

Applying Interactive Technology with Technology Acceptance Model into Digital Media Basic Modeling Course

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The wide application of interactive technology brings new opportunities and challenges to digital media design teaching. This study aims to find how to integrate interactive technology into the classroom teaching of digital media basic modeling and explore the acceptance of interactive technology through the combination of technology acceptance model (TAM) and fixation, inspiration & creativity. This study combines questionnaires with classroom reforms to investigate students' attitudes toward interactive technologies. The survey results found that most of the students accepted the introduction of interactive design in the course, very few people held a negative attitude, and some students proposed to increase the interactive devices in the classroom for better learning.

Keywords: *design education; digital media modelling, interactive technology, technology acceptance model*

1 Introduction

Advances in technology have contributed to the continuous development of design disciplines. With the rise of new media, digital media design major has blossomed throughout China. The novel interaction, cool animation, rich user experience, and diverse information visualization show the charm of digital media discipline from different angles, and these colorful classifications are now inseparable from the help of interactive technology. Without interactive technology, the digital media design will exhaust on nutrients, like the fish that left the water, and gradually abandoned by the public. In fact, this situation was raised many years ago by McLuhan and others. When technology as human extended is no longer willing to undertake its natural mission, its identity and existence will also be questioned by common people (McLuhan, 1994).

In order to let the junior students in the lower grades gradually understand the digital media design from the rational and the perceptual, the teachers need to involve the corresponding scientific and technological knowledge in the curriculum design, especially the basic interactive technology. However, when the freshmen who have just entered the school are

mostly artistic backgrounds and lack the professional quality of the science and engineering disciplines, they need to carefully arrange the course content and carefully cultivate their interest in the teaching process. Related design education problems appear in two aspects: First, some of the teachers themselves are not from the digital media design profession. They lack the overall educational vision of the profession. The knowledge in the curriculum is limited, resulting in an insufficient connection between the classroom content and other professional courses. Second, the artistic background freshmen have some natural stereotypes about technology, fear and rejection of learning technology, lack of interest in learning and self-confidence, and need to be better guided and encouraged in the curriculum.

As early as a decade ago, some scholars discussed the impact of digital hardware software on inscription characteristics in design (Cleveland, 2004). In the research, the contradiction between design willingness and technical possibility was discussed in depth and point out "The commands are controlled by the algorithms that control the way images are constructed." A few years later, another design team compared the differences between traditional design tools and digital design tools. They believe that although computers have speed advantages in design activities such as previewing fonts, they present an inferiority in efficiency compared to traditional design tools. In addition, they also indicate "If, for instance, students received focused training on using digital tools in the preliminary stages of design, results may be different." (Stones & Cassidy, 2007). Subsequently, several research teams conducted in-depth research on traditional design and digital design. Among them are the study of planar 2D mapping processes (Tang, Lee & Gero, 2011), the study of 3D modeling processes (Alcaide-Marzal, 2013), and the impact of using different digital design tools on the designer's thinking process (Xu & Fan, 2017).

Based on previous research results and the current problems in digital media undergraduate teaching, this research is devoted to exploring the interdependence between interactive technology and digital media design course. Two important issues need to identify in the study:

First, in the digital media undergraduate course, can teachers avoid talking about interactive technology and reduce the learning pressure of art students?

Second, how to redesign classroom teaching according to the different needs of students, and use scientific methods to interpolate interactive technology into the digital media basic modeling course?

2 Literature Review

Students need a scientific teaching method to learn the basics digital media modeling at school. How to carry out digital modeling activities in the digital space is the main content of teaching. Interactive technology as an inevitable theme of the digital media profession needs to be discussed. The TAM model was introduced to understand students' attitudes toward interactive technologies.

2.1 Design Education

The foundation of digital media modeling will directly affect the study of digital media design for first-year freshmen. It needs students to put the traditional design modeling awareness on hold, understand what is the difference between digital space and real space.

Learn how to carry out conceptual modeling in digital space and physical modeling in real space, so as to make the connection between the digital world and the real world, and finally complete a design task. Corsini and Moultrie (2018) found that collaborative work with digital tools can provide creativity, and the use of more interactive digital production processes can drive creative production. Thoring, Desmet and Badke-Schaub (2018) pointed out in their research that there are five types of design space: Personal space, Collaboration space, Making space, Presentation space, Intermission space. The specific spatial environment helps to promote the designer's creative work and learning process, and it is important to be able to fluently convert space type and smooth workflows. In the field of design education in higher education, Jeffries (2007) designed a web-based creativity analysis tool from a quantitative perspective.

