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Introducing sustainability to interior design students through industry collaboration

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Abstract

Purpose – The purpose of this study was to introduce a sustainability course to interior design students and explore how working with industry could address challenges with integrating sustainability education into and ensuring student motivation in non-studio courses.

Design/methodology/approach – This is a case study presenting qualitative evaluation from the 15-week "IAED 342 Sustainable Design for Interiors" course with a sample of 98 third-year interior architecture students at Bilkent University, Turkey.

Findings – The findings were analyzed from the perspectives of two processes learning and working with industry. The results revealed that an active learning environment and industry collaboration positively influenced students' awareness of sustainable design, increased their ability to integrate sustainability knowledge to design studio projects and improved academic outcomes.

Originality/value – This study is a unique effort by the Department of Interior Architecture and Environmental Design at Bilkent University by being the first to introduce a sustainability course and create a responsive and social learning environment through industry collaboration. The results of the study highlighted that better outcomes are achieved by working directly with industry than by performing theoretical exercises.

Keywords Sustainability, Active learning, Design education, Industry collaboration, Interior design

Paper type Case study

Introduction

The growing concern and increasing interest in sustainable built environments is changing the design education agenda. Design education, which is rich in teaching, learning and communication potential, represents a series of advantages for gaining essential knowledge on technical, social cultural and technological issues through studio teaching. Design studios are assumed to be the core of the curriculum in architectural design education, where designing is a matter of analyzing, synthesizing, evaluating and presenting ideas for a solution to a design issue. Each studio project generally requires studying precedents, creating designs for architectural space and form, using of appropriate materials and construction techniques and presentation in drawings and 3D models. The teaching and practice of sustainability is not a trend; it has become a necessity in design education (Zuo *et al.*, 2010). Despite huge efforts in design teaching and learning, however, students still have difficulty with motivation and self-direction regarding sustainability concepts, especially in non-studio courses (Oxman, 2008; Schneiderman and Freihoefer, 2012; Zuo *et al.*, 2010).

Sustainable design must be part of the core curricula, rather than being neglected, pulled out, branded or marginalized (Stewart-Pollack and Pillote, 2006), as is still

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occurring in some schools. Although the majority of design schools are integrating sustainable content in non-studio and studio courses (Tucker, 2005), three main issues may contribute to the topic's neglect:

(1) students do not see the relevance of the material to their studio practice;

(2) students have a naïve conceptualization of creativity; or

(3) students are not confident about the skills required for non-studio class work (Eberly Center for Teaching Excellence, 2012).

The first issue is related to the lack of the direct link of sustainability content to studio problems that could foster student cognitive around learning –, i.e. storing, forming associations, and processing information (Guilford, 1968; Akin, 1984). The second issue arises because of students' resistance to include other contexts (environmental, economic, and social) in design thinking and creativity, with the result that they prioritize studio courses over non-studio courses (Smith, 2011). The third issue is closely related with students' anxiety and disengagement around writing, research and analytical thinking (Ambrose *et al.*, 2010).

Interior design is a major player of sustainable architectural development, and thus appropriate sustainability design teaching must be incorporated into design education to prepare students for the real world. However, interior design teaching has lagged in the effort of integrating sustainability and some aspects of sustainability, such as solar energy use, are not taught in detail (Zuo *et al.*, 2010). The purpose of this study, therefore, was to introduce a sustainability course and explore how working with industry could resolve challenges in integrating sustainability and ensuring student motivation in non-studio courses. This paper argues that relating sustainability issues to non-studio courses through industry collaboration and an active learning environment can foster creative practices and cognitive learning process in design students. This paper first reviews the literature on how learning works in interior architectural design education. Then, it discusses the educational context and how a 15-week sustainability course was designed with a sample of 98 third-year interior architecture students at Bilkent University, Turkey. The findings were analyzed from the perspective of the two kinds of processes involved in the study: learning and working with industry.

How does design learning work in interior architecture education?

