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Using a Three-Problem Framework to Understand How Nursing College Students Learn to Design Healthcare Animations

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Abstract: This study implemented a three-problem instructional framework to investigate the learning performance of nursing college students in healthcare animation design. Each genre of problem represents a distinct narrative animation design skill to acquire, including abstract design, actual design, and deconstruction design skills. A total of 34 nursing college students from northern Taiwan were recruited as participants. All participants sequentially engaged in the learning tasks presented by the three problems, with each problem unit spanning five weeks. Assessment took place at the end of each problem unit, utilizing a self-developed 5-point scoring rubric to analyze students' performance and variances across the three animation design problems. Preliminary findings revealed that students exhibited comparatively lower learning performance in abstract design and deconstruction design problems while excelling in actual design problems. Additionally, further analysis suggested no significant correlations between students' performance in abstract design and deconstruction design, shedding light on future pedagogical design approaches.
Keywords: Narrative animation, problem-solving, healthcare, nursing college students

1. Introduction

In the ever-evolving landscape of healthcare education, the acquisition of proficiency in crafting narrative healthcare animations holds profound significance for nursing college students (Parikh & Huniewicz, 2015; Korda & Itani, 2013). This significance has been magnified, particularly in the wake of the Covid-19 pandemic, which has reshaped the dynamics of public engagement with health information. The role of narrative healthcare animations as a pedagogical tool has transcended conventional methods of disseminating health knowledge. As the pandemic surged through communities, a noticeable shift occurred in how the public seeks, absorbs, and comprehends health-related information. The surge in digital consumption during lockdowns and social distancing measures prompted a surge in the popularity and effectiveness of narrative animations as a medium of communication.

Against this backdrop, nursing college students in Taiwan find themselves at the intersection of healthcare education and digital curation. The imperative to master the art of designing narrative healthcare animations has arisen not only from the need to convey complex, abstract healthcare concepts to a diverse audience but also from the recognition that animations possess a unique ability to bridge gaps in health literacy (Bétrancourt & Tversky, 2000; Preim & Meuschke, 2020; Weiss, Knowlton & Morrison, 2002; Sanchez & Wiley, 2010). The transformative potential of these animations lies not only in their ability to convey information but also in their capacity to evoke empathy and emotional connection (Lowe & Boucheix, 2008; Lowe & Boucheix, 2016). Storytelling through animation enables the presentation of healthcare scenarios in relatable and compelling ways, fostering a deeper understanding of health issues among the public. Consequently, nursing college students are not merely acquiring a technical skill; they are honing a form of expression that amalgamates creativity, medical acumen, and effective communication.

Thus, it becomes evident that a significant portion of nursing students exhibits the capacity to proficiently navigate the creation of healthcare animation projects, meeting the initial completion benchmark with relative ease. Nonetheless, it is noteworthy that despite this widespread capability, the resultant animation projects diverge markedly in terms of their quality and overall efficacy. While a substantial number of students can traverse the technical aspects of animation design, the variations in the final outcomes underscore a crucial distinction between merely producing animations and crafting ones that genuinely resonate with their intended audiences (Calderȯn, Shaheen, Hays, Fleming, Norris & Baker , 2014; Betrancourt, 2005). Ideally, a proficiently designed healthcare animation should adeptly transform abstract healthcare terminology, like "Myocardial Infarction," into a narrative scenario replete with relatable examples that enable the audience to swiftly grasp and apply the information to real-world scenarios. Thus, the audiovisual features of animations alone without a meticulous, structured design as well as thinking process fail to deliver the learning content.

2. Narrative Animation and Learning

Narrative animation can be perceived as a cross-national and cross-lingual teaching and communication tool. Relevant researches indicate that when integrating animation into learning, it primarily enhances learners' motivation through high interactivity and rich context-dependent storytelling. This approach reduces the extraneous cognitive load of knowledge content and reinforces learners' perception of the knowledge content, particularly aiding in the construction and organization of specific knowledge mental representations (Cavazza, Bandi & Palmer, 1999; Fleer, 2018; Mayer and Moreno, 1998). Among these, the convenient and narrative-rich nature of animation is common in health education animations, where creating learning situations through storytelling is a prevalent design approach. The narrative context of animation aids in knowledge transmission because storytelling itself assists learners in revisiting life experiences and organizing sequences and logical relationships among various experiences (Gottschall, 2013; Moen, 2006). Therefore, for abstract health education knowledge requiring contextual comprehension through storytelling, computer animations with narrative elements play an inseparable role in instructional applications and research.

