is organized in **Figure 2**.

In this way, research using images generated by Generative AI has also emerged. This is a study that examined the positive effect of the video of a virtual person on the psychology of visitors, which is composed of a Generative AI of an environment in which people are observed in real time on a display of an unmanned store. And this is a study of the effect of the service in a situation where a virtual person composed of a Generative AI is exposed to the screen to make and deliver coffee directly from an unmanned cafe. In addition, this is a study that explores ways to cope with fashion design and the situation of fashion shows with a Generative AI video [20–22]. As such, it can be seen that various measures to utilize the technology of Generative AI that implements an image as an image are being proposed.

Figure 2. Example of Scenes from Coca-Cola's 2024 Christmas Commercial in Generative AI (Place from Top to Bottom, Left to Right Based on Time Axis).

3. Approach of Design

3.1. The Effect of Games for History Learning

In the past, related physical tools, space, and environment were required to participate in games, but now, games can be easily enjoyed anytime, anywhere through digital devices. Accordingly, research using games that can be easily accessed through digital devices is emerging. This includes research related to education. This is a study that shows that game-mediated learning induces pleasant emotions of participants to maximize the effectiveness of education and have a significant effect on learning [23,24]. In addition, games induce interest and have a significant effect on improving students' basic education learning ability [25]. The reason why games have a significant effect on education or learning is that the visual stimulus of the motion graphics as dynamic image affect the user's attention [13]. As an element of the motion graphic above, there is a cinematic image of the game. Cinematic images are elements of dynamic images that positively influence the immersion of the game, the concentration of users, and the induction of curiosity [26]. As above, it can be said that the visual stimulus of the dynamic image in the game improves the user's attention and has a positive effect on learning.

As the case of how games affect education and learning is the history-related game. History games can be explained by simulations based on real history or contents of history substitutes. One of cases of the historical game is Sid Meyer's Civilization. Civilization is a turn-based strategy simulation game in which users choose a specific civilization presented and compete with other civilizations. This game competes by selecting a civilization that extends from the past or to the present that has given the characteristics of a civilization based on history. This civilization induces positive learning effects in the improvement of empathy and historical thinking in history learning [27]. The interface during the selection of civilization in the game is organized in **Figure 3**.

Above the case of historical game, users can experience history indirectly by selecting historical time zones and characters of historical real person through historical games. This method of experience assuming historical facts provided a context for effectively learning knowledge and theoretical elements [28]. In this way, a graphic that is similar to the actual history in history-based game content or reflects the history of the times as it is improves the user's sense of immersion [29,30]. As above, examples of selecting historical figures or games based on historical time zones are summarized in **Figure 4**. As such, it was examined that historical contents can have a positive effect on education.

Figure 3. Examples of Users Choosing a Specific Culture in the Game of Sid Meier's Civilization 6.

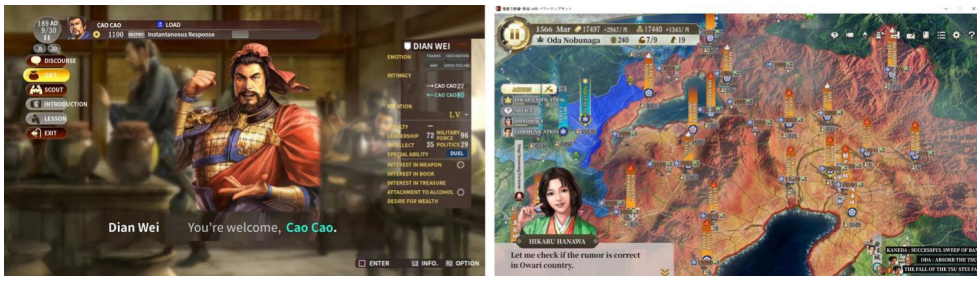

Figure 4. Examples of A Case of Koei's Game about Three Kingdoms (Left) and Warring States Period (Right), And This Examples was Change the text on the game screen to English)

3.2. Current Status of Historical Digital Textbooks in Korea

Among the textbooks for basic education in Korea, history subjects have been Korean national, modern and contemporary history, and world history. Among them, the UI design of the Korean history textbook released as a digital textbook in 2022 is summarized in **Figure 5**.

