Design and Technology Education: An International Journal

26.2

Phenomenological Approach to Product Design Pedagogy: A Study on Students' Experiences in Interdisciplinary and Intercultural Settings

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Abstract

Product design pedagogical approaches require a specific mix of competences that demand multiplicity of perspectives, hybrid knowledge that exceeds professional field silos, and continuous problem reformulations. To do this, design studio education follows many traditions, among which is design critique. Design critique is believed to provide students with the ability to reframe design problems, but it can also lead to misunderstandings. The necessity of this approach is put into question by assessing the experiences of a group of students in an intensive course structured for interdisciplinary work, intercultural teams, and projects based on challenges from practice, where the critique was not part of the pedagogical program. The course was conducted over four consecutive weeks and supported a hands-on approach based on an interdisciplinary work between the areas of product design and occupational therapy, with the participation of Brazilian and Norwegian bachelor students and professors. Students responded to questionnaires prior to and at the end of the course that addressed their expectations of and experiences in the course. A qualitative analysis of the students' responses was carried out based on content analysis. The joint work with occupational therapy students and professionals, as well as the opportunity to develop projects that targeted demands from people with disabilities, were shown to be factors that contributed to students' engagement in the course and overall gain of knowledge. The experiences reported here indicate that the phenomenological approach to the design studio, which focuses on providing an immersive environment, deserves more attention from educators, and that design critique is not necessarily a crucial ingredient in design education.

Keywords

design studio critique, design pedagogy, interdisciplinarity, inclusive design, occupational therapy

Introduction

Product design education is grounded in practice rather than in theory. The design pedagogy theoretician Tovey noted that "there is a greater emphasis on being able to do it (design) than on designers being a repository of specialist knowledge." He further claimed that designers are "generalists in as wide range of content as possible" (2015, p. 37). Studying by exercising design allows for design process mastery that is then used to discover knowledge fields according to

Owen (2007). In his article about design thinking and its nature and use, he noted how design thinking is generalist in preparation and execution. Accordingly, he claimed that "the wider the reach of the knowledge base, the more likely the creative inspiration" (p. 24). This approach allows designers to address complex challenges that are multifactorial and global as well as work with dynamic problems that evolve as design projects develop (Rittel & Webber, 1974). The design discipline is therefore practical in the sense that it assumes processes of the accumulation of knowledge, development, and testing of concepts.

To teach this way of problem-solving, design pedagogy traditionally relies on practical projects and critiquing practice, which allows for the constant reframing of design problems and ideas. Critique is a common teaching process applied among participants in a design studio where the role of an educator is to both provide critique and teach fellow students to provide critique to each other, thus questioning their preferences and knowledge about the given problem (Gray, 2013). Critique is therefore done by all the participants, where criticizing each other's approaches through the series of meetings is meant to facilitate critical thinking in the design studio. These pedagogical traditions rely on theories about critical reflection involved in the constructivist pedagogical approach (Schön, 2003), but also in critical dialectic approaches (Habermas, 1978), where students are supposed to incorporate multiple perspectives into their thinking and eventually into their designs.

Multiplicity of perspectives, hybrid knowledge that exceeds professional field silos, and continuous problem reformulations are, without a doubt, key ingredients of design discipline and good design pedagogy. However, the opinions on providing it by means of critique as a pedagogical tool have been at odds. While many understand this pedagogical practice as necessary (Kolko, 2011) and in need of theoretical formulation, others have questioned this practice (Goldschmidt et al., 2010). The criticism of design studio critique encompasses the issues of educators' power over the students, especially as design methods are not scientific and rely on teachers' professional design experience. This study questions the adequacy of critique as a pedagogical approach to state-of-the-art design studio education. We argue that immersive environments that provide immediate real-life feedback as well as meaningful human relations are the key factors of learning and will allow for multiple perspectives, interdisciplinarity, and the ability to reframe the problem. Even though constructivists themselves claim that experience and meaningful action are preconditions for critical reflection, we take the notion of immersive learning further and connect it to a phenomenological understanding of pedagogy.

Furthermore, the role of education should be to develop the knowledge, skills, attitudes, and values that enable people to contribute to an inclusive and sustainable future. Androutsos and Brinia (2019) argued that the current educational system needs to be changed because there is a gap between real-world needs and the current education methods. Education needs to prepare young people not only for the professional world, but also to give them the skills they need to become active, responsible, and engaged citizens (Organization for Economic Co-operation and Development, 2018). We see design immersive learning space as a part of the international effort to provide this kind of education.