Architecture design education is similar to other design educations in how it is conducted in studios. However, it is different than non-design disciplines, because learning is conducted along a design activity, which is "a form of problem-solving where individual decisions are made toward the fulfilment of objectives" (Akin, 1984). Problem-solving activities are central to the development of architecture design teaching (Taylor, 2000). Different from other problem-solving activities, however, design problem solving is concerned with ill-defined problems (Simon, 1979; Akın and Moustapha, 2004) searches for an adequate solution within a large space of alternatives by developing a set of 2-D or 3-D (Simon, 1979; Akın and Akın, 1998). Design learning has many variables and complex relationships (Demirkan and Afacan, 2012). The creative process balances purposeful analysis, imaginative idea generation, and critical evaluation. In its otherness or difference from architecture, interior design makes the learning process more complex by requiring a detailed level of the following

concepts: furniture selection and layout, sustainable material and finishes, decorative elements, colour theory, furniture design and, fabric selection (Gürel and Potthoff, 2006). Compared to architects and engineers, sustainable interior designers should be active players throughout a project; their knowledge is not restricted to space planning, furniture selection or material specifications (Zuo *et al.*, 2010). Interior design students should be equipped with enough knowledge on sustainability to minimize environmental impact, reduce energy demand and create high-performance interiors.

The literature on sustainable design education incorporates many studies and models. Stieg (2006) identified sustainability gap between theory and practice; the Council for Interior Design Accreditation (CIDA, 2006) released a sustainable teaching manual (revised in 2009); Ruff and Olson (2007) studied students' awareness of sustainable design; Zuo *et al.* (2010) applied the performance-based design approach. Recent developments and emerging tools in design practice pose expectations for educators to re-organize their curriculum and introduce more digital technologies, such as building-performance simulation tools.

The educational design context: designing a sustainability course

In Bilkent University's, Department of Interior Architecture and Environmental Design, the curriculum is organized around studios that prepare future designers to progressively deal with larger and more complex interiors. The undergraduate education is four years. Concepts of interior architecture, such as material, form, composition, are taught in the first two years, and the last two years provide specialization in areas, such as technology, the humanities, and designing for the disabled.

The non-studio course called "IAED 342 Sustainable Design for Interiors" module, with a focus on sustainable indoor environmental quality was redesigned in spring 2012 to address the design learning challenges mentioned above. An active learning experience with industry collaboration was incorporated into the course 4 hours per week (2 hours twice a week) for a period of 15 weeks. Active learning in the course was achieved in two ways:

(1) students could formulate their own goals and pursue them which provide an increased feeling of autonomy and belonging through self-directed learning; and

(2) working in small groups, engaging in group discussions and classroom presentations.

The pedagogical strategies applied in this course were based on face-to-face classes and e-learning modules, where instructors and students could enjoy the benefits of new information and communication technologies (ICTs). The course was instructed by the author. Classes were theory-based for the first eight weeks and practically based for the last seven weeks. Forty-five percent of a student's grade was allocated to the theoretical part, composed of student presentations (25 percent), a building trip (5 percent) and a written exam (15 percent). The remaining 55 percent stemmed from the practical portion of the class, which consisted of an individual term project with an industry partner.

The theoretical portion included eight topics (one per week): sustainable strategies, water systems, waste water and its reuse, toilet design, energy conservation, indoor environmental quality: heating and cooling and eco-architecture). Class time incorporated group presentations (no-more than six students) on energy efficiency,

effective water use, green principles, spatial and mechanical strategies for sustainable interiors, human thermal comfort and air conditioning processes. Students were graded on their active participation and engagement in achieving the learning outcomes and on their critical thinking, assessment and research skills. Most importantly, the presentation was to reflect an interior/architectural perspective rather than a mechanical engineering viewpoint; students needed to focus on the implications of each topic in the interior architectural design context. The students were provided with a reading list and guided by the instructor regarding the presentation outline and required concepts for each topic. The final presentation grade was the mean grade from the instructor and the other students; it was also a peer-review assessment.

According to Biggs (2003) peer-assessment provides active involvement with the criteria of good learning, teaching students how to select good examples and practicing self-evaluation through making judgements about whether a performance meets the given requirements. Although peer assessment has many positive outcomes, there are issues with it (Brown and Knight, 1994). In this study, informal discussions after the presentation assessments showed that some students resented being asked to perform what they felt should be the instructor's responsibility (Brew, 1999). Students may be unsophisticated in their judgements and give higher marks to showy and extroverted students and lower marks to quieter ones, who may nevertheless have made an equally significant contribution (Brown and Knight, 1994). After each presentation, each group immediately uploaded their presentations into the virtual learning environment. For the remaining 2 hours of class, the topic elaborated on by the instructor, who also provided online tutorial materials before each class. Students were expected to study the course material and the group presentation for that week, and prepare for the face-to-face discussions. Preparing a presentation, assessing their friends and absorbing further information on the topic by the instructor allowed students to raise concerns, develop autonomy and responsibility, become more engaged with the subject and increase their interactions with their professor and peers.