In this way, digital textbooks are composed of contents that students can directly intervene and study. Recently, Generative AI has become capable of direct communication with users. Accordingly, the study on how to use a communication-based AI digital textbook in which Generative AI directly shares questions and answers with students has also appeared. This was a case study of AI digital textbooks in which students communicate with AI to learn about history [31]. The above study has limitations in conducting learning limited to the Korean War. In addition, there are limitations in terms of using ChatGPT, a generative AI, and AI that considers only the way students answer questions. The UI design of the above study is summarized in **Figure 6**.

Figure 5. UI Design of Digital Textbook by Geumseong Publishing Co., Ltd.

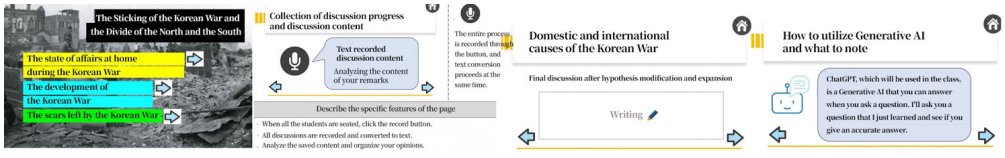

Figure 6. Example of History Digital Textbook as the Experiment [31].

3.3. Experimental Approach

As shown above, historical games have a positive effect on learning, and the motion graphics – as dynamic images within the game – effectively enhance concentration as a form of visual stimulus. Furthermore, current digital textbooks and prior research in Korea, which AI technology could be used in digital textbooks, had limitations in using AI as a static tool. Therefore, this research set the problem statement in order to examine how the dynamic visual stimulus that composes the moment of history into the cinematic image of the game affects the learning effect through Generative AI in history-based textbooks. This is to check whether the visual stimulus of the dynamic image other than the competitive element of the game affects the user's intellectual curiosity and learning motivation as a

factor inducing concentration or interest.

3.4. Concept Design (Experiment Materials)

This research used AI digital textbooks as a method, and to explore the potential impact of videos generated by Generative AI on learning, national history and modern history were used as experimental materials. In addition, relics related to history in the textbook, photos in history, and oriental paintings were composed of images. The video was composed of 5–10 seconds images through the Generative AI Runway, and this was used together with text as a visual stimulus. The concept digital textbook was produced in a structure that selects the history time zone on the cover page and provides the contents of the textbook and related AI images together. The UI structure was constructed through Figma. The concept UI design of the concept digital textbook, which was arranged by placing the UI on a tablet lock-up and dividing the start and end situations of the video, was summarized in **Figure 7.** Furthermore, in order to conduct more clearly examination, the concept digital textbook in **Figure 7** was constructed by Framer so that it could be experienced on the website. This is summarized in **Figure 8.**