Materials and Methods

Our phenomenological understanding of learning rests on ideas described by the phenomenologist Maurice Merleau-Ponty. Phenomenology explains learning as bodily situated and therefore happening in relation to the environment. Merleau-Ponty (1996, p. 164) explained that physical and social embodiment shapes meaningful learning. Embodied learning means that human bodily capacities, such as the mental, emotional, and physical, in relation to environmental affordances and constraints, are the preconditions for learning. The focus here is therefore on the relationship between the environment and learner and the connection they establish that changes them both. Accordingly, learning is a process in which previous knowledge allows participation in an embedded situation. Each additional act of learning modifies the entire horizon of experience and expertise. Learning means to change and transform oneself in relation to the environment. For phenomenologists, the object of scientific study to explain learning is therefore the relationship between the learner and the environment the learner inhabits. This is in contrast to constructivist ideas where learning is happening in learners' minds as a result of a construction of the model of the world they inhabit (Steffe & Gale, 1995).

Following Merleau-Ponty's ideas, we as educators facilitate a learning environment that will allow learners to establish relationships that will stimulate design learning. We create a learning environment based on three main pillars: 1) interculturality to stimulate multiplicity of perspectives, 2) interdisciplinarity to stimulate hybrid knowledge that exceeds professional field silos, and 3) real demand-based projects to stimulate continuous problem reformulations. This paper is based on assessing the perception of product design students about their educational experience in an international collaborative project in inclusive design, which involved design students from two universities, staff, and people with disabilities from a rehabilitation center. This immersive approach is closely connected to the inclusive design principles where empathy exercises, meeting users, and ownership of the project development are integral parts of the learning experience.

This unique research setting allows for studying immersive approaches for learners where they learn from their environment and relations that emerge as a result of the design activity. To assess this approach, we study students' expectations and experience/engagement in the course. Inclusive design is one of the approaches within the design area that is frequently associated with the theme of technologies for people with disabilities. Inclusive design emphasizes the need to understand customer diversity with the aim of better satisfying the needs of a wider range of people (Waller et al., 2015). It is therefore fertile ground for working across disciplines as it aggregates knowledge from the areas of rehabilitation applied to design practice. It is also a way to create an environment that demands design students to leave aside their own preferences and knowledge and put themselves in the position of patients and therapists.

By designing for people with disabilities, through collaborative work with rehabilitation professionals, students are provided a wider view of the user's need, thus contributing to ownership of the project briefing. Muller et al. (2019) found positive outcomes from a hands-on course on rehabilitation biomechanics for engineering students and observed that they developed an empathic client-centered design approach. Despite the growing number of studies reporting inclusive design experiences in education, there is still a lack of consensus

when it comes to the pedagogical approach. Indeed, a recent study (Wilson et al., 2019) found that there is a lack of clarity within inclusive design, with a wide variation in the methodologies taught.

Kiernan et al. (2020) highlighted the changes in design education toward collaborative work with other disciplines to address unstructured problems, which requires the designers to have skills to share information, negotiate, and reach consensus. Addressing current themes that are often complex, multifactorial, and of global interest is a means of stimulating interdisciplinary knowledge acquisition. Ramirez (2011) stated that there is an increasing involvement of the industrial design profession in themes of global concern and socially responsible design, and some design schools provide their students with the immersive experience in developing countries to learn collaborative design with local communities. In this context, Ferraelo (2019) emphasized that the practice of ethics and morality in design and engineering education can contribute to the development of an ethical industry that is able to address social issues. Our academic experience reported here to some extent meets this current global educational context. Encouraging product design students to work with the demands from local communities, groups of social vulnerability, and people with disabilities is a means for the development of the sense of socially responsible design, thus contributing to the formation of engaged students.

Research design: Cross-sectional qualitative study

This study was carried out as part of the inclusive design course taught in 2019, which is part of the regular curriculum of product design at Sao Paulo State University (UNESP), Brazil. The 2019 course was held over 30 days from April 15th to May 13th, four days per week, and four hours daily.