Given the swift expansion of cloud-based, drag-and-drop animation tools like Vyond, Animaker, and Powtoon, the process of designing healthcare narrative animations appear less daunting for nursing college students than in the past. The technical learning curve of animation design has steepened for learners, yet the real challenges reside in the instructional design strategy that can effectively foster the assimilation of healthcare knowledge. The process of narrative animation design, however, is typically a linear flow in which learners engage from start to finish on their own. Subsequent refinement and adjustments to the animation work often occur beyond the confines of a classroom, posing a challenge for teachers to effectively monitor and provide timely instructional support. Consequently, within the context of animation design courses tailored for nursing college students, teachers encounter a number of unresolved challenges. Foremost, there lies the imperative to cultivate the adeptness in converting abstract, complex healthcare concepts into concrete examples—an endeavor demanding immersive practices, discussions, and introspective evaluation. This crucial facet often remains overshadowed within conventional animation design curriculum. Secondly, varied narrative plots begets a corresponding diversity in the demanded audiovisual effects for animations. Given the expansive spectrum of healthcare themes, guiding students towards identifying pertinent shortcomings within their narrative animation endeavors presents an intricate task for teachers. Thirdly, a majority of students possess the ability to create animations from the ground up, but they often lack the expertise to analyze and dissect an animation project that is already in progress. This skill becomes particularly crucial when designing healthcare animation projects that encompass multiple viewing paths.

3. Research Method

3.1 Participants

The study took place at a nursing vocational university located in Taipei, Taiwan. The participants comprised 34 sophomores, consisting of 27 females and 7 males, with an average age of 21.6 years. None of the participants had previously enrolled in any courses related to animation design prior to the study.

3.2 Procedure

In this 15-week study, each participant was required to attend a 100-minute animation design course in a computer classroom every week. The researcher and another nursing expert teacher jointly served as the instructors. The course was structured into three problem-based learning units, including (1) abstract design problems, (2) actual design problems, and (3) deconstruction design problems. Each problem unit had a duration of 5 weeks. All participants engaged in the three, problem-based learning units in a sequential order. Assessments were conducted after the final class of each learning unit, exploring participants' learning performance toward animation design.

3.3 Curriculum

The curriculum was designed and structured with respect to the three animation design problems as stated above. In the abstract design problem unit, participants were asked to transform textual health information into narrative animation scripts, endeavoring to present abstract healthcare knowledge concepts in a personified manner for easier comprehension. Figure 1 is an example of transforming text-based descriptions of Angina pectoris into visual illustrations. Participants used the Canva application to visualize and illustrate their ideas as individual scenes. Next, In the actual design problem unit, all participants attempted to utilize the Vyond animation design application to carry out the previously designed story script. Participants were tasked with contemplating how to adhere to multimedia design principles and effectively employ the audio-visual effects of animation to convey the narrative within the script. Through the use of audiovisual enhancements, participants aimed to guide the audience's attention effectively. Lastly, in the deconstruction design problem unit, participants exchanged their unfinished animation works with other groups and then attempted to complete each other's designs. Participants needed to first deconstruct the narratives step by step and then figure out how to resume the design work without deviating from the original goals.

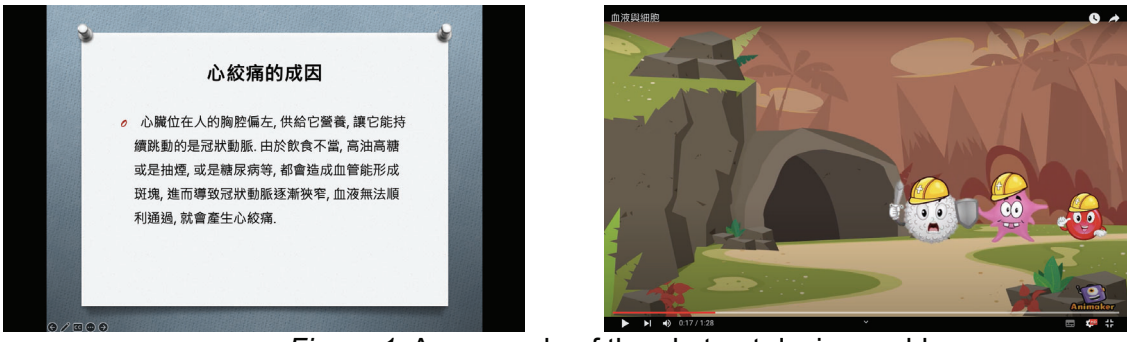

Figure 1. An example of the abstract design problem

3.4 Assessment

The assessment primarily corresponds to the three design problems that guide the learning of animation design. The researcher created four measures for each of the three design problems along with one additional measure for assessing the overall design performance. These measures include Abstraction Measure, Design Measure, Deconstruction Measure, and Application Measure. The first three measures correspond to the three animation design problems while the last measure evaluates the final healthcare design project at the end of the class. Each measure consists of customized scoring rubrics. For each assessment indicator, the researcher designed customized scoring rubrics, serving as the basis for measuring students' learning outcomes before and after participating in the workshops.