As part of the instructor lecture, representatives from expert firms and industry partners, for each topic were invited to share, discuss and/or lecture on different aspects of sustainability. The students eagerly anticipated these opportunities for hearing and sharing ideas about practice and policy. Input from expert firms and industry partners was absorbed by the students through experiential learning, that is, providing them with concrete experience, such as starting the lecture by showing a trigger film of their recent projects and built references that illustrated the technical aspects and functioning of each topic. Thus, during this part of class students were engaged in reflective observation through taking notes, watching films and exploring the various interior design aspects of each topic through question and answer sessions.

In this part of the course, the students visited an office building with a LEED Platinum Green Building Certificate, the highest certification in the LEED system. During the trip, a lecture introduced the students to the building's facilities and environmental, mechanical and electrical components of the building required for comfort and facilities. The services of cold and hot water supplies, heating, ventilation, air conditioning, sanitation, sewage disposal, sustainable systems and alternative energy were discussed in detail. Design applications and installation principles were illustrated with regards to legislations and standards. To enhance and support the learning process, this excursion aimed to encourage students to envision the potential strengths and weaknesses of the course subjects in a real building.

For the second part of the course, all students worked individually with TROX, one of the industry partners, which has been the leading global supplier of innovative and sustainable air conditioning technology since 1951. The project was a collaborative process between interior architecture and indoor climate, integrating a sustainable heating, ventilation and air conditioning element into the studio design project. Each student developed his or her own project, so that each was unique in quality and approach. In the first and second weeks, company representatives gave detailed lectures on the design criteria for air conditioning and ventilation, focusing on equipment selection and comfort zone requirements. Informal class discussions ensued at the end of each lecture, where students could share their ideas, ask questions and receive feedback.

An online account within the virtual learning environment was created for the company representatives to participate online discussions, post questions and give and receive updates. In the third week, the company introduced their "Easy Product Finder" software tool (www.troxtechnik.com), which students were expected to use for their projects to work in detail with air conditioning equipment, such as diffusers and water systems (Easy Product Finder, 2012). According to their choices, they could access their comfort data and acoustic results, and easily import them into their drawings.

For the last four weeks, two company representatives provided there were individual desk critiques and held group discussions about student projects. From the feedback, students redesigned ventilation systems, chose more sustainable air conditioning equipment and improved indoor environmental quality. The six projects that best achieved interior architecture integration with mechanical design were exhibited in TROX's Istanbul Central Office, and later in TROX branches throughout Europe (see Figures 1 and 2 for examples). The possibility of an award much motivated the students and helped maintain interest in the course throughout the semester. The attraction was apparently not the award itself but, rather to the honour of receiving an award in front of faculty and their peers.

Findings

The direct quotes (translated from Turkish by the author) in this section provide evidence of students' shared enthusiasm for the course's active learning environment, group work and, working with industry, as well as some student concerns. At the end of the module, unstructured questionnaires, observations and focus-group interviews provided data on students' attitudes and gathered their feedback. The results revealed that the active learning environment and industry collaboration positively influenced students' awareness of sustainable design, increased their ability to integrate sustainability knowledge into design studio projects and improved academic outcomes. These findings and responses were crucial for the instructors and guest lecturers in terms of improving students' learning quality. Race (2000) defined group learning as two kinds of processes: learning and working with others, and the responses in this study can be analyzed from these perspectives (Afacan, 2012).

Learning process

All 98 students commented positively on presentations as an effective way of learning sustainability learning in terms of:

- multi-dimensional analysis;
- use of experience; and
- creativity.

