



Development and Evaluation of A New Studio-Based Course on Critical Design

Aykut Coskun

Department of Media and Visual Arts, Koc University, Istanbul, Turkey
E-mail: aykutcoskun@ku.edu.tr

Abstract. Although the last decade has seen critical design growing as an area of research, studies have rarely focused on how to teach it. Some design schools have established graduate programs and others have developed individual undergraduate courses on critical design. However, to date there has been no study that investigated student reactions to the learning of critical design. Addressing this gap, this paper proposes a new studio-based course at the graduate level aimed at providing students with a medium for critical discussion and creative reflection on contemporary social issues. Lectures, seminars and class discussions were used to instruct theoretical concepts pertaining to critical design, while a 10-week design studio project was used to concretize these concepts. The students' initial reactions to this teaching methodology was gathered through semi-structured interviews conducted at the end of the course. The interview results indicate that students had a very positive attitude towards critical design and the course. Furthermore, although understanding critical design was a major challenge for them, the teaching methods used in the course (i.e. lectures, critical design assignment and reflection paper) helped them overcome this challenge. Finally, this paper offers suggestions for design educators for constructing critical design courses that meet design students' expectations.

Keywords: *critical design; design education; design studio; design students.*

1 Introduction

“The world we live in today is incredibly complex, our social relations, desires, fantasies, hopes and fears are very different from those at the beginning of the 20th century. Yet many key ideas informing mainstream design stem from the early 20th century. Society has moved on but design has not. Critical Design is one of many mutations design is undergoing in an effort to remain relevant to the complex technological, political, economic and social changes we are experiencing at the beginning of the 21st century” [1].

Since the beginning of 21st century, computers and information technology have impacted many aspects of our lives including the way we communicate, socialize, work, travel, entertain, shop, and so on. These technologies provide us

with various benefits that improve our quality of life (e.g. smart cities, smart homes, smart watches) as well as creating new societal, economic and environmental challenges (e.g. data protection, privacy, global warming). Introduced to the design community by Dunne and Raby in [1], critical design encourages designers to explore our complex relationship with technology and put forward speculative and critical proposals that provoke questions and inspire debate about the consequences of rapid technological, social, political and economic developments, and environmental changes.

Previous work on critical design focused on exploring its definition, purpose and scope [2-4]; producing individual design projects that illustrate the notion of critical design in real-life contexts [5-9]; and integrating critical design into the design curricula through research programs¹ and studio-based design courses.² These efforts are valuable contributions that help teaching critical design to future designers, thus helping design “remain relevant to the rapid changes in 21st century”. However, teaching critical design is not a trivial task as it differs from traditional design practice in terms of its purpose. While the latter refers to design that supports the existing political, economic and social conditions, the former uses speculative design proposals that challenge these conditions, raise questions and provoke debate [7]. This difference can bring various challenges for students in learning about and practice critical design. Understanding these potential challenges and how to overcome them is key to improve current programs and courses as well as to inform the development of future courses on critical design. The current literature on critical design education lacks a study revealing these challenges. This paper intends to advance the current state by: 1) developing a new studio-based course on critical design, 2) evaluating it through student interviews, 3) revealing the challenges the students are faced with during this course, and 4) discussing techniques that can be used to overcome these challenges.

The critical design course was designed within Koc University’s Design Technology and Society PhD program. A total of eight graduate students entered the course in the Spring 2016 academic semester. The first part of the course was aimed at helping students gain a broader understanding of critical

¹ Graduate programs are: MA program in Design Interactions (Royal college of Art), MA program in Critical Design Practice (Goldsmith University of London) and MA program in Social Design (Design Academy Eindhoven).

² Studio courses are: Design Fiction – Speculative and Critical Design (Australian National University School of Art), Open Critical Design Studio (Ontario College of Art and Design University), and Critical Design Practice (University of California-San Diego).

design with the help of lectures, readings, seminars, class discussions and assignments on critical design. The second part was aimed at providing them with the opportunity to put their theoretical knowledge into practice by engaging in individual critical design projects. The second part utilized individual and peer critiques, student presentations and reflection reports as teaching media. At the end of the course, semi-structured interviews were conducted to gain the students' insights into the topic of critical design, the course and the teaching media used, with the aim of identifying the challenges the students faced in the course and to hear their suggestions about possible changes in the course that could be made.