Nineteen students (ten Brazilians and nine Norwegians) of the bachelor program in product design at UNESP and Oslo Metropolitan University (OsloMet) registered for this course. The course program was mostly practical and divided into four main blocks: (1) theoretical content on inclusive design, disabilities, and assistive and rehabilitation technologies, (2) practices of empathy development, methods of data collection, observation, and survey with people with disabilities, (3) meeting with real patients and assessment of their functional needs, preferences, and expectations, (4) project development, proposing solutions, and prototyping, and (5) prototype testing with the patients (Figure 1). The theoretical content, teaching methodology, and contact with students and professionals of occupational therapy and people with disabilities were clearly stated in the course description; thus, the enrollment in the course was by spontaneous demand. The pedagogical methods did not include critique from either peers or teachers.

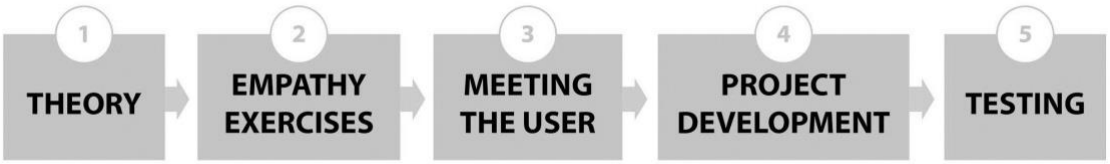

Figure 1. Course structure: From theory to prototype development.

A cross-sectional qualitative study was carried out at Bauru campus of the UNESP and in the Specialized Rehabilitation Center in UNESP-Marilla, a school clinic that provides rehabilitation services in the areas of physical therapy, speech therapy, and occupational therapy for people with disabilities, where design students had the opportunity to meet and work collaboratively with patients, occupational therapy students, and their supervisors.

The students worked in groups of approximately three members, and each group worked on a single case of a person undergoing a rehabilitation program at the Specialized Rehabilitation Center. Seven patients with neurological conditions participated in this course, including four children with cerebral palsy ranging in age from 3 to 9 years; one one-year-old child with brachial plexus injury; one five-year-old child with mild microcephaly; and one person 72 years old with Parkinson's disease. These patients were selected based on the therapists and caregivers' indications about the lack of products and technologies available that could facilitate the rehabilitation program and the performance of daily life activities.
Initially, the students received a summary of the patients' medical condition and rehabilitation program information, allowing them to gain knowledge about the patients' medical and functional status and help them prepare the interviews for the first meeting with the patient and therapist.

All the groups were allowed to follow one occupational therapy session of the patient with whom they were going to develop their project, and they were allowed to interview the therapist and the patient and/or the caregivers. From this first meeting, students then worked on defining the design goals and developed concepts of prototypes that could meet the rehabilitation goals as well as the patient's needs and preferences. After seven days, the students' groups met the occupational therapy team (professor and last year students) and presented their ideas and concepts and received feedback about the potential for success and possibilities of improving their design concepts. Finally, the students worked for seven days producing a prototype that was then tested by the therapist and patient during a rehabilitation session. This prototype test allowed the students to see their projects implemented in the rehabilitation routine and receive feedback from the occupational therapy team and from the patient or caregivers. During the entire design and prototyping process, students were supervised by design professors.

The non-probabilistic convenience sample consisted of nineteen (N = 19) students of the undergraduate course in design (11 Brazilians and 8 Norwegians), who enrolled in the course on personal demand.

For data collection, two questionnaires were applied: one before and the other after the course. The first questionnaire aimed to verify the students' expectations regarding the course, while the second was designed to assess their experience and engagement with the course. Both questionnaires contained open and closed questions and were constructed based on the literature. To verify the semantic adequacy and the adequacy of the questions in relation to the objective of the study, the questionnaires were submitted for analysis by two professors, one Brazilian and one Norwegian, both of whom are researchers who have worked with themes related to this study, who attested to the adequacy of the questionnaires.

Although a total of 19 students attended the course, the first assessment was answered by 15 students, while the second one was answered by 17 students. Seven Norwegian students answered both assessments, whereas eight Brazilian students answered the first application and 11 answered the second.

The data analysis was based on the content analysis proposed by Bardin (2011). From the careful reading of the participants' responses, the content was sorted and grouped according to similarity and relevance to the objective of this study. From this grouping, we arrived at the units of analysis, from which two categories emerged, namely "Expectations" and "Experience/Engagement," with their respective subcategories, according to their specific content, as shown in Figure 2. The category "Expectations" refers to the assessment prior to the course, while the Experience/Engagement refers to the assessment at the end of the course.