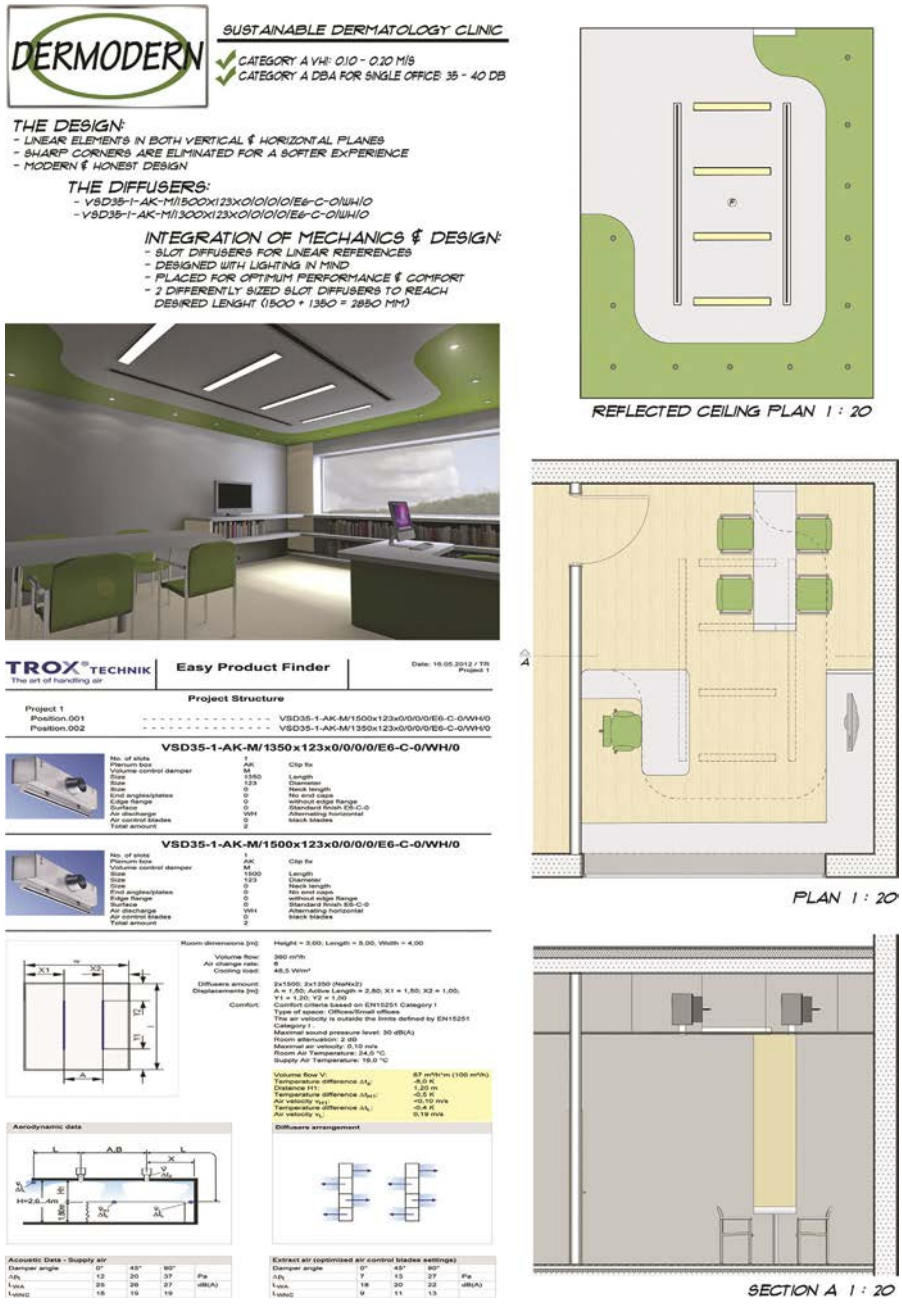

Figure 1.
One of the examplary projects that best achieved interior architecture integration with mechanical design