This paper first presents a detailed account of the course structure along with the teaching media used. Then, it reveals the students' assessment of the course in the form of overall insights on course structure, challenges they faced throughout the course, how the teaching media helped them overcome these challenges, and their suggestions for improving the learning experience. The paper ends with a discussion on the implications for the critical design education derived from the instructor's reflections and student interviews.

2 Critical Design Course

The course was offered at the Koc University's Design Technology and Society PhD Program (DTES) in the 2015-2016 Spring semester, as an elective course with 4 ECTS credits. Being established in 2011, DTES focuses on the interrelationships between design, society and technology. The aim of the program is to educate scholars and professionals who use interdisciplinary thinking skills to develop new approaches to the utilization of technologies and digital products in the 21st century. The program accepts MA and PhD students from various design backgrounds, including, but not limited to, industrial design, interaction design, experience design and visual communication design.

The course is aimed at providing students with a medium for critical discussion and creative reflection on contemporary issues. The learning outcomes were:

1. having an awareness of critical design and the critical design process;
2. being able to observe and analyze how the material world shapes our relationships with a critical eye;
3. learning how to reflect on contemporary social issues through critical design.

The course duration was 15 weeks and attracted the participation of eight PhD students: four with a BSc degree in industrial design, three with a BSc degree in visual communication design and one with a BA degree in graphic design. Each student had experience in design and had experience in exploring and defining

problems, generating solutions, and testing, iterating, revising and implementing these solutions.

2.1 Teaching Methodology

Before developing the course, the existing critical design courses and research programs mentioned in the introduction section were examined. The main teaching methodology for both programs and courses was integrating critical design theory with critical design practice. Both aimed to provide the students with a broader understanding of critical design and to give them the chance to implement the theoretical knowledge they gained through projects. The projects involved research, the selection of an issue based on this research and responses to this issue through critical design. The main difference between individual courses and research programs is that the former are taught at undergraduate level and include shorter design projects.

The proposed course is similar to these courses in terms of integrating theory with practice in one course, but it differs from them in terms of including: 1) a ‘critical design analysis assignment’, asking students to critically analyze two previous critical design examples, 2) peer critique sessions that allow students to receive feedback from and give feedback to their class mates, and 3) a reflection report asking students to write a report reflecting on their design process. Besides these three components, a variety of media was used throughout the course, including lectures, class discussions, video seminars and presentations, as shown in Table 1.

Table 1 Teaching media used throughout the class.

Teaching media	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Lectures		x	x		x										
Video seminar			x												
In-class exercises	x				x										
Presentations	x			x		x	x	x							x
Individual critiques									x		x		x	x	
Peer critiques										x		x			
Reflection reports															x

2.2 Course Structure

The course was divided into two parts. The first part was structured as an introduction to critical design following a didactic approach. During this five-week period, the students engaged in class discussions led by the instructor that were supported by readings, a guest lecturer, a video seminar, and an assignment. The second part was structured as a ten-week critical design project in which an experiential approach [10,11] and a studio-based pedagogy [12,13] were adopted. The aim was to help students practice what they had learned in

the first part, to test their ideas, to receive feedback from their tutors and their peers, to reflect on their design process and to learn through this reflection. Studio-based teaching has been the major teaching medium for design disciplines (architecture, industrial design, graphic design and such) since the 1930s. In a studio-based environment, design students are: 1) given an open-ended assignment aimed at addressing a complex and heterogonous problem, 2) asked to offer solutions to this problem through a series of iterations guided by frequent critiques from instructors, peers and other experts, and 3) encouraged to reflect on their process so that learnt skills and acquired knowledge can be used in following assignments [12].