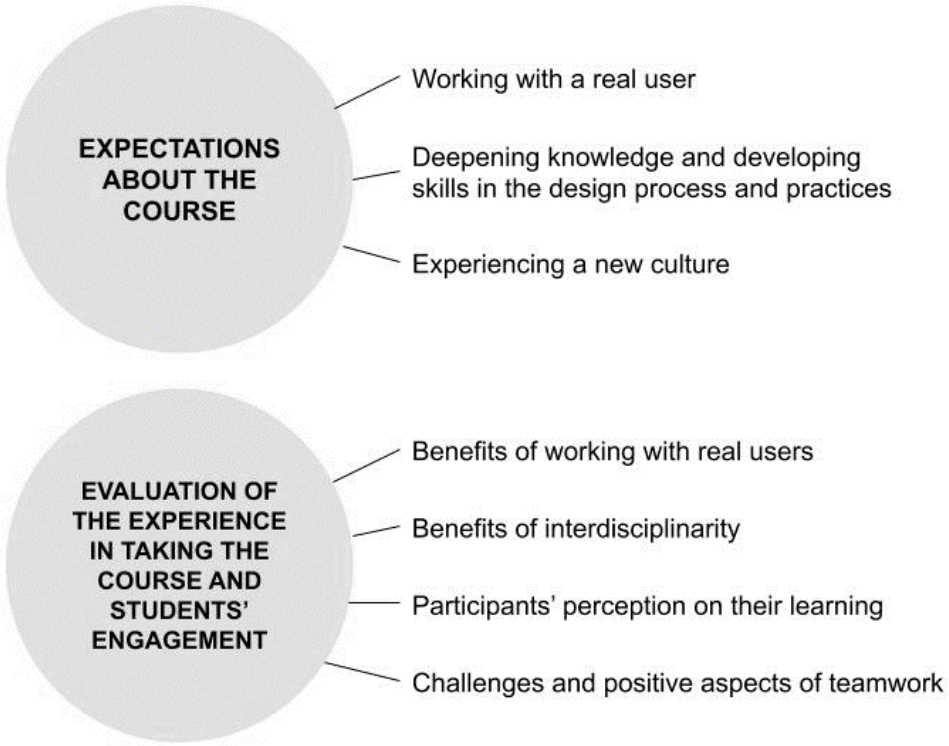

Figure 2. The two main categories with their supporting sub-categories.

Results

Results from the pre-course assessment are presented according to the respective category and subcategories, followed by the Experience/Engagement post-assessment and its subcategories.

Category 1 – Expectations about the Course

Prior to the beginning of classes, students were asked about their expectations when registering for the course. The main expectations identified were: (a) working with a real user (containing the terms real users, real patients, designing for/to, specific cases/conditions, purpose, real-life situations, disability, elderly, and assistive technology), (b) deepening knowledge and developing skills in the design process and practices (including terms such as inclusive design, methods, techniques, research methods, development as designer, CAD, and

3D printing), and (c) experiencing a new culture (including the terms experience, culture, different country/university/course, new approach, language, and communication).

Subcategory 1.1 – Working with a Real User

The opportunity to work with real users was an expectation when enrolling in this course for 46.7% of the students, especially due to the opportunity to develop products for people with disabilities or the elderly:

> *"[The most important reason why I registered for this course was] to develop skills in product design [and] to be involved with a real product for someone who needs it."*

> *"[The most important reason why I registered for this course was] to work with real users."*

Another expectation identified was related to socially responsible design. Students mentioned the opportunity to improve accessibility in a daily context as an expectation they had about the course:

> *"[The most important reason why I registered for this course was] to use design for a good purpose."*

> *"[At the end of the course, I expect to have learned] how to use design to help people live in a better and more inclusive society in this course."*

Subcategory 1.2 – Deepening Knowledge and Developing Skills in the Design Process and Practices

Eighty percent of the students showed interest in improving their knowledge and skills in design. The participants mentioned their expectations about developing skills in product design, including CAD and 3D printing, deepening their knowledge about inclusive design, and using this knowledge in the development of projects (from organization to a full project):

> *"[At the end of the course, I expect to have learned] new things about inclusive design as well as I expect I will find some directions toward which to go forward in my development as a designer."*

> *"I expect to learn how to organize and develop a project, mostly an inclusive project, considering the patients' needs."*

