WERE WE READY TO TEACH IN TIMES OF SOCIETAL CRISIS? LESSONS LEARNED FROM A PRACTICE-BASED DESIGN ENGINEERING COURSE

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ABSTRACT

In March 2020, the Corona Virus Disease 2019 (Covid-19) outbreak forced the Dutch Government to close the schools at all levels to fight the spread of the virus. Immediately, education at the University of Twente was suspended, and all on-campus teaching had to be transferred to online platforms. It soon became apparent that conducting an online assessment, especially in practice-based courses, was challenging. This paper reports the challenges that were faced in the online student assessment of one of those courses. The topic of this paper is a third-year Industrial Design Engineering bachelor's course that employs peer assessment to teach industrial design engineers (IDEr) the importance of user testing of physical products in the design process. Unfortunately, this type of assessment, which had initially been planned synchronous and in-class, had to be adapted to the 'new normal'. While the test results showed that students could accomplish online peer assessment, the results of an online survey carried out with 24 students illustrate the multitude of challenges students faced. In the paper, I reflect on the lessons learned from the online peer assessment experience and provide suggestions for similar industrial design engineering courses of higher education.

1 INTRODUCTION

More than a year has passed since the World Health Organization announced that the new coronavirus resulted in a global Covid-19 outbreak. Immediately afterwards, governments began to announce their measures to tackle this global challenge. On March 13, 2020, the Dutch Government announced lockdown and suspension of education at all levels. Higher education had to move off-campuses, and academics had to find ways to continue education online. While the new situation pressured academia to find creative ways of teaching and testing, students had to cope with the uncertainty created by this transition in education.

Equipping the students to be critical and independent evaluators of their and others' works, higher education prepares them for the world's changing values [1]. However, the Covid-19 pandemic illustrated that higher education itself was not ready for the unexpected changes. As a result, many academics struggled to find alternative ways of transforming teaching and testing to online platforms, which sometimes resulted in downsizing higher education ambitions.

The paper's subject is a practice-based experience design course offered in the third year Industrial Design Engineering (IDE) bachelor's programme in one of the high-ranked Dutch universities. One of the course goals is to teach future IDErs how to test the designed experiences with users. To this aim, the course replicates user-testing and prepares the students for real-life testing in peer assessment. In this form of testing, the students test and evaluate each others' experience design prototypes, and provide feedback.

Unfortunately, only six days were left to the in-class peer assessment activity when the Dutch government announced the lockdown. Immediately, the course faced the challenges of online peer assessment. Some students were not ready to present their product prototypes, while others depended on pitching their ideas to their peers during the peer assessment.

This paper reports the changes enforced in the online testing of the aforementioned practice-based experience design course. It reflects on the effects of those changes and reports 24 students' views on how the Covid-19 crisis affected their assessment results. In the end, I provide suggestions for online peer assessment practices of practical courses of higher education.

2 EXPERIENCE DESIGN AND ASSESSMENT IN DESIGN ENGINEERING EDUCATION

2.1 Design and Meaning: The Experience Design Course

The context of this paper is a 2.5 ECTS, third-year industrial design engineering course. Before taking the course, all students take the same courses, except their one semester of minors studies. Therefore, the entry-level of all students who take the course is considered equal.

This practice-based course focuses on the role of human-centred design at various levels of people's experiences with products and systems. The course is designed as an experimental course, in which students get acquainted with the theory that unfolds people's meaningful experiences with products. The goal of the course is to recall the student's human-centred design knowledge and incorporate the theory by using their sketching, product design, prototyping and critical thinking skills. In addition, the course aims to help students (1) identify opportunities to influence and design for people's experience and (2) design and test a product by evaluating the relevant theory of design for experience [e.g. 2]. In that sense, the course helps students comprehend the product qualities that create meaningful human experiences through design.

During the course, around 20 hours in total is taken up by lectures, feedback sessions and prototyping workshops. The course is designed to spend the rest of the course hours on research, design, prototyping, and preparing the deliverables.

2.2 Peer Assessment as Testing Experience Design

The course of this paper is ambitious about teaching how to design products that create meaningful experiences for their users. A body of knowledge brings out the importance of product qualities on people's experiences with products and their connection with their contexts [2]. Meanwhile, several attempts have been made to develop an agenda for integrating this knowledge into industrial design education [3, 4]. While it is already challenging to assess design works in higher education, users' subjectivity and uniqueness make the assessment even more challenging for teachers.