The project was carried out in seven stages – *define, discover, synthesize, generate, refine, implement* and *reflect* – which were devised in line with the design methodology proposed by Zimmerman, *et al.* in [14]. This methodology is deemed suitable for critical design in that both have a similar purpose, that is to achieve a shift from a current state to a preferred state by exploring how things could be [4]. Students performed these activities mainly in the design studio of the DTES program. This studio provided them with individual spaces where they could conduct desk research, sketch, ideate and so on, a shared space where they could present their ideas and receive feedback, as well as a workshop space where they could rapidly prototype their ideas.

2.2.1 Part 1: Introduction to Critical Design

The first part of the course included five sessions. The first session was a short introduction to the course outline, readings and assignments. After this introduction, the students performed an in-class exercise. Working in pairs, they selected a social issue they found important and thought about why this issue is important and how they could increase people's awareness of it through design. Pairs presented their ideas to the class followed by an interactive discussion. The second session was a short introduction to critical thinking. A guest lecturer from Koc University's Department of Philosophy gave a lecture on critical thinking, with a specific focus on the irrational and rational ways of thinking that govern our decisions.

The third session was an introduction to critical design. As there is an ongoing debate on the definition and scope of critical design, and those involved have yet to refine and agree upon a definition, students were given three readings that provided various perspectives on critical design [3,7,8], and watched a video seminar [15]. The aim was to show this variety to the students and to encourage them to find their own interpretation of the topic. The session included an interactive discussion around the definition of critical design based on the readings and the video seminar. At the end of the third session, a critical design

analysis assignment was given. This assignment asked students to search the course materials (readings and seminar) for critical design projects, select two examples (one they found successful and one they found unsuccessful), and analyze these examples according to questions below:

1. What is the problem on which the example focuses?
2. How does it deal with this problem?
3. Do you consider this to be a good example of critical design, and if so, why?
4. How would you approach the same problem?

The purpose of this exercise was to develop the students' skills in critical thinking and to help them discuss the concepts pertaining to critical design through the use of examples as a reference point. The session included a student presentation of the assignment followed by an interactive class discussion.

The fifth session was an introduction to the critical design process. Based on the assigned readings [4,16] an overall process framework was introduced to the students. This framework proposes a seven-staged design process: *define*, *discover*, *synthesize*, *generate*, *refine*, *implement* and *reflect*. The session also included an in-class exercise. By using the framework as a reference point, the students began analyzing social issues, selecting and defining their focus.

2.2.2 Part 2: Critical Design Project

The second part of the course included ten sessions. Between session 5 and 6, the students analyzed contemporary social issues and selected an issue on which to work (*define*), having been given no specific brief for the project. Session 6 involved a presentation of their analysis and an interactive discussion. Then, the students conducted a literature search and user studies to make themselves familiar with the selected issue, and uncover any opportunities that may lead to design solutions (*discover*). During this phase, besides key readings, the instructor provided students with additional readings depending on their project topic and encouraged them to share any material that may be relevant for the projects of others. In doing so, a Google Drive folder was created for each student allowing anyone to access it and add papers. Session 7 involved student presentations of their research findings and an interactive discussion.

After assessing the findings of the discovery phase, the students determined several intervention points (*synthesize*) between sessions 7 and 8. Then, an interactive discussion on the research findings and intervention points was conducted. Following the *synthesize* phase, the students started generating multiple ideas for each intervention point (*generate*). Starting from these sessions, the students received feedback through critiques, with two different

techniques employed, based on the framework proposed by Oh, *et al.* in [17]. The first technique is individual critique, where the instructor makes individual critiques of each student's work. This method is regarded as the most effective way for an instructor to monitor each student's progress over time [18]. The second technique involves group critique sessions in which the instructor has a rather passive role and encourages students to criticize each other's works, i.e. peer critique. This method provides students with the opportunity to learn from each other and in such a setting the students benefit significantly from interacting with their peers as they share interests and problems [13]. For the ideas they generate, the students received individual critiques from the tutor in session 9, and peer critiques in session 10.