The opportunity to gain in-depth knowledge about inclusive design was mentioned by nine students. Deepening knowledge about the design process, methods, and research was another main expectation mentioned by six students:

> *"[At the end of the course, I expect to have learned] more about inclusive design, research methods, and different approaches."*

Subcategory 1.3 – Experiencing a New Culture

A total of 53.3% of the students reported their expectations about having new college and academic experiences:

> *"[The most important reason why I registered for this course] was to experience different ways of learning… and to experience how different a university is in another country."*

In addition, experiencing new cultures and becoming more comfortable in speaking and interacting in English, their non-native language, were themes mentioned by the students:

> *"[At the end of the course, I expect to have learned] . . . get out of the comfort zone and be more comfortable with the language."*
> *Collaboration with people from other countries was also a motivating factor to register in the course:*
>
> *"[At the end of the course, I expect to have learned] about Brazilian culture…and to collaborate with people from other countries"*

The differences in the design process and between academic life were pointed out by five students as a motivation for the course. A related topic – contact with a different culture – was also mentioned by four students. The last relevant topic was the improvement of communication and language skills, mentioned by three students.

Category 2 – Evaluation of the Experience in Taking the Course and Students' Engagement

At the end of the course, students were asked to evaluate their experience throughout the course regarding their learning outcomes and the positive and negative aspects they identified, and to give sincere feedback. Students pointed out the benefits of (a) working with real users and the (b) the interdisciplinary aspect of the course; (c) their perception of their learning regarding design process and practices, including the advantages and disadvantages of using digital modeling and manufacturing; and (d) the challenges and positive aspects of teamwork.

Subcategory 2.1 – Benefits of Working with Real Users

For most (94.1%) of the students, working with a real user was a very positive aspect about the course because it provided quick feedback, a better understanding of the user and their needs, and the development of empathy toward the user. Close contact with real users and their families was very helpful from both professional and social perspectives. From a professional point of view, working with real users helped the students to get relevant information to apply in their projects:

> *"[A positive thing experienced developing projects for real patients was the] importance of understanding individual human needs."*
>
> *"It's nice as a designer to know that someone is going to use the prototype, and the challenge prepared us for the 'professional' life."*

From the social point of view, it created empathy, which helped them to put themselves in the "other person's shoes":

> *"[The most important thing I have learned in this course was] to work with real-life situations, and to be in another person 'shoes.'"*

> *"[The most important thing I have learned in this course was] empathy, putting yourself in other people's shoes is a basic part of the project."*

The user's involvement also influences the development of students' projects since it creates a higher motivation in developing a product and higher engagement in meeting and satisfying the user's needs:

> *"It was very positive to develop for real people, mostly because of the gratification that you feel when you see it working, [sic] other good thing was how easy we could obtain information and feedback."*

In the end, some students pointed out that working with real users improved their confidence in developing an inclusive design project:

> *"I feel a little confident because now I feel I can communicate with patients/families well enough to bring something to the project."*

Subcategory 2.2 – Benefits of Interdisciplinary Work

Working with professionals from other areas, namely occupational therapy, was also a positive experience highlighted by the students. They mentioned that working with the rehabilitation center, alongside the occupational therapists, helped to meet their expectations for the course. The majority, 82.4% of the students, stated that having the professionals was very important in the mediation with the patient and that it helped them to better understand the users' specificities and needs as well as offering another point of view:

> *"It was very good to be able to have this contact with people with greater knowledge in the area [occupational therapy] for better direction and to have another point of view."*

> *"I think this interdisciplinarity is very cool, and I was able to get to know more about occupational therapy."*

> *"[A positive thing experienced collaborating with the occupational therapists was] having a professional (therapist) to guide our decision-making."*

Subcategory 2.3 – Participants' Perception of Their Learning

Another positive outcome from the course was the perception of improvement in the students' knowledge and skills. Several students expressed feeling more confident in developing a project – from concept to prototype – especially an inclusive design project, because they felt they had learned about the process:

> *"Now, I am able to understand what it takes to go through all the process, [sic] since meeting the patient until delivering the prototype."*

> *"How to make something from scratch in a short period of time because we had little time and very real expectations to meet, so it had to be done."*

> *"I feel confident because I had a good experience when learning many aspects at prototyping accessible inclusive design projects."*

Students also mentioned having both positive and negative experiences with digital modelling and manufacturing. On the positive side, for 76.5% of the students, working with digital modelling and manufacturing was an advantage because it helped to visualize an idea, identify failures in the project, and make changes, as mentioned by one of the students:
"[Working with digital modelling and manufacturing was] a good way to visualize your product/prototype from different views and easy to change dimensions and colors."