2.2 Digital Media Modelling

Digital media modeling mainly refers to the activities of designers using digital media for model, usually divided into concept model and physical model. Vardouli (2015) studied at how to look at human-artifact engagement in design activities from the perspective of design-communication-using three centers. Knight & Stiny (2015) explores the changes in design activities from shape grammar to design computing. Another group's research on making of and making for takes digital media modeling a step further. They separate information processing from material processing, and the digital media modeling process tends to be more traceable. (Gursoy & Ozkar, 2015). Even some research groups have developed a conceptual design model based directly on Scientific Ontology and intentionality theory (Chen, Zhang, Xie & Zhao, 2015), which can be used to test the conceptual basis of existing design methods or models. It can also be used to create custom concept design tools.

2.3 Interactive Technology

Interactive technology is an integral part of digital media modeling. In the information age, its main dependence is computer science, because designers have no other effective way to control design objects in the digital world except computers. Bernal, Haymaker & Eastman (2015) uses the power of computers to integrate different forms of design knowledge into the same platform. Some scholars have explored the human-machine design process by case studies, and through the three-layer framework of "imitation, iteration and improvisation", it is found that learn making and make learning is emerging in the process of making (El-Zanfaly, 2015). By studying the visual divergence of humans and machines, Sosa, Rojas, Gero & Xu (2016) developed a set of methods to define simple design tasks for research purpose.

2.4 Technology Acceptance Model

Technology Acceptance Model (TAM) is an evaluation model proposed by D. Davis (1985). It is mainly used to test the end-user's acceptance of information systems and the impact of system characteristics on user acceptance. Venkatesh & Davis (2000) also improved the model by adding seven factors to the original four factors. Subsequently, Legris, Inghamb & Collette (2003) conducted experiments using the new model and pointed out that there are important uncertain factors in the model. Taherdoost (2018) conducted a literature review of all Adoption / Acceptance Models, including TAM.

2.5 Fixation, Inspiration & Creativity

Fixation, inspiration, and creativity are three important indicators of design value. Among them, fixation may lead to design failure, inspiration may promote design success, and creativity can improve design quality and provide better solutions. Cheng, Mugge & Schoormans (2014) shows that using specific design strategies can break the fixed design thinking and enhance design creativity. Vasconcelos & Crilly (2016) also from a methodological perspective collated recent years research on inspiration and fixation in the design field. The study of idea generation and design fixation by Atilola, Tomko & Linsey (2016) shows that sketch representations can cause fixation and function trees can reduce idea fixation. Crilly & Cardoso (2017) through international workshop to further explore the fixation of creativity and inspiration.

3 Research Design

3.1 Research Framework

The core purpose of this research is to discover the role of interactive technology in digital media undergraduate design education, and to figure out the understanding and perceptions of interactive technology among junior college students in digital media major. Based on the discussion of related theories and concepts, the research summarizes two questions: First, the three indicator concepts in the teaching of digital media are fixation, inspiration and creativity, and good interactive technology needs to help students focus, inspiration and creativity in the course; secondly, according to the perspective of the technology acceptance model, students' perceived usefulness and perceived ease of use will influence their intention to use and usage behavior of interactive technology. This study needs to understand the students' perceptions and real use of the interactive technologies in current course and find out whether such influences also exist in digital media design education. Research design hopes to clarify the significance and value of interactive technology for digital media undergraduate design education based on these two issues. Therefore, the researcher developed the research structure as follows (Table 1).

Table 1 research framework

	Fixation (F)	Inspiration (I)	Creativity (C)
Perceived Usefulness (PU)	The practicality of interactive technology for students to reduce fixation	The practicality of interactive technology for students to get inspiration	The practicality of interactive technology to enhance students' creativity
Perceived Ease of Use (EU)	Interactive technology reduces the ease of use of fixation for students	The ease of use of interactive technology in getting students' inspiration	The ease of use of interactive technology as students enhance their creativity
Intention to use (IU)	Are students willing to use interactive techniques to reduce fixation?	Are students willing to use interactive technology to get inspiration?	Are students willing to use interactive technology to enhance inspiration?
Usage Behavior (UB)	Does the student actually use interactive techniques to reduce fixation?	Are students using interactive technology to get inspiration?	Whether students actually use interactive technology to enhance creativity

3.2 Method

This study used questionnaires to collect relevant research data to explore students' attitudes toward applying interactive techniques to the digital media basic modeling course. The design of the questionnaire consists of three parts:

The first part is basic information, including the student's gender, age, grade, and length of study.