Following the first idea-generation phase, the students selected one promising idea and refined it further (*refine*). In session 11, they received individual critiques from the tutor. In session 12, they received peer critiques. Between sessions 12 and 14, the students realized the selected idea through the creation of conceptual prototypes (*implement*). In session 13-14, they received individual critiques from the instructor.

In the last session, the students presented their final concepts to the other students taking the class as well as other students from the PhD program. The project ended with the submission of reflection reports, which summarized the students' reflections on their projects in terms of their design intent, the problem they investigated, the process they followed and the design solution they offered (*reflect*). The purpose here was to encourage them to reflect on their own design process and learn through this reflection.

2.3 Generated Concepts

At the end of the course, the students developed eight different conceptual designs. Although describing and assessing the processes of each of these concepts would have a great value in terms of understanding how the course changed the students' cognitive experiences while ideating [19], this section will only describe each concept briefly as such an analysis is beyond the scope of this paper.

As the students were free to choose any topic of interest, the projects touched upon diverse issues, including sharing, privacy, healing, immortality, time, perception of social robots, obedience, and food consumption. While some students chose to modify existing products with the touch of a critical design to address a contemporary issue ('Love and Privacy', 'Time Bottle', 'Untitled', 'Not-book', 'Criche'), others chose to create new products to speculate on possible future scenarios ('Friend', 'Healing Box', 'Bettle').

The first concept, ‘Friend’, is an electronic device belonging to a larger network system that aims to connect users for motivating them to share their products with others. This concept criticizes people’s tendency to abandon fully functional products, a major problem for sustainable design, and explores how we can encourage sharing through design. The second concept, ‘Love and Privacy’, is a head-mounted projection patch showing others’ personal information to the viewer. Exploring the relationship between technology and privacy, this concept speculates on what happens if augmented reality applications let users invade privacy only if everyone is aware of the situation (Figure 1).



Figure 1 Friend (Sergin Keyder) & Love and Privacy (Çağlar Genç).

The third concept, ‘Time Bottle’, is a water bottle that can regulate the amount of water according to the time spent in social media during work hours. This concept criticizes people’s tendency to spend too much time in social media, inefficient use of time as a resource, and explores how we can visualize time for creating an awareness of the fact that time is a type of currency. The fourth concept, ‘Untitled’, is a social robot with an abstract appearance but with human-like behaviors. This concept criticizes the field of robotics for its tendency to design human-like social robots, and explores how we can design an abstract robot for social settings (Figure 2).

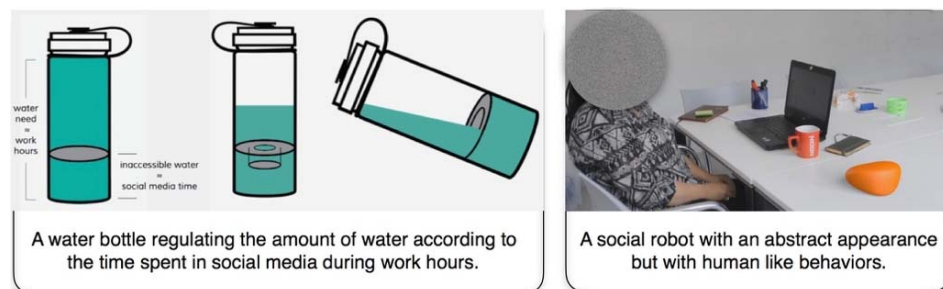


Figure 2 Time Bottle (Selman Yüçetürk) & Untitled (Muhammet Ramoğlu).

The fifth concept, ‘Healing Box’, is a cloud system aimed at helping individuals who have gone through an emotional break-up, which focuses on the relationship between technology and psychological well-being. This concept explores how technology can be used to heal people. The sixth concept, ‘Not-book’, is a notebook consisting of various cards that illustrate obedience with various examples. This concept criticizes people’s tendency to obey rules and norms without questioning them, and explores how we can create awareness of everyday life obedience (Figure 3).