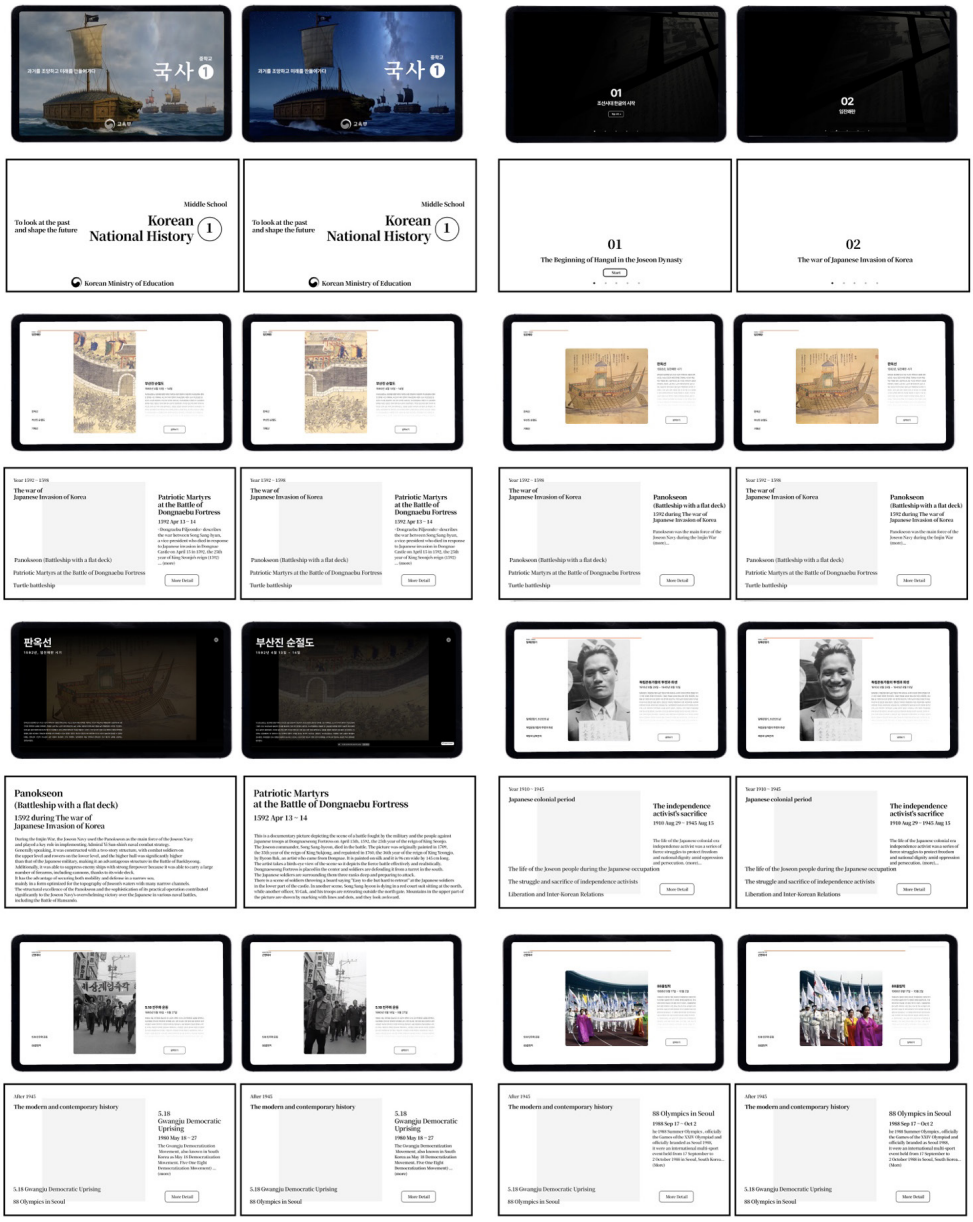

Figure 7. The UI Design Based on the Change of Timeline for Concept AI Digital Textbook.

Figure 8. The Prototype of AI Digital Textbook on Web Site by Framer.

3.5. Experimental Evaluation Factors

In this research, 2 evaluation factors were set to examine the effect of the image generated by the Generative AI on learning. Firstly, it is a valuation factor as a media art for motion graphics made from images. The reason why the results of imaging historical images were selected as media art is that exhibition cases of Van Gogh's works are classified as media art. Examples of media art exhibitions above are summarized in **Figure 9**. Therefore, in previous studies, 'recognition', 'empathy', and 'enjoyment' factors were selected that evaluated the value of media art that reproduced images as images with Generative AI [32].

Secondly, it was a learning motivation factor through textbooks. In previous studies, 'interest' and 'information gap' were selected as evaluation factors to examine the effect of study classes using subject knowledge. In addition, play-centered education was evaluated through the factor of 'expansion of learning' for professional knowledge learning [33–35].

In this research, the above factors were composed of evaluation factors based on a 5-point Likert scale, and non-structured short answer questions were added to collect the factors that influenced the evaluation. The questionnaire items are summarized in **Table 1**.

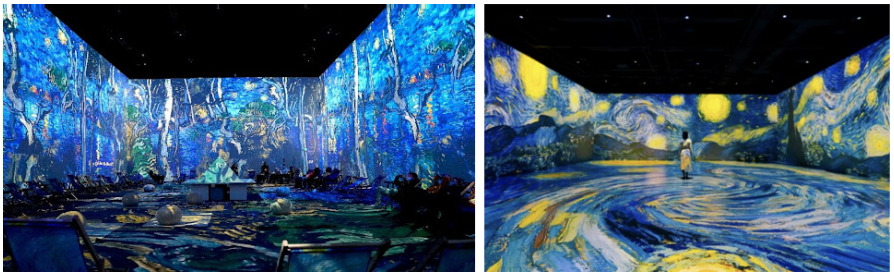

Figure 9. Example of the Entertainment Firm Fever's Media Art exhibition <Van Gogh: Immersive Experience>.