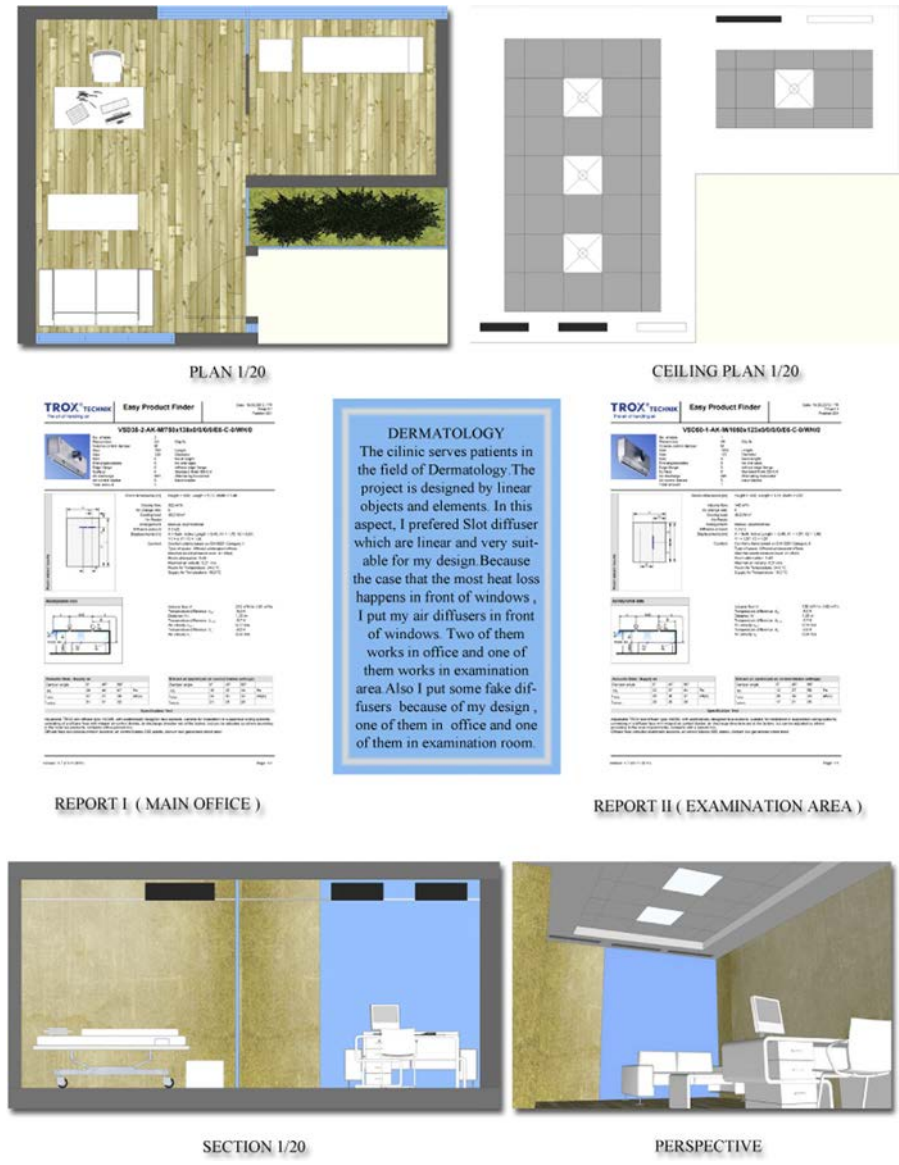

Figure 2.
One of the examplary projects that best achieved interior architecture integration with mechanical design

Thirty-one students said, they learned through the feedback provided while preparing, introducing and assessing the presentations. Sixty-five students found the brainstorming sessions with TROX partners very helpful because they could share ideas, collaborate, discuss and benefit from others' experiences. The more students engaged with the course, the more successful and creative projects they had. Creative design is a matter of working out all solution variants through all phases and studying the number of possibilities by divergent and convergent steps (Cross, 2006);

49 students indicated that by working first in groups and then, individually, they were able to incorporate different ideas of design. The diversity of the project results achieved by students' active participation in face-to-face and online activities improved their success in studios:

> I learned about different building performance topics and understood the project through brainstorming in a more comprehensive way (Student 41).
>
> I enjoyed the course more while sharing ideas and experiences of industry partners with my friend (Student 18).
>
> Thanks to the TROX partner for his helpful, creative ideas and for his knowledge that allowed me to better analyze the project (Student 7).
>
> Through the presentations I benefited from different kinds of ideas about indoor environmental quality and improved my approach to the subject (Student 85).

Thirty-five students said that industry collaboration was the most effective way to learn about sustainability themes (Figure 3) because it gave them a different perspective of learning, increasing their interest in and motivation around building-performance issues. Twenty-two students found that research presentations followed by peer review as most helpful way in meeting the course requirements. Twenty students felt that the TROX desk critiques best assisted them to apply the course material into their studio projects. For 14 students, the field trip developed their creative approach to projects and allowed them to analyze issues in practice. For seven students, detailed lectures by industry firms increased their motivation and enhanced their cognitive skills in the design education context.