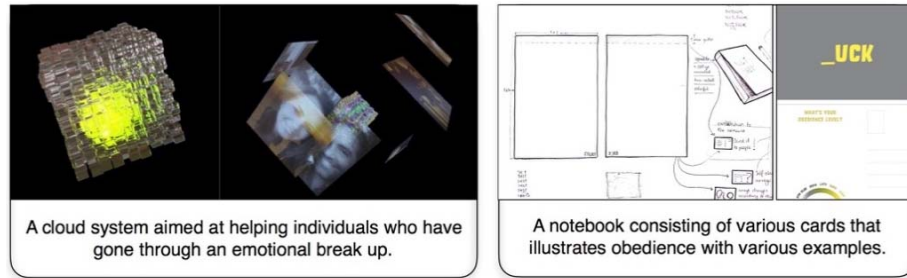


Figure 3 Healing Box (İşıl Döneray) & Not-book (Doğa Çorlu).

The seventh concept, ‘Bettle’, is an affordable and user-operated medical device that allows people to renew their cells by using stem-cell application. Focusing on the relationship between humans’ desire to live longer and the accessibility of available services, this concept speculates on whether it would be possible to make immortality affordable through design. The last concept, ‘Criche’, is a 3D printer that uses cricket powder and algae as ink. This concept criticizes current unsustainable food consumption patterns and explores how design can help create an appetite towards unconventional food (Figure 4).

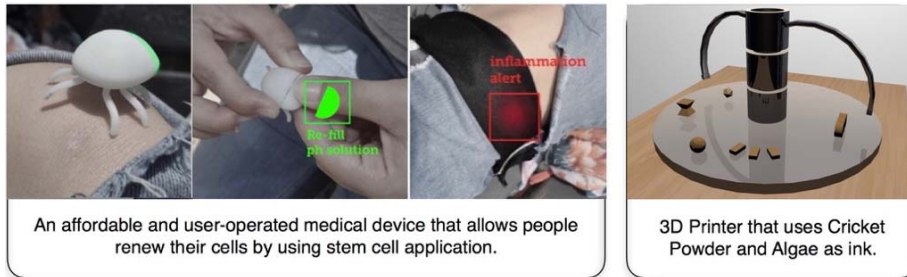


Figure 4 Bettle (Gülben Şanlı) & Criche (Damla Çay).

3 Evaluation of the Course

Evaluation of the course was done through semi-structured interviews with students. The purpose was to gain the students’ insights into the topic of critical

design, the course and the teaching media used, with the aim of identifying the challenges they faced in the course and to hear their suggestions about possible changes to the course that could be made.

3.1 Semi-Structured Interviews

Semi-structured interviews were conducted by the instructor between 15 and 19 June 2016. Participation was voluntary and the students were already aware of their grades before the interviews. The instructor reminded them that their willingness to participate and their responses would have no effect on their grades, encouraging them to articulate their thoughts about the course freely. The interviews included seven questions (Table 2).

Table 2 Interview questions.

No	Question
1	What is your overall opinion of the course?
2	What challenges did you come across during the course? How did you respond to them?
3	Which project phase was the most challenging to you? Why?
4	Which of the teaching materials used in the class did you find more useful/less useful?
5	If you were the instructor of this course, what you would change?
6	What do you think about the concept of critical design?
7	Would you consider applying this concept in your future projects?

These questions were supported by probes to gain a deeper understanding of their experience. Each interview took approximately 30 minutes, and the interviews were voice-recorded and analyzed through qualitative coding [20]. First, the recordings were transcribed into text, after which the instructor read the full transcripts to familiarize himself with the data. He started coding each question following a deductive approach, using a pre-determined list of codes: attitudes (students' positions regarding critical design and the course), perceived benefits (of taking the course and teaching methods), challenges (difficulties students faced during the course) and suggestions (student suggestions on how to improve the quality of the course). The instructor re-coded each category following an inductive approach, with codes derived from the data. For instance, when categorizing the challenges, four new subcategories emerged: understanding what is critical design, giving feedback to peers, conducting desk research on a social issue, and deciding on the right intervention.

Overall, the results showed that students had a positive attitude towards the course and critical design. They found the course and the teaching media useful. They were faced with several challenges during the course. Looking at the perceived benefits of the course, it appears that the course was successful in term of addressing the learning outcomes. Table 3 gives a summary of these results along with the number of students who made the assessments.