The second part is the student's acceptance of interactive technology. Using the scale method, 12 questions (Table 2) are designed based on the concepts and contents involved in the research structure. This study used the Likert 5-point scale to survey students' recognition of problem descriptions.

Table 2 Items in the second part of the questionnaire

	Factor	Question
PU	Fixation	1. For me, interactive technology is not very useful.
	Inspiration	2. Using interactive technology can give me more inspiration.
	Creativity	3. Use interactive technology can enhance my creativity.
EU	Fixation	4. I can learn well without interactive technology.
	Inspiration	5. Interactive technology can easily inspire me.
	Creativity	6. Interactive technology can easily bring me creativity.
IU	Fixation	7. I don't want to use interactive technology.
	Inspiration	8. I want to try interactive technology to enhance my inspiration.
	Creativity	9. I want to use interactive technology to help me improve my creativity.
UB	Fixation	10. I did not use interactive technology for classroom learning.
	Inspiration	11. I used interactive technology to enhance my inspiration.
	Creativity	12. I used interactive technology to help me improve my creativity.

The third part is the student's comprehensive view of the digital media course, in the form of semi-open questions, allowing students to freely play their views on the topic. There are three questions: (1) If you think interactive technology is useless, describe why? Then what kind of use do you want it to be? How would you learn digital media basic modelling without using interactive technology? (2) If you think interactive technology is very useful, please list several places that you think it works, for example: why you think it can bring you inspiration and creativity. (3) If you use interactive technology to learn the digital media basic modelling, please briefly describe how you will use it, for example: how you can use interactive technology to enhance your inspiration and creativity.

3.3 Participants

The subjects are undergraduates the digital media art of class 2018 in a university with engineering background in Zhuhai, Greater bay area of China. Among them, 16 were boys and 19 were girls. They were between 18 and 20 years old; the ages are between 18 and 20 years old; they are currently in their first year, and they have been studying digital media design for less than one year.

3.4 Procedure of Questionnaire survey

The questionnaire survey of this study was conducted synchronously with the professional course "Digital Media Basic Modelling". This course involves 48 class hours. The course involves two interactive technologies processing and Arduino, corresponding to concept modelling and physical modelling. The course requires students to create an entity's

digital media modelling work in the form of a group. Questionnaires were distributed and collected through the online questionnaire platform. The quantitative data collected from the questionnaire were analyzed using SPSS 22.0, and the open questions were extracted by coding.

4 Results and Discussion

After the questionnaire is completed, they will be collected uniformly, the access permission of the online questionnaire will be closed, and the result of the questionnaire will be exported to XLSX format for subsequent processing. 35 questionnaires were issued, 35 questionnaires were returned, 35 valid questionnaires, and 0 invalid questionnaires. First of all, the questionnaire answers are processed separately in this study, and multiple-choice questions and short-answer questions are divided into two parts for separate processing. Secondly, according to the research framework, the factors are processed one by one.

4.1 Student acceptance of interactive technology

1. Perceived usefulness of interactive technology

Only one student made it clear that interactive technology is useless. The rest of the students said that interactive technology is useful for learning the digital media basics modeling, and one in four people made "very useful" choices. But almost all of the students said that "interactive technology helps to increase their inspiration and creativity". Even the one who opposed the interactive technology chose the answer of the positive attitude "agree".

2. Perceptual interactive technology ease of use

For the project, half of the students said that there is a close correlation between interactive technology and better learning digital media modeling, while the other half choose "no feeling". Among the questions about interactive design that can be inspiring, one-third of the students chose "no feeling", 1/3 chose "agree", and the rest chose "disagree". In the question about the interaction design that can bring creativity, basically the same as the previous question, in the question about the interaction design can bring inspiration to the person who chose "no feeling", also choose "no feeling" in the creativity question.

3. Willingness to use interactive technology

Except for one classmate who made it clear that he didn't want to use interactive technology, the remaining students made it clear that they wanted to use interactive technology. Among them, half of the students chose "completely disagree" and the other half chose "disagree". In the question of trying to use interactive technology to enhance inspiration and creativity, all students chose "agree", and one of them chose "completely agree" in the inspiration question, and two of them were chose "completely agree" in the creativity question.