Most (73.47 percent) students stated that from the presentation research they could approach environmental quality issues from different perspectives and analyze them in a multi-dimensional way, which they could not do previously (Figure 4). For about one-quarter of students (26.53 percent), the group presentations resulted in:

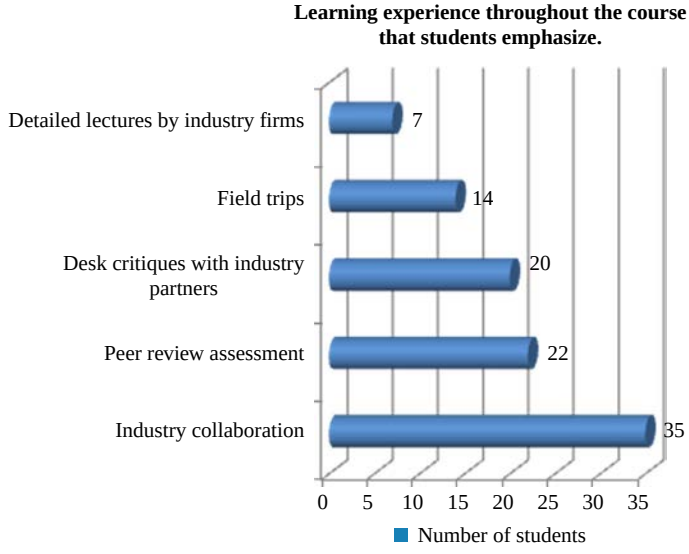

Figure 3.
Responses to the learning experience throughout the course

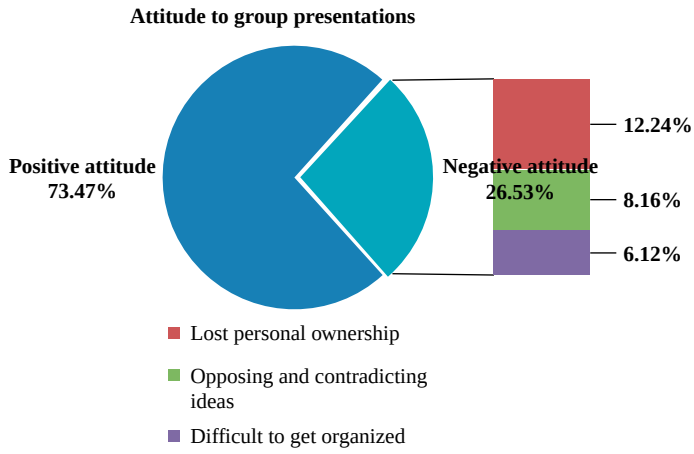

Figure 4.
Attitude to active learning environment through presentations

- loss of ownership;
- contradicting ideas; and
- organization problems.

For 21 students (21.42 percent), industry collaboration resulted in:

- feeling overwhelmed;
- technological problems; and
- loss of ownership (Figure 5).

Twelve students (12.24 percent) stated that working in a group decreased their learning performance because they lost ownership of the project. Ownership of ideas is more important in design fields than in other areas of education. Design is as a graphic and verbal language game (Schon, 1981) and, each student wants to his or her own