Table 1. Survey Questions.

Classification	Factor	Question
Value of Media Art	Recognition	Do you think it's a way or work to accept the video and method of this textbook?
	Empathy	Could you understand the video and method of this textbook as a way to convey history?
	Enjoyment	Do you think the video and method of this textbook is a way or work of feeling the value of history?
Learning Motivation	Interest	Do you think this textbook is an interesting way to acquire knowledge?
	Information Gap	Do you think the information and images in this textbook lead to a consistent experience?
	Expansion of Learning	Does this textbook make you want to check out the new clearer content?
(Subjective Question)		Please describe the cause or factor that influenced the evaluation of this experiment.

3.6. Research Model and Hypothesis

Based on the above, the research model is summarized as **Figure 10** and hypothesis is summarized as **Table 2.**

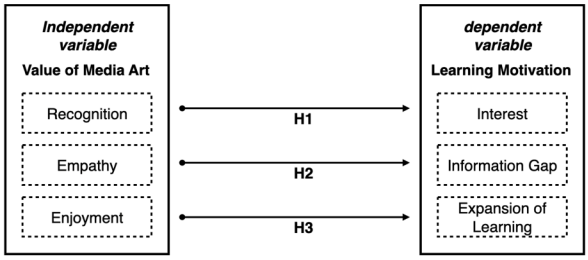

Figure 10. Research Model.

Table 2. Hypothesis.

Hypothesis	Content
H1	The historical video of AI digital textbooks will have a positive (+) effect on learning motivation with recognition of studying.
H2	The historical video of AI digital textbooks will have a positive (+) effect on learning motivation as a way to arouse empathy with history.
H3	The historical videos of AI digital textbooks will have a positive (+) effect on learning motivation as a way to enjoy history.

4. The Result of an Experiment

4.1. Process of an Experiment

From April 7 to 10, 2025, this research provided **Figures 7** and **8**, which were the UI of the concept textbook through a prototype video composed of motion and a web service, on the online Google form. The subjects consisted of those in their 20s and 30s who would be more familiar with using digital devices than other generations and high school students who would be related to digital textbooks. There were total of 140 subjects, 39 in their teens, 64 in their 20s, and 37 in their 30s. The average value of all factors evaluations was 3.5 or higher, which was a positive result as like **Table 3**.

Table 3. Average Value of the Factor's Evaluation (N=140).

Value of Media Art			**Learning Motivation**		
Recognition	Empathy	Enjoyment	Interest	Information Gap	Expansion of Learning
3.89	3.89	3.78	4.04	3.79	3.94

4.2. Verification of Hypothesis

4.2.1. Result of Multiple Regression Analysis

This research aimed to examine the effect of video that reconstruct past artifacts, pictures, and video, which was generated by AI such as media art, on learning motivation through Generative AI. This result of research was assumed normality because of central limit theorem, which is constructed more than 30 subjects. For this reason, Multiple regression analysis was conducted to examine whether there is a significant relationship between value of media art and learning motivation. Recognition, empathy, and enjoyment which are factors for evaluating the value of media art, were appeared a positive (+) effect on all factors of learning motives, which were interest, information Gap, and expansion of learning. This was because all factors of value of media art had p-value lower than the significant variable 0.05 in each factor of learning motives. Furthermore, the adjusted R-squared of media art were all 0.9 or higher. Since the corrected coefficient of determination is closer to 1, the effect of value of media art on the learning motivation was obviously. Therefore, hypotheses <H1>, <H2>, and <H3> are adopted. The experimental results are summarized in **Table 4**.

Table 4. The Result of Multiple Regression Analysis (N=140).