When answering what had the greatest impact on learning student responded:

> *"Actually delivering a product that may have an impact."*

On the other hand, for 58.8% of the students, it also provoked negative experiences because some students felt they did not have enough knowledge or skills to work with it. They pointed out the lack of experience with these technologies as too challenging to solve in the short time given to deliver the prototype:

> "Digital modeling (to use milling machine and 3D printing) provides us many possibilities. But not everybody was prepared to do it."

Subcategory 2.4 – Challenges and Positive Aspects of Teamwork
Working in a team created both friendly and challenging experiences. A total of 64.7% of the students mentioned that communication was challenging several times, and 23.5% noted that they did not feel very comfortable with their English skills. On the other hand, although communication was difficult, they seemed to have overcome it with the help of their classmates, as observed by one student:

> *"The only thing that demotivated me was the language because I could not express my ideas totally, but my classmates helped me a lot in this matter."*

Overall, working with people from different cultures was seen as a motivating and positive experience:

> *"[The most important thing I have learned in this course was] collaborations with different people from different cultures because collaborations can happen beyond language, through drawings, modeling, and visual communication."*

> *"I was hoping to get to know people with a completely different way of life, vision of things . . . and it was awesome because all of these [sic] contact really made me grow as a person and as a designer."*

Other situations that were experienced and overcome within the teamwork were the opportunity for improvement and learning:

> *"[The most important thing I have learned in this course was] to be a little more patient and understanding that for a project to happen, sometimes we must share tasks and understand that each person can contribute in some way. And friends, regardless of how little time, I feel I have new friends."*

Discussion

Analyzing the interviews, we can see how the relational approach to learning played out through this study. Students described their learning in relation to patients, therapists, prototyping technology, design media, and their colleagues from other universities. Their knowledge was situated and arose from the learning setting. Even when they were asked to assess their own learning, their descriptions included design medium/3D printing technology and practical aspects of the use of it for users' benefits. Many of them had a steep curve learning in terms of 3D modeling, engineering, and ergonomics at the same time. Still, it was meaningful because of the patient care and immediate feedback.

A teaching approach of inclusive design based on cross-disciplinary work and project development for real users was shown to benefit students' engagement with the course, confidence, and ability to gain knowledge. Positive reports mainly related to the opportunity to meet and work with people with disabilities and occupational therapy students and their supervisors.

Occupational therapists played an important role in collaborative work by contributing to the definition of the main project requirements as well as the most appropriate features and functions of a given assistive device that could better meet the users' needs. The knowledge from the occupational therapists' practice was essential for the design conceptualization of an assistive device in addition to the designer's expertise (Moraiti et al., 2015). Indeed, our experience in this course showed that the participation of the occupational therapy team provided an important contribution supporting the design students in making key decisions in the design process. This finding is supported by the feedback from the therapists and the users' family/caregivers about the students' projects during the prototypes' final tests with the users. They reported that, in general, although improvements could and, in some cases, needed to be implemented, taking into account the fact that it was a first prototype test with the user, the prototypes had design features that were in accordance with the users' capabilities, needs, and rehabilitation goals as well as to their preferences.

Although there is a body of knowledge that is specific to the rehabilitation sciences, design students were able to comprehend the main aspects related to the disability and functioning of each patient and, based on this, to propose solutions that could meet their needs, preferences, and expectations. We believe that project development based on real users' demands was a key factor that facilitated the gain of interdisciplinary knowledge. Corroborating with this, the

study of Self et al. (2019) found that students responded positively to interdisciplinarity when it could be applied to their projects.

Working with actual users and developing a complete project – from concept to prototype – was considered the main motivation for the students to enroll in this course and, at the same time, a positive factor that met their expectations. Most of the students mentioned this opportunity as a highlight of the course because working with the user, as well as in collaboration with the rehabilitation center, was considered helpful in the learning process. Our results indicate that a more practical course can stimulate students' engagement and benefit the learning process. In agreement with our findings, Self et al. (2019) observed that direct application of learning is an important element for gaining interdisciplinary knowledge. Interdisciplinarity provided students a broader perspective on the design problems, with consequent interlocution among professionals from different areas and spaces of shared decisions, aiming at the integral attention to the subjects with disabilities. Additionally, the study of Androutsos and Brinia (2019) found that the use of a co-design process methodology, that is, the collaboration with real users and other members (in this case the occupational therapists) in educational practices, leads students to be more creative and innovative.