There are several assessment methods that teaching experience design courses significantly benefit. Peer assessment is one of those activities [5, 6]. This type of evaluation aims not to end up with a grade but to promote student learning [7]. By definition, this type of assessment requires the students to 'showcase' what they learned rather than 'repeat' what they learned or memorized [8]. This type of assessment can be time-consuming [9], while it perfectly fits teaching user experience design goals. It measures the outcomes of the experience-design process and improves students' evaluation skills by being critical about the work of both others and their own [10].

The topic course of this paper is the first course of the relevant IDE educational programme, in which 'peer-testing of prototypes' is employed as an assessment method. Students first carry out research and understand the experience they would like to design (Figure 1) in the first three weeks of the course to facilitate this type of learning. Following, they (1) design a product that enriches the human experience, (2) prototype the product, (3) bring the prototype to the class. Finally, in week 6, during an in-class peer assessment activity, students (4) act as the users of the designed experiences and (5) test and assess the products according to the experience design goals. During in-class peer assessment activity, students undertake two roles: a designer and an expert user. As expert users, students test the designed product by using the knowledge they gain in the course. As expert users, they provide (and write) constructive feedback to the designer group. At the end of the course, they submit a visual essay to document their design process.

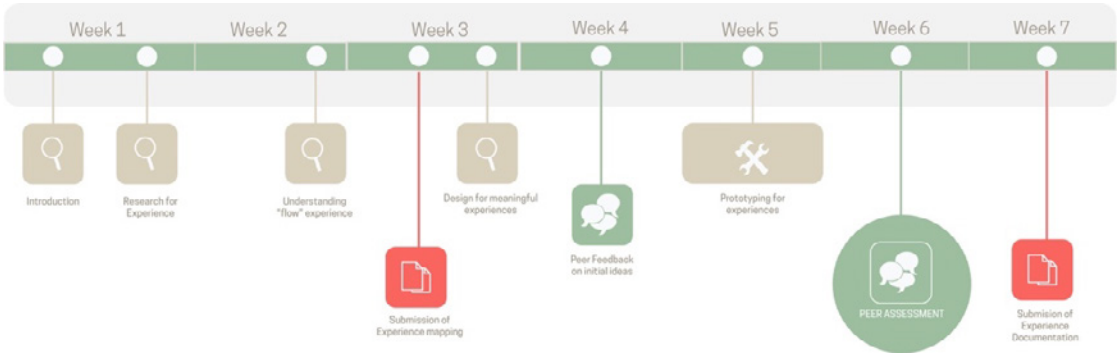

Figure 1. Plan of the Experience Design Course

2.3 Changes Enforced due to Covid-19 Global Pandemic

In the previous years, the peer assessment of experience design prototypes had been held in class. However, in 2020, it had to be deployed via online tools and asynchronously due to the Coronavirus pandemic. Therefore, as soon as on-campus education was suspended, students were asked their opinion about the best possible way of explaining their experience design concepts via the university's online-class platform. In the end, it was mutually agreed that the students submit a 2-minutes' video pitch, in which they describe their experience design, the ideal use case of their prototype and the way they think the product could enhance the experience. Students were given ten days to submit the videos to the university's online teaching platform.

After the deadline, all the videos and shared were downloaded and were shared with two peer groups. Then, the peer groups had one week to assess the experience designs articulated in the videos and submit their feedback to the designer groups in separate Word documents via the online education platform of the university. Finally, the written feedback was collected and communicated to the designer groups. In this process, to ensure the reliability of the peer assessment results [11], none of the groups gave feedback to and received input from the same groups. In the end, except one group (out of 24) all passed the course without having a resit assignment.

3 ONLINE SURVEY

After the announcement of the final grades, the students were asked their opinion about the peer assessment and the course overall. The survey consisted of closed and open-ended questions. Students were asked about their overall rating of the course and the effectiveness of peer assessment in achieving the goals of the course (1=very poor, 3=average, 5=very good). In the open-ended question, students were also asked about their opinion about the role of the global Covid-19 crisis in their peer assessment results. In the online survey, no personal data was collected, and all the collected data was anonymized. In total, *N*=24 students (out of 86) responded to the survey.

3.1 Course Evaluation

Overall, the students rated the course with *M*=3.79 out of 5.00 (*SD*=0,59). When students were asked about the effectiveness of peer assessment in achieving the goals of the course, the goal of "identifying opportunities to influence and design for people's experience" was scored with *M*=3.88 (*SD*=0.80). However, the goal of "designing and testing a product by evaluating the models and frameworks of experience design" was a score relatively lower with an *M*=3.21 (*SD*=1,06).