A scoring rubric adheres to three application norms: (1) it focuses on measuring a clearly describable learning behavior, (2) it employs a scale to measure the outcomes of learning activities, (3) it employs text-based or descriptive representations of specific learning performances, which are then graded on a scale. In the current study, each dimension and detailed scoring criterion within the scoring rubric were reviewed by three domain experts to ensure reliability.

3.5 Narrative Animation Design Tools

Vyond is used as the animation design tool for all participants. Vyond is a cloud-based narrative animation design application, its interface is shown in Figure 2. Learners don't require to learn any modeling techniques to start their design work; instead, they can quickly create characters according to the animation script using an intuitive drag-and-drop approach and modular editing interface. Additionally, learners can even customize the facial expressions and subtle movements of their characters.

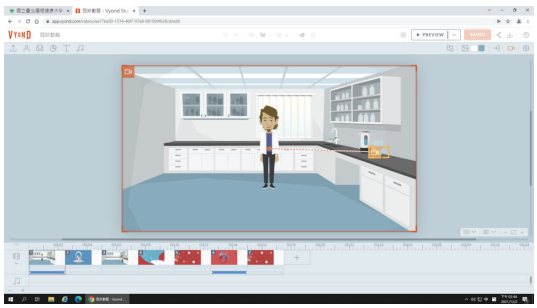

Figure 2. The user interface of Vyond animation design application

3.6 Research Questions

The proposed research questions are as follows:

1. What are the learning results when nursing college students engage in the three problem-based animation design tasks?
2. Is there any interaction effect between the three animation design problems for nursing college students?
3. Does one's performances in the three problem-based design tasks affect their overall animation design results?

4. Preliminary Results

Multiple regression analysis indicated that participants' learning performance in the three design tasks explained 63.9% of their overall animation design results at the end. Participants showed the highest scores in the actual design problems, and they struggled with the abstract design as well as deconstruction design problems. When exploring the interactions among the four measures, the Repeated Measures ANOVA results indicated a significant interaction among the four assessment indicators, with Wilks' Lambda=0.77, F(2,

28)=4.08, p=0.028. This suggested that the three types of animation design problem implementations significantly impact the overall learning outcomes of nursing college students.

Further analyzing the correlations among the four measures, the Pearson correlation coefficient analysis revealed that the overall “Application Measure" had significant correlations with the other three indicators ($p<0.01$). The "Design Measure" showed significant correlations with both "Abstract Measure" and "Deconstruction Measure" ($p<0.01$), while the correlation between "Abstraction Measure" and "Deconstruction Measure” was not significant ($p=0.247$), see table 1. These analyses implied that nursing students' performance in abstract design problems and in deconstruction design problems might represent distinct problem-solving capabilities.

Table 1. *Correlational analysis of the four measures*

Measure	1	2	3	4
Abstraction Measure	--			
Design Measure	0.412*	--		
Deconstruction Measure	0.247	0.385**	--	
Application Measure	0.678**	0.639**	0.491**	--

5. Conclusion

Integrating and implementing three distinct types of animation design problems into one class was a challenging experimental teaching attempt aimed at guiding nursing college students to develop healthcare narrative animation design skills. The results yielded fruitful pedagogical insights. Drawing from the perspective of Lave & Wenger (1990), learning is seen as a contextually meaningful social phenomenon, leading to the concept of Legitimate Peripheral Participation (LPP). This concept asserts that novice learners must gradually cultivate expert experiences through engagement in essential learning activities. The three-problem framework in this study essentially fostered LPP for one’s animation design competence. Through problem-solving activities in diverse contexts, nursing college students were guided to actively engage in the entire process of narrative animation creation, from pre-production to design and refinement, while also assessing their own creative and explanatory skills. Lastly, on the technical front of animation creation, current healthcare narrative animations predominantly follow a linear, single-path viewing format where viewers watch from start to finish. This fixed viewing path limits viewer interaction with the knowledge content within the animation. The absence of an open script and interactive viewing paths hinders the customization of animation scripts according to individual viewer needs. Students' creative works also often lack an awareness of the limitations posed by a single viewing path. They may not know how to incorporate interactive paths into their creations. The challenge lies in guiding students to design customized viewing paths, allowing for interaction and engagement with the content. Integrating interactivity into animations requires students to be conscious of the possibilities and limitations posed by different viewing paths. In the future, facilitating the incorporation of customized viewing paths into students' creations will be a significant challenge.

Acknowledgments

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