The students' reports of concern about delivering their projects to a real user might be interpreted as a sense of responsibility with their work that was brought about by the development of empathy with the user. This is in accordance with the findings of Muller et al. (2019), who reported the development of an empathic user-centered approach in engineering students who attended a hands-on course on rehabilitation biomechanics. Perhaps this kind of educational setup and real-life feedback were more motivating than seeking consensus about what is a good design by teachers and peers through a design critique. In this study, this was especially visible as students gave positive course evaluations even though their grades were not markedly better than in other courses. Additionally, some of the designs students proposed throughout the course did not achieve the desired reactions by the patients, which students themselves have acknowledged and commented on, showing the ability to be self-critical.

We noted the students to be engaged in designing solutions that could be useful and helpful for the patient, and this feeling of responsibility, empathy, and willingness to help someone was triggered after the first meeting with the patients. Such observations suggest that the course strategies contributed to the development of positive social attitudes by the students. Social attitudes are part of a dynamic process that incorporates human relations as generators of novel perceptions, meanings, and attitudes toward a social object or actors, in this case, the people with disabilities. Ferraello (2019) highlighted the importance of implementing practices of ethics and morality in educational approaches to design and engineering. The experience of being in contact with people with disabilities supports the development of favorable attitudes in relation to them and, consequently, empathic behavior and the willingness to establish social interactions and help them (Baleotti, 2006). The course format reported here, based on interdisciplinarity, interculturality, and real demand projects, was effective in developing a user-centered practice and had a positive impact on students' engagement and learning. It also supported the presumption that the learning and self-awareness of students comes from real experience, rather than only being construed in their minds through critique by their peers and educators.

Conclusion

This paper reported the outcomes of the students' experience of and perceptions about an approach to inclusive design teaching based on interdisciplinarity and interculturality. This teaching strategy was shown to greatly benefit students' learning and engagement with the course. The opportunity to develop projects for real users and the cross-disciplinary work with occupational therapy students and professionals were the most positive outcomes reported by design students. They were able to engage in an experience that provided a basis for gaining knowledge and developing skills of group work (communication, sharing, decision-making), improved their confidence in developing projects, and, finally, enhanced their development of empathy. The possibility of evaluating a teaching approach in which the student assumes the role of protagonist, interacting with the person with a disability and with health professionals, is a relevant element in the development of skills of collaborative interdisciplinary work as well as the search for sources to expand the discussion on the subject. To be part of these sources is what is expected with the realization of this research, obviously, without the intention of being the final word on the subject, but of offering a contribution to the discussion, especially in the scope of the teaching methodologies of inclusive design.

The study therefore indicates the feasibility of the phenomenological pedagogical approaches in design studio, which puts into focus the affordances and constraints of the design environment, rather than construction of knowledge by critical reflection. Consequently, it shows that good learning outcomes can be achieved without the critique approach to design learning. In fact, the study shows that critique can be replaced by a stimulating learning environment where design challenges come from the reality where the mistakes are explicitly uncovered *in situ* with patients and therapists, rather than simulated by previous experience of the educator and theoretical discussions by peers. Therefore, it is important for design to explore beyond the field silos and become familiar with enabling knowledge creation by means of integrative and collaborative interdisciplinary work where real-life feedback is imperative in an externally interconnected design studio.

The global challenges of modern life require a new approach to education. In this context, in areas such as product design that have a strong connection with technology and people, knowledge must be built on the foundations of interdisciplinarity, interculturality, and the ability of students to exercise agency over the design situation.

Constructivist pedagogy has brought into focus student-centered education. In this pedagogical approach, minimal influence of educators and safe space for social development are considered to be central topics. The phenomenological approach to learning in design studio takes this topic further. In this approach, educators are important as organizers of rich learning environments and supporters of students' agency in these environments. This article shows that pedagogues should perhaps focus more on learner immersion rather than on the content of the curricula or academic discussions.

Acknowledgements

The research is financed by DIKU (Norwegian Agency for International Cooperation and Quality Enhancement in Higher Education) under grant UTF-2016-long-term/10053, and Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq - Brasil (Process 310661/2017-0).

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