3.2 Online Peer Assessment of Experience Design Concepts

The answers to the open-ended question of the survey were clustered around three main themes: (1) decreased quality of the feedback due to lack of interaction between peers; (2) the difficulty of understanding and explaining the concept in 2-min video presentations; (3) difficulty of assessment.

The majority of the respondents (*N*=14) stated that the lack of interaction made it difficult to understand the concepts, resulting in a low quality of feedback provided to their peers. One student noted that it was sad not to touch and use the prototype (P22), while P23 regretted missing the interactive part of real-life peer testing. P24 explicitly stated that the feedback became shorter and possibly less extended due to this lack of interaction among the peers. According to P18, the groups that gave them feedback focused on many things but little on the things they wanted to test and get feedback on.

As was signalled by the students, some students (*N*=5) found it challenging to explain their experience design concepts in a 2-minutes' video. This also was the case for understanding the peers' concepts from the video presentations. P8 found it more difficult than explaining the process in person and having people test the functions of the prototype. P2 found it hard not to ask questions to the groups, which could have positively affected the results of their peer assessment. P13 stated that they wanted to give a more general overview of what they wanted to achieve with the experience design instead of explaining their prototype in their video. This respondent thought this way of presenting affected the feedback they provided negatively, as most of their feedback concerned the lack of a prototype. Their conscious decision was to put more effort into the movie.

Eventually, these challenges resulted in difficulties in the assessment of the experience designs (*N*=3). Especially P1 mentioned that the prototypes were difficult to assess through videos, while P2 stated that the group they assessed did not articulate how they fulfilled the assessment criteria. This made it difficult for the groups to critically and fairly evaluating the prototypes presented in the videos.

On the other hand, a few students (*N*=3) stated that video presentation was a good alternative to on-campus testing. P5 thought that every group reviewed the other groups' material thoroughly and formulated feedback carefully. This respondent stated that doing this on the spot would not have made that much of a difference.

4 DISCUSSIONS

The assessment results showed that students successfully passed the course, while an online survey carried out with *N*=24 students illustrated how the students struggled while fulfilling the peer assessment requirements. Results showed that the students rated the course and the effectiveness of peer assessment to achieve the course's goals lower than the rating scale's good score (*M*=4). There were several reasons listed for these low scores. First, the peer-testing had to be held online due to the lockdown. Second, the students' lack of communication and interaction during peer testing turned into a significant limitation of the test results. Finally, not being able to experience prototypes fully (e.g. seeing ad touching) made the outcomes of peer assessment superficial for some students.

The enforcement of the global pandemic made it clear that the changes that had to be made at the last minute in in-class peer assessment were not suitable for the learning goals of the course. Furthermore, since the students did not see the designer groups, it became difficult for them to embrace the "user role" in peer testing. This was also evidenced in the results. Therefore, the way the online peer assessment was formulated should be redesigned to facilitate engaging and effective communication among peers. One way to do this is to arrange synchronous question-answer sessions among the students. This would help the assessor groups to ask questions while the designer groups could have the opportunity to answer the questions live.

Finally, even though it was not reflected in the online survey results, the role of the teachers in organizing the peer testing should be reconsidered if the peer assessment would be held online. It was time-consuming for the teachers to embrace the mediator role between the groups. Due to the time constraints, the teachers had to work overtime to arrange a smooth transition to online platforms. In the future, online platforms could be utilized to make the exchange of files more accessible.

5 CONCLUSIONS

This paper presented the setup and challenges faced in the online peer assessment of a third-year Industrial Design Engineering, experience design bachelor's course. It showed a promising way of teaching user testing (i.e. peer assessment) in higher education and the challenges the students and teachers faced due to the sudden changes enforced due to the global Covid-19 pandemic.

Results showed that even though most of the students of the experience design course passed the course successfully, there are several improvement points in applying peer assessment and other practice-based assessments online. Accordingly, asynchronous prototype presenting and testing is not the best way to facilitate this type of assessment, as it nullified the potential positive impacts of peer assessment on student learning. This experience showed that even though academia expects design engineers to be ready for the world's changing views, academia was not fully prepared to adjust to the sudden changes.

I invite future engineering education to report more evidence that showed their struggles with online education transfer. Only with such an open discussion can we learn from each other and make engineering education prepared for similar global societal challenges.

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