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From Students, For Students: Exploring the Online Collaborative Design Education Method

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ABSTRACT

With the increase in internet technology and the impact of the COVID-19 epidemic, more and more online courses have gained popularity in recent years, and they are becoming an important component of higher education. Researches on online collaborative processes include team communication, sketching activities, and collaborator performance. Most previous researches have focused on revealing learning phenomena, while scientific solutions or logical explanations have often been neglected. This study designed a cross-cultural collaboration design course with SDGs as the theme and conducted an online teaching experiment. A total of 64 students from different fields participated. Then we invited 6 group leaders as representatives to conduct face-to-face personal interviews. By retracing the whole course process, we investigated the students' attitudes and opinions about the online co-design course and their preferences. The results show that students' attitudes toward online co-design tend to be positive. They believe that online collaborative courses help improve design efficiency. Especially after initial software training, most students found the online collaboration platform easy to use. However, they are also concerned about the current technology gaps, especially the inability to monitor students' real status, and the tendency of students to be inattentive or even absent, making collaboration difficult. In addition, the problem of network latency when collaborating with multiple people needs to be addressed. The results of this study can provide insights for future online design education practices, help improve the quality of design education and provide practical assistance to a wider range of practitioners in the design education industry.

Keywords: Online education, Design education, Collaboration design, Learner's need, ICT

INTRODUCTION

Co-design education is an approach that involves groups of learners working together to address a topic, complete a specific task, or create a targeted product or service. With the increase in internet technology and the impact of the Covid-19 epidemic, more and more online courses have gained popularity in recent years, and they are becoming an important component of higher education.

Typically co-design is a creative process based on teamwork, allowing different people to assess and solve a specific need based on their expertise (Roschelle, Penuel and Shechtman, 2006). It enhances staff initiative,

practice reflection, and design ownership. Considering that the future of co-design will be a close collaboration between all stakeholders in the design development process and a variety of professionals with mixed design or research skills. These team members may be cross-cultural, including disciplines, national cultures, worldviews, ways of thinking, etc. Today, we are also witnessing the realization of the ideas they proposed. A variety of new co-design languages for cross-cultural communication are gradually gaining high attention, and collaborative learning is one of the representative forms.

In terms of pedagogy, the collaborative design focuses on the development of cognitive, social, and aesthetic skills with students (Seitamaa-Hakkarainen, Lahti and Hakkarainen, 2004). Sociocultural skills and values, such as trust, competence, empathy, and openness, are expected to develop when team members are deeply involved and actively participate in each stage of proposing and solving problems (Dreamson, 2017), which are developed through the use of various interactions and communications. However, in existing online design courses, the progress of co-design has been limited by certain specific technical requirements. Nowadays, researchers have developed computer-aided systems to overcome the challenges of online co-design learning. Information and communication technologies (ICT) facilitate collaboration, communication, and interaction in online environments.

Advantages of Information and Communication Technologies in Design Education

With the increase in internet technology and the impact of the COVID-19 epidemic, more and more online courses have gained popularity in recent years and are becoming an integral part of higher education. At the same time, research has demonstrated that the use of ICT in online co-design has many benefits for design education (Lahti, Seitamaa-Hakkarainen and Hakkarainen, 2004). In design education, online collaboration technology allows for timely storage of operational steps, including offline collaboration, especially when design projects need to be reviewed, as the application has recorded information on every action and decision of all process visualization users, which helps other users to asynchronously review evaluation and deeper engagement (Drinkwater *et al*., 2004; Karakaya and Şenyapılı, 2007). Moreover, the design modification approach has become more straightforward and the collaborative decision-making process has been enhanced due to the richness of ways to support communication and communication media (Shao, Daley and Vaughan, 2007; Wang, 2011).

The Challenges of Online Collaborative Education

The use of ICT in online co-design does have many benefits for design education, but on the other hand, it has also been found that students show negative attitudes toward collaborative learning, and they often suffer from a lack of socio-emotional interaction and attention deficits. Many works of literature point out the negative student attitudes toward collaborative learning as a common phenomenon in higher education. Causes of negative

attitudes include equity issues such as task assignment, differences in learning styles, differences in communication habits, inadequate social skills, and incompatible values, among others (Pfaff and Huddleston, 2003; Ruiz Ulloa and Adams, 2004; Wen and Tsai, 2006; Espey, 2010). Therefore, in order to gain insight into the causes of problems that cannot be solved by current technology, teachers need to understand the opinions of students who experience difficulties and develop negative attitudes in online collaboration in order to minimize their negative emotions and enhance student engagement and learning (Dreamson, 2017).