Table 3 Summary of students' assessment of the course.

Assessment dimension	Students' assessment (number of students)
Attitude towards critical design	Positive (n:7)
Attitude towards the course	Positive (n:8)
Benefits of the course	Increase awareness of critical design (n:4) Increase competence in performing critical design (n:4)
Benefits of the teaching media	Understanding critical design Readings (n:4) Class discussions (n:4) Seminars (n:4) Understanding the critical design process Reflection paper (n:4) Critical design assignment (n:2) Opening up new perspectives to a given problem Critique sessions (n:5)
Challenges	Understanding critical design (n:7) Giving feedback to peers (n:4) Conducting desk research on a social issue (n:2) Deciding on intervention points (n:2)

3.2 Attitudes to Critical Design

The students had a positive attitude towards critical design, although nearly all (seven students) thought that it was a more suitable approach for projects related to design exhibitions, fairs and biennales than for research. Of the total, two stated their intention to integrate the approach into future research projects, but stated specifically that it could be a supportive element to their overall research framework, e.g. identifying overlooked parts of a problem area and raising new questions. The students often compared the practice of critical design with professional design practice, and found it more enjoyable and less stressful. Five of them appreciated the freedom provided in terms of the type of problem, the type of solution (a solution can be a scenario, a product, a video or a statement) and the number of design considerations dealt with to solve the problem. Three of them liked the emphasis on raising questions and discovering overlooked problem areas rather than finding the right solution. Two appreciated the addressing of social problems and the belief that design could actually have a positive effect on people's opinions.

3.3 Perceived Benefits of the Course

The students had a positive attitude towards the course as well, stating that the main contribution of the course was raising their awareness of critical design, learning how to do it, and practicing it as part of a studio project. Four students who had no previous knowledge of critical design said that the course had

increased their awareness, and two of these indicated that the course had provided an additional layer to their design knowledge in that they had started seeing and assessing things from a critical design perspective. The remaining four who had previous knowledge of the concept of critical design and had experienced several examples, stated that the course had increased their competence in critical design projects and served as a reminder of the significance of critical thinking in design.

Another perceived benefit was the ability of the technique to uncover overlooked problems and issues in the students' PhD studies. This was especially evident for a student whose project was focused on an issue that he was already exploring. The following quote illustrates this:

*'It [the course] revealed a significant concern for my PhD research. I am working on head-mounted displays used in social settings. So far, I have been mostly dealing with problems related to usability and feasibility. I never thought that privacy could be a major issue for such displays. The course helped me discover this'.
(Student 2)*

3.4 Perceived Benefits of the Teaching Media

The students appreciated the fact that the course structure integrated theory with practice and stated that the course had helped them develop an understanding of critical design and gave them the opportunity to apply the approach to a problem area that they were able to choose for themselves. They found the most useful teaching media to be readings, class discussions and peer critiques, stating that the readings and class discussions were particularly useful in understanding critical design (four students), serving as a base knowledge database for peer critiques (three students), completing the critical design analysis assignment (three students), and initiating their desk research (two students). As for the critiques, the students came to understand the different roles the two critique methods had on their learning. They thought that individual critiques helped guide their design process when they felt lost and served to frame and scope the problem area, but most found the peer critiques to be more useful. Specifically, they found the peer critiques to be useful in:

1. Opening up new perspectives to a given problem, resulting from a group of people with different perspectives commenting on a project (five students);
2. Learning from others' mistakes (one student); and
3. Providing the opportunity to criticize one's own work in an objective way (one student).

Of the total, four students indicated that the reflection paper contributed to a better understanding of their design process. They said that this understanding had helped them to see problems and to come up with methods to resolve them; strengthened their decision-making mechanism; and allowed them to perceive their strengths, weaknesses, regrets and wishes. Speaking about the critical design analysis assignment, two of the students indicated that it contributed to a better understanding of critical design processes, especially when they were able to find detailed information on the design process behind the examples. Finally, four stated that the critical thinking seminar had been useful in introducing the concept of critical thinking, while the other four said that the seminar had not helped them connect critical thinking with design.