4. Usage behavior of interactive technology

In the question of using interactive technology in the classroom, two-thirds of the students said they used interactive technology. In the question of using interactive technology to enhance their design inspiration and creativity, most students chose "agree", and only a few students chose "no feeling".

4.2 Students' comprehensive view of digital media courses

1. About the practicality of interactive technology

Most of the students' responses are positive, such as "I don't think interactive technology is useless", "I think interactive technology is useful", "useful" and so on. In addition, in the sub-question "What do you want interactive technology to use?", some students said that "I hope that through interactive technology can bring me more help in design" and "I hope to be able to use it in the classroom." Other students suggest "I hope to have some interactive devices for everyone to experience in the classroom." In the last sub-question, students said that if they don't use interactive technology, they will pay more attention to "using drawing software on the computer", "film, CG, animation, etc.", "photography or filming video microfilm", "Pay more attention to artistic modeling".

In general, the attitude of students to interactive technology is generally accepted, but the scope of interactive technology is not clear. The students' understanding of the basics of digital media shows a two-pole pattern, one end is interactive design, and the other end is film and photography.

2. About the ease of use of interactive technology

Nearly half of the students said that the interactive technology is very fresh, interesting and impression. In addition, some students mentioned that "can develop oneself very big imagination space", "I think it is very fun and lead to thinking, ..., so creativity is also improved." "This will make me think in many ways... There will be a lot of different inspirations in the process...and this is a process of creation itself, "I can think more broadly in an interactive world" and so on. Some students think that the interactive technology "can be more convenient to make... can create different things at any time, can modify the dissatisfaction", "thinking about the interaction mode will make me adjust the details of the work, maybe the inspiration will come out from the details I don't pay attention to", "Let me have more choices when I create."

In general, most of the students' ease of use of interactive technology is still in the stage of rational understanding. The understanding of interactive technology is mainly judged by their former own life experience, not the interactive technology itself, but they can still experience the convenience that interactive technology brings to their design activities.

3. About the usage behavior of interactive technology

In the question of how to use interactive technology, the students' answers lacked a sense of unity. Some students said that "to make our game more real and interesting, can interact with real people", and some students want to "do some small things that they can usually use in the dormitory, to facilitate themselves, and to add some fun to the dormitory life." Some students "hope that the teacher can take us to try to do a complete project, step by step to complete such a process." Some students want to "build an interactive design game", "pay more attention to visual beauty in their own designs", and "make a simple interaction behavior become interesting".

In general, students have their own unique ideas on how to use interactive technology, which can be roughly divided into three categories. The first category, independent, this type of students generally hope to use interactive technology to improve their design; the second category, explorer type, this type of students will try to use interactive technology to carry out design activities, but there is no clear Design goals; the third category, which requires help, this type of classmates need external assistance for learning interactive technology.

5 Conclusion

The survey results show that interactive technology is not only an integral part of the basics of digital media, it can also enhance design inspiration and creativity for first-year students who have just entered the campus. Not everyone accepts the introduction of interactive technology into the classroom, so students need to adjust the syllabus and change teaching methods. In addition, the scope and content of the interaction design is not very clear, and the corresponding knowledge points need to be covered in the subsequent courses. In the digital media basic modeling course, the practicality, ease of use and intention to use interactive technology are introduced. The students generally show a positive attitude and embrace the interactive technology rather than hostile attitude. This is similar to the previous studies. However, in terms of the use of interactive technology, the students' responses are slightly different. In addition to the regular use of interactive technology, there is a need to add more interactive devices in the classroom, and more technical assistance is needed from teachers. However, it is worth noting that almost all of the responses do not involve content that works with others, although the class is grouped in the very first time and the group continues until the end of the course. In terms of fixation, inspiration, and creativity, the most difficult problem to solve is still in fixation. Even if visual effects such as generative art, parametric design, and information visualization are introduced in the classroom, some students still maintain the attitude of “away from the computer and embrace the brush”. This is also the case when teaching related computer-aided design courses. The last problem found in the study was the relationship between interaction design, photography and film and television design. Some students don't know much about these concepts. They can only use the production tools to classify them, but they can't really understand these nouns, the meaning behind it and its historical roots are also the areas that need to be introduced in the future curriculum design.

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