METHOD

As shown in Figure 1, the study was divided into 3 phases. The first stage was course preparation, which required students to select topics in groups. The second phase is the formal course, where this study adds a collaborative component based on the Double Diamond Model of design thinking. The final stage was the feedback and analysis of the results, where in-depth face-to-face interviews were conducted with the course participants to understand the difficulties and real feelings that students encountered in the online

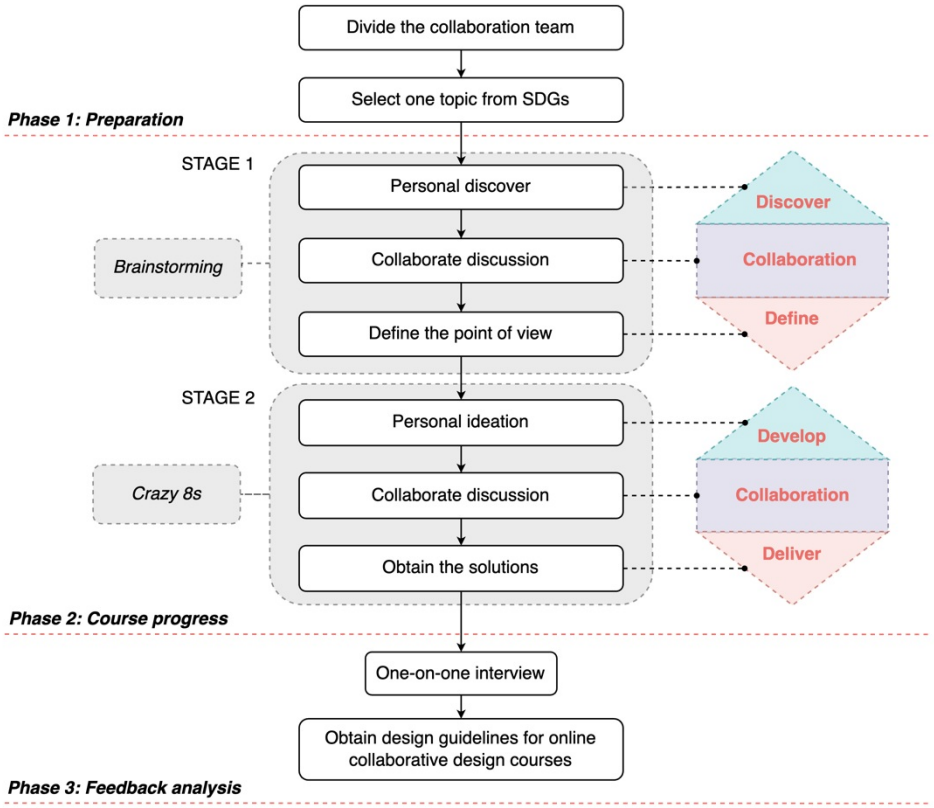

Figure 1: Collaborative design course experiment framework diagram.

collaborative design course, and basic generalizations were made. Finally, guidance suggestions for the online collaborative design course were given.

In summary, the task of this online co-design course is for participants to work in teams according to a specified procedure based on a course exercise template prepared by the instructor, resulting in a complete visualization of the design thinking process and the conceptual solution. The instructor will outline the task at the beginning of the course, remind and assist students in the collaborative process throughout the course, and provide a summary at the end of the course. The specific schedule for the online collaboration design course is shown in Table 1.

Participates

In this study, 64 participants with different professional backgrounds were invited. They included students from the Department of Industrial Design, Electrical Engineering, Creative Industries, Biotechnology, Taiwanese Literature, Economics, Social Sciences, Materials, Psychology, History, and Civil

Table 1. The schedule of online collaboration design course.

	Items	Item description
Day 1	Grouping	Students grouped freely. Choose a topic from the SDGs.
	Course explanation	Introduction of course topics and class flow.
	Personal brainstorming	Conducting data collection. Individual brainstorming to identify problems under the topic.
	Group working	Share individual brainstorming content in the group. Group members discuss together. Continue and add to the questions under the topic. Vote on the most valuable questions and compile them into a summary.
	Interim presentation	Each group presents their progress and gets feedback from the teacher and other groups.
Day 2	Course Review	Review the course content of day1. Introduce the objectives and time planning of this section of the course.
	Personal ideation	Personal quick association of 8 possible solutions or tools that can be applied.
	Group working	Share individual ideas within the group. Discuss and add more possible solutions to the group. Vote on and add to the list of possible solutions. Organize a more complete mind map.
	final presentation	Groups present their results.
Day 3	Submit the assignment	Complement and refine the course results and submit the assignment with a complete Miro link one week after the course.

Engineering. They were freely assigned into groups of four, and each group contained two or more collaborators from different fields, ultimately forming a total of 16 cross-disciplinary collaborative teams.

Procedure

The interview was conducted one week after the course ended at the Department of Industrial Design, National Cheng Kung University. Before the interviews began, participants were informed of the purpose of the interviews. Each participant signed an informed consent form and could withdraw from the interview at any time. In the beginning, the interviewer asked the interviewees to provide demographic information. Next, the purpose of the experiment was described to each interviewee. After revisiting the course session, participants were asked to share their attitudes and perceptions about online co-design learning. They were also asked to provide some of their own course suggestions at the end. The duration of each interview was approximately 30 minutes.