3.5 Challenges

3.5.1 Understanding What Critical Design Is

The students indicated that one of the hardest tasks was to gain an understanding of critical design. They gave three reasons for this. Firstly, three students thought that the proximity of critical design to art makes it very difficult to distinguish between the two; secondly, two students thought that the different approaches to defining critical design makes identifying what critical design is and what it is not even more difficult; and thirdly, two students said there was a lack of explicit focus (any social issue can be a topic of critical design) and a specific method (there are many ways to critique an issue through design).

They emphasized that these issues had been a major problem, especially at the beginning of course. In time they were able to establish an understanding of critical design with the help of readings and class discussions (four students) and the critical design analysis assignment (two students). While the readings and in-class discussions provided a definition of critical design and its related concepts, analyzing previous critical design examples helped students understand “what a critical design project is” and “how others have done it”. The students revealed that before choosing examples for the assignment, they reviewed many critical design examples that helped them “...understand the scope of critical design and how it is performed in real life.” (Student 1) Furthermore, three students indicated that the combination of readings and the assignment was crucial at this stage, claiming that without knowing the concepts related to critical design, analyzing the examples would be challenging.

3.5.2 Giving Feedback to Peers

The second common challenge was the critiquing of each other's work. Although the students found peer critiques very useful, three stated that they had difficulty giving critiques to others. Two of them believed that this difficulty was based on the cognitive load of adapting oneself to different projects. Throughout the course, each student was working on a separate topic, and they were required to critique each other's work in each peer critique session. They reported that trying to understand the scope of each project and the proposed solutions was too tiring for them. The second given reason was the lack of previous experience and knowledge of each other's topics (two students), which led them to believe that their feedback would be less useful for others than the instructor's feedback. In fact, two students claimed that this lack of experience and knowledge reduced the quality and usefulness of the feedback. Another mentioned that, when taken as a suggestion, these critiques carry the risk of directing the student along an undesired path:

"They [peer critiques] are great, but there is also a risk. I was working on how technology can help people heal, a topic that I had made no research about before. So, when critiquing my work, others needed to be knowledgeable about the topic, as otherwise a suggestion may have led me along an undesired path. As such, the instructor's role is very important in preventing this from happening." (Student 8)

Despite these challenges, the readings, class discussions and the assignment appear to have been helpful in the peer critiques. Of the students, three said that the readings and class discussions had served as a base knowledge database for peer critiques; and two reported that the assignment had strengthened their critical thinking and their ability to criticize each other's works. They stated that the questions "Do you consider it to be a good example of critical design? Why?" and "How would you approach the same problem?" helped in this respect. They thought that answering these questions served as a form of critique, similar to what was expected from the peer critique sessions.

3.5.3 Conducting Desk Research on a Social Issue

The students had difficulty conducting desk research in a domain in which they were not familiar. For example, two of the respondents stated that although working on a social issue was interesting for a design student, they claimed that a thorough understanding of the problem area is crucial in creating a good solution. They underlined that as they had no prior training in social sciences, it took significant amount of time for them to gain a broad understanding of the social issue they were exploring. They indicated further that the additional

readings provided by the instructor to the students related to their topics were helpful in overcoming this challenge and helped initiate their research, saving a significant amount of time.

3.5.4 Deciding on Intervention Points

The final challenge reported by the students was deciding on the right intervention points, i.e. potential areas where the students can come up with a design solution (two students). They indicated that during this selection, they had to consider whether the solution could be an example of critical design, while also considering other common selection criteria used in idea generation, including technological feasibility, ease of use, functionality, etc. They claimed that as they had difficulty in defining what critical design is, this additional criterion made the selection process more difficult. One student indicated that the peer critique sessions helped them to decide on the right intervention, as they provide an opportunity to hear the opinions of others on the same topic.