Est			F	Adjusted R-squared	P (Sig)
Recognition	(Intercept)	0.315	957.9 ***	0.954	0.000
	Interest	0.038			
	Information Gap	0.376			
	Expansion of Learning	0.627			
	Intercept	0.324			
Empathy	(Intercept)	0.253	981.9 ***	0.955	0.000
	Information Gap	0.415			
	Expansion of Learning	0.411			
Enjoyment	(Intercept)	0.166	574.4 ***	0.925	0.000
	Interest	0.039			
	Information Gap	0.638			
	Expansion of Learning	0.304			

*** p < 0.001, ** p < 0.01, * p < 0.05.

4.2.2. Summary of Subjective Question

This research conducted to organize answer of non-structural-based subjective question in order to collect the causes that influenced result of the quantitative research through open cording. Accordingly, overlapping or similar opinions were categorized in short answer answers.

First, the opinion is that they are familiar with the method of conveying historical stories through video. The subject suggested that the story arouses curiosity because the video is like a cinematic video that provides a video related to the story of the game. And, the other opinions, it is short and concise like a summary video that delivers short video content in the OTT and YouTube's video list, so there is no sense of heterogeneity because it feels like a function that induces clicks.

> • *"It feels familiar because I think it will make you want to know more about the story and want to participate, like a cinematic video from the beginning, the end, or the middle of the game. It feels familiar playing a history game." (P21, 93)*

> • *"I am used to it because it looks like a preview video that compresses or summarizes the contents of the video on YouTube and OTT services. I think I will click it if it is interesting after watching the short video." (P28, 46)*

Second, it was an opinion that the video of a short historical story induces interest. The subject said that it was good to be able to see the relics of the museum (such as comb-pattern pottery) that are difficult to see depending on the region more interestingly, and that it was like a video in the kiosk of the museum, so they wanted to see more. They also said that the way of watching the situation of history in the video was interesting and that it seemed to help stimulate the imagination. They suggested that he clicked because they wanted to see more of the next content and know more than a still image. And they said that the video is likely to be used like a function that continues to pass on the keywords of knowledge like Wiki service in which is website where an unspecified number of people can directly modify the content and structure through collaboration.

> • *"It's hard to go to the (Korean) National Museum of Korea if you're in a rural area. The kiosk, which is in museum, is designed to provide 360-degree views of relics such as comb-patterned earthenware. I feel like I can experience this at a tablet as like museum's kiosk. It's interesting and fun. I want to see*

more and read more." (P13, 45)

• *"The way you see it in the video is interesting and inspirational. I was curious because the contents of the past, not modern or contemporary history, were only pictures or pictures, but they were more vivid because the images moved. That's why I clicked on the video or text to see more." (P38, 63, 84)*

• *"I think the video will create intellectual curiosity like an auxiliary textbook that is visually unique. I think I will be able to find and move on to the video as if I keep moving on while reading the Wiki service and studying." (P8, 79)*

Third, they said that they could feel the strength of digital media beyond paper. It was suggested that paper textbooks were somewhat less concentrated in learning because they only had texts and photos. And since it was a method suitable for the generation who accumulate knowledge and search for information through videos on YouTube or Instagram, it was suggested that this concept will be a means of positive experience and knowledge accumulation for the digital native generation who are familiar with digital devices. They said that as they move while reading videos and writings on the device, they will be able to concentrate as if they were continuing to read books.

• *"Paper textbooks have only pictures, so there is a limit to concentration. Since the video is provided, I can concentrate more in the process of reading and looking at the situation, so I watched (the experiment) for a long time. I think it will help me accumulate knowledge while watching videos naturally." (P41, 102)*

• *"I think this is the right way for the times because the (digital native) generation who are familiar with smartphones now searches for information and studies it through videos on Instagram or YouTube." (P4, 78, 121)*

• *"These days, it's hard to read books for more than 20 minutes, but smartphones are easy to concentrate for more than an hour. So, as I move around and watch videos and writings on tablets naturally, I can concentrate as if I were using websites or apps." (P11, 98)*

Fourth, it was a precaution. It was pointed out that because the video of this concept is a 5–10-second video, it is too short, and due to the limitation of Generative AI, the concentration was lowered in that it is strangely implemented in the video. In addition, it was suggested that it should be a plan to be used from various angles, and that the point that video was the main means of transferring knowledge will be main audience conduction.