Data Analysis

In this study, audio recordings were transcribed verbatim for data analysis. First, open coding is applied. Words or meaningful units that were frequently mentioned by respondents were marked, extracted, and tagged with codes. Second, highly similar codes are categorized into parsed concepts by continuously comparing the data. Highly related concepts are further combined at a more theoretical and abstract level. for example, phrases such as "fast collaboration" and "easy to operate" are categorized as the theme of fast operation, which is a concept of perceived usefulness.

RESULT AND ANALYSIS

To explore students' attitudes toward online co-design learning, participants were asked to express their opinion about the online co-design learning. The majority of students expressed positive attitudes toward online co-design learning and the technology platform. They were further asked to specify the reasons or perceptions behind their attitudes (difficulties/barriers, likes and dislikes, and pros and cons). These reasons fell into facilitation conditions and barriers. A summary of these reasons and perceptions is shown in Table 2.

Participants in this study showed positive attitudes toward online co-design platforms. The reasons behind their attitudes included facilitating conditions and barriers. Detailed aspects of these reasons were also identified. Participants identified the positive usability of the online co-design platform as convenience and efficiency, helpful for epidemic and sick students, high efficiency, fast operation, powerful features, good presentation, low cost and environmental friendly. The collaborative platform is easy to use, changing text and layout on the collaborative platform is quick, and it does not take long to learn the software. Instead, major barriers include network environment issues, lack of monitoring capabilities, and easy distraction.

Table 2. Participant perceptions of online collaborative design platform.

Categories	Subcategories	Examples of selected quotes
Facilitating conditions	Convenience and efficiency	Do not spend a lot of time pasting sticky notes or connecting lines on paper
	Helpful for epidemic and sick students	Collaboration can be achieved anywhere, without risk of infection
	High efficiency	More efficient than handwriting, typing heh dragging modules
	Fast operation	Just drag and drop the window with the mouse, very effortless
	Powerful features	There are many templates and auxiliary functions that can be used
	Good presentation	Easy to organize and change, the final presentation is complete
	Easy to use	The operation of the collaboration platform is simple for students
	Easy to change programs	Changing text and layout in the collaboration platform is fast
	Easy to learn	Do not spend long time learning the software
	Environmentally friendly	Do not waste paper
	Low cost	Do not need to prepare materials in advance, the online platform is free
Barriers	Lake of pre-course training	I was a little anxious when I first used it, but after training I found it very easy and practical
	Network environment issues	If there are too many people online on the collaboration platform, there will be network latency
	Lack of monitoring function	Unable to see members' expressions and status, unable to confirm whether members are online
	Easily distracted	The switching of pages is convenient, but it is easy to be distracted by other pages

DISCUSSION

The main advantage of qualitative research is that it helps to gain a comprehensive understanding of the phenomenon, as it allows participants to express their attitudes and experiences in their own words (Coenen *et al.*, 2012). This study conducted a qualitative study using personal interviews to explore college students' attitudes and perceptions of online co-design education. Students' preferences for technology and course elements in operational exercises were determined. The results show that students' attitudes toward online collaborative design tend to be positive. They think that online collaborative courses help to improve design efficiency. After the initial training, most students found the online collaborative platform easy to use.

A noteworthy finding of this study is that pre-course training was a significant contributor to students' adoption of collaborative platform technologies in their online co-design courses. Most students who had no experience with online collaboration were initially intimidated by the course, as their unfamiliarity with the operation of the software led to anxiety. However, after familiarizing themselves with the basic functions of the collaboration platform, students were able to carry out the course tasks smoothly. They may even think that the online collaboration tool actually simplifies the operational tasks and is more efficient in terms of editing and layout. On the other hand, they were cautious about the constraint of online learning, believing that the current inability to monitor students' attendance status could easily lead to difficulties in course collaboration.

The solutions to these problems should serve as a major direction for future researchers. In the future, more relevant practitioners or experts can be interviewed to find implementable countermeasures to correct and improve the platform in order to enhance user experience.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

There are two limitations of the current study that should be addressed in future research. One of the limitations of this study is the sample size and number of participants; a larger sample size or in-depth interviews in focus groups may be able to enrich the results. Second, only one representative online collaboration platform was selected as the subject of this study, and multiple similar platforms could be selected for further in-depth comparative studies in the future.

CONCLUSION

As needs change and technology advances, using technology to create effective online learning environments or online education platforms is no longer an option, but an important new requirement for teachers. Effectively designing such a learning environment requires establishing a clear set of sessions, while also maintaining open lines of communication with students. This study enriches the emerging research on the adoption of online educational technologies by providing new insights into cross-disciplinary students' attitudes and perceptions of online collaborative courses and online collaborative technologies.

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