3.6 Suggestions from Students

The students also shared their suggestions on how to improve the learning experience. Instead of working on separate topics, two students said that there would be benefits to the entire class working on the same topic. This would involve choosing a topic, conducting research on this topic and choosing intervention points as a group, but developing individual projects in response to different intervention points. They said that this would help in the peer critique stage, in that the more knowledgeable they become about the problem as a class, the more confident they may feel in giving and receiving critiques. Another suggestion was to conduct several short projects rather than focusing on one larger project, in that they believed this would help them try different methods and topics in critical design.

4 Conclusion

Although the research on critical design has grown significantly within the last decade, studio courses on critical design, in which students have a chance to learn the theory of critical design and practice it, are still rare. The proposed course provides a great opportunity to increase the number of studio-based courses on critical design. More importantly, this paper illustrates that integration of the critical design approach into design curricula could bring different challenges for design students. The identified challenges were understanding what critical design is and what it is not, criticizing others' work and receiving critiques from them (peer-critiquing), conducting desk research on a social issue and deciding on design intervention points. Relying on the instructor's own reflections and the semi-structured interviews with the

students, the remainder of this section gives recommendations on how these challenges can be overcome and presents implications for critical design education.

A studio-based course appears to be a suitable choice for the integration of critical design approach to design education. However, in such a setting, the combination of theory and practice is essential to enhance the learning experience of the students. The study revealed that these two factors appear to be inseparable components in the teaching and learning of critical design. Although students believe that engaging in a critical design project contributes more to their learning than reading about critical design, fundamental knowledge of critical design acquired through key readings, discussions and an analysis of key examples is often considered a prerequisite for engaging in critical design.

For a studio-based course combining theory with practice, the balance between these two is important. In the scope of the proposed course, the time allocated for the critical design project (practice) was twice the size of the introduction part (theory). Five weeks' introduction seemed to be sufficient for students to gain a broad understanding of critical design. However, the project duration would have been longer. For instance, students had only two weeks to conduct research on their selected project topics. When they engaged in a topic of which they had no previous knowledge, finding the right resources could be very challenging within the given time. To facilitate this process, a Google Drive folder was created containing additional readings provided by the instructor and the other students were also encouraged to contribute. The interviews showed that this technique was useful for the students.

The most common hurdle encountered by the students was understanding the nature of critical design. This may be attributed to the fact that literature on critical design has not yet provided a precise and agreed upon definition. The interviews showed that the readings, class discussions and the critical design analysis assignment helped students overcome this challenge. While the readings and class discussions gave them the breadth of related concepts and definitions, analyzing previous examples contributed to a detailed understanding – i.e. “what is a critical design project” and “how others have done it”. Thus, the critical design analysis assignment served its purpose, giving students a better understanding of an approach without an agreed upon definition.

Individual critiques and peer-critiques were essential elements of the course. The advantages of peer critiques are evident: they open up new perspectives to a given problem, help to learn from others' mistakes and provide an opportunity

to criticize one's own work in an objective way. However, these advantages can be suppressed by the students' concerns related to the high cognitive effort required to critique several projects in one session, the lack of previous knowledge and experience in the project being critiqued, and the quality of feedback received from their peers. Structuring the course around a theme (e.g. privacy issues in public displays) and engaging students in group work, particularly in the initial stages of a project, could help reduce the negative impact these concerns may have on the learning experience. That said, whether the students work as a group on one themed project or work individually on different projects, the instructor's moderation of the peer critique sessions is essential, as this will ensure that the students receive useful feedback. In the scope of this course, all the peer-critique sessions were moderated by the instructor. However, this moderation was very challenging since some students seemed to be offended when they received negative feedback from their peers. Delivering a short lecture on the nature of giving and receiving critiques prior to the project would have helped overcome this challenge for both students and the instructor.

Finally, the students taking part in the course all came from a design background, which could be an advantage when the course involves idea generation, an activity design students have experience with. Having a more heterogeneous group of students from a broad range of disciplines, such as psychology, philosophy, engineering and biology, may contribute to the exploration of different possibilities. Future studies on this theme may include investigations of how an interdisciplinary team of students would influence the student learning experience.

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