• *"It was a shame that the video was too short. But if it's too long, I don't think I can concentrate. And I'm sorry about the quality of the video. I think a consistent video should be implemented." (P39, 62)*

• *"If video becomes the core of the textbook, I think it will decrease my concentration. I think it should be an auxiliary function of studying. The balance should be balanced so that it does not become a subject." (P85, 136)*

4.3. Additional Experimental Results

In this research, usability verification was additionally performed to examine the possibility of concept design in **Figures 7** and **8** from May 25 to June 9, 2025. The research was conducted by SUS (System Usability Scale) test. Eighty-two people in their teens and 30s participated in the experiment. The SUS test consists of 10 questions that evaluate the level of agreement and are standardized questions that aim to evaluate the whole, combining positive and negative questions. The questions of SUS test are in **Table 5**.

The Google Form was employed as the survey collection method, and it was administered online for SUS test. The SUS test is considered to be usable if the average

result of each experiment participant is 75 points or higher. The evaluation result of the SUS test in this research was 84.72, which exhibited a satisfactory level of usability. Additionally, this research conducted normality test in order to confirm whether each the SUS results of each experiment participant constitute a normal distribution. Result of normality tests, which were conducted by Shapiro-Wilk and Anderson-Darling, appeared p-value higher 0.05, which was a significant value. The results of this study are presented in **Table 6**.

Table 5. The Contents for SUS and Question.

Num	Content
1	I think that I would like to use this system frequently.
2	I found the system unnecessarily complex.
3	I thought the system was easy to use.
4	I think that I would need the support of a technical person to be able to use this system.
5	I found the various functions in this system were well integrated.
6	I thought there was too much inconsistency in this system.
7	I would imagine that most people would learn to use this system very quickly.
8	I found the system very cumbersome to use.
9	I felt very confident using the system.
10	I needed to learn a lot of things before I could get going with this system.

Table 6. Result of SUS and Normality Test (N=81).

M (SUS test)	Normality test			
	Shapiro-Wiki		Anderson-Darling	
84.72	Statistic	Sig	Statistic	Sig
	0.093***	0.001	1.583***	0.002

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

5. Conclusions

This research aimed to examine whether the strengths of digital devices and Generative AI can be a natural way to accumulate knowledge by inducing interest in games at the present time of transition to AI digital textbooks. In order to examine the above objective, the concept of realizing images and photos of past artifacts as images through Generative AI was implemented based on the content that the dynamic image of the game affects users in previous studies. As a result, the factors, were value of media art and learning motivation, had a positive (+) effect on relation. In the subjective question, the subject answered that it was a familiar means of conveying knowledge and information through video, and that it will be a positive way to induce interest because the digital native generation acquires information and knowledge through video. The above results were the same as those of previous studies that specific visual stimuli in AI digital textbooks positively affect student motivation and information search [36]. This will be a positive direction for utilization of AI digital textbooks beyond the perception of digital textbook being considered an interesting tool by previous study [6]. Moreover, it was suggested that the length of the video constructed in the concept of this study should be used as an auxiliary tool rather than a key factor in acquiring knowledge in textbooks due to its long length. In addition, this research conducted usability verification to examine

whether the concept AI digital textbook is at the level of use. In the SUS test results, the usability of this concept design was examined to be acceptable.

In conclusion, this research examined that if Generative AI was used in digital textbooks, static images are converted into video as the dynamic images in paper textbooks and used as visual stimuli, it can have a positive effect on learning. However, it should be noted that while it is a positive tool for the digital native generation who acquires knowledge and information through images, images should be used as an auxiliary tool. Accordingly, this research proposes that these results will help build digital textbooks using Generative AI in the future.

Author Contributions

Conceptualization and Writing, S.J.; Project Administration, M.H.; writing—original draft preparation, J.Y.; Visualization, D.K., J.B., J.H.

Funding

This work received no external funding.

Institutional Review Board Statement

Ethical review and approval were waived for this study due to the reason why personal information and ethical reviews are not important as the study of user's personal experience and preferences.

Informed Consent Statement

Not applicable.

Data Availability Statement

In the survey, this study suggested that 'complete disposal of personal answers after the end of the experiment' and discarded all related data.

Acknowledgments

We used Generative AI services for the research materials in which was included images and films by Midjourney and Runway. And we used Framer as the research material as the prototype so that the subject can experience it.

Conflicts of Interest

The authors declare no conflict of interest.

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