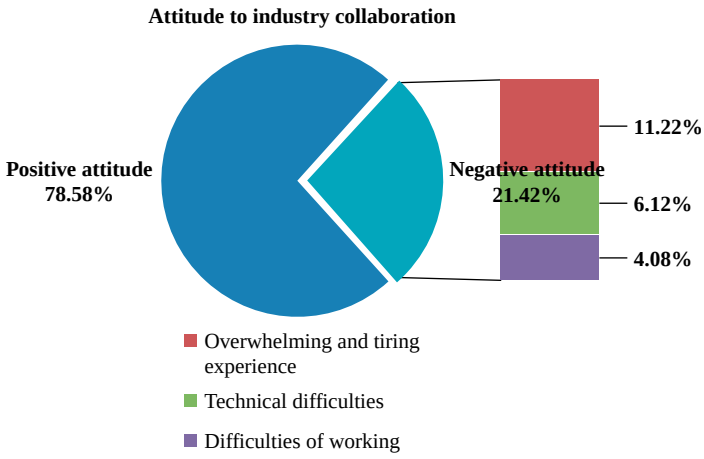

Figure 5.
Attitude to active learning environment through industry collaboration

and distinguish him or herself from others. In this study, students felt that in group work they lost their unique designer character, and thus could not develop their skills and became unmotivated. Eight students (8.16 percent) complained that there were always opposing ideas, contradicting discussions and disagreements regarding the solution alternatives. The nature and content of interior/architecture education are such that there is not one solution domain underlying studio teaching; rather, there are a number of ways to approach a design problem, each of which could be accepted as relevant as long as the technical considerations are correct. Therefore, differences between students' ideas could be difficult to deal with if each student wishes his or her idea to be used.

Six students (6.12 percent) noted that it was difficult to get organized for the group work because some students were not cooperative regarding meetings and responsibilities. For 11 students (11.22 percent), industry collaboration was overwhelming and tiring, they felt a non-studio course did not merit such effort and energy. Six students (6.12 percent) complained about technical difficulties with TROX's required software and, four students (4.08 percent) experienced difficulties working with someone outside the learning environment:

> I am more creative by myself; I lost ownership of the project by group work (Student 47).
>
> Some opposing ideas can cause arguments, which we could not deal with. Aggression slows the project process (Student 23).
>
> It is difficult to do a project with different ideas and, different people (Student 58).
>
> Contradictory ideas can be problematic and sometimes you don't want to do what the industry partner proposes (Student 69).

The process of working with industry

Working with industry can create considerable value for interior architecture education, the study analyzed the following research questions about that process:

RQ1. How important is working with industry?

RQ2. What are the benefits of collaborating with an industry partner?

RQ3. To what extent does working with industry help link non-studio course material to the studio project?

RQ4. How can the process of collaboration be more effective?

Forty-six students (46.94 percent) found the collaboration process very important, 25 students (25.51 percent) found it important, 20 students (20.41 percent) moderately important and seven (7.14 percent) students unimportant (Figure 6). The last seven students were unable to decide and collaborate on an issue with the industry partner, and they believed that process impeded their studio project. These students received a lower grade overall.

The study also examined whether students who received higher grades had a more positive attitude to group work. The results show a statistically significant relationship between grade and attitude ($\alpha = 0.01$, two-tailed). Students with higher grades found working with industry important; they listed benefits such as; creating and sharing ideas (32 students), initiating concomitant dialogue with the instructor and industry representative (18 students), increased awareness of practice methods (16), effective listening (15), ease of understanding and use of the technical knowledge in the

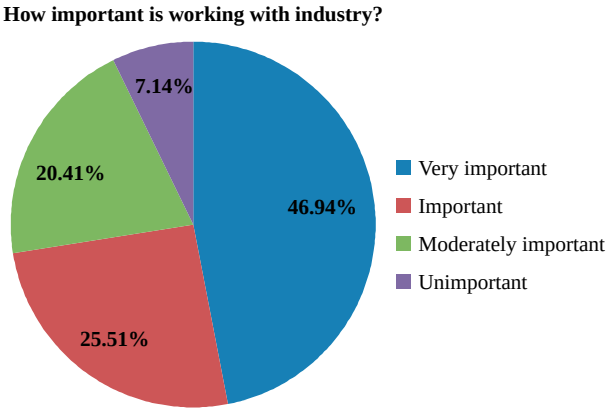

Figure 6.
Students' response to how important is working with industry

studio (11) and a shared sense of responsibility for the firm (six) (Figure 7). In terms of sharing ideas, most students agreed that the process of working with industry and how the course was formulated around this process allowed them to engage with the course material and studio together, and offered the ability to use non-studio material intentionally and effectively in their studio project, factors were that are very problematical within a traditional course format. Sixty-two students highlighted that working with industry extremely helped them to link non-studio course material to the studio project, and 27 students indicated that this greatly helped them. Ten students stated that working with industry did not help any learning issue.

The study also analyzed student suggestions for making the collaboration process more effective. Two main themes were apparent within the suggestions:

(1) integrating of such processes into other curriculum courses to be better prepared for real-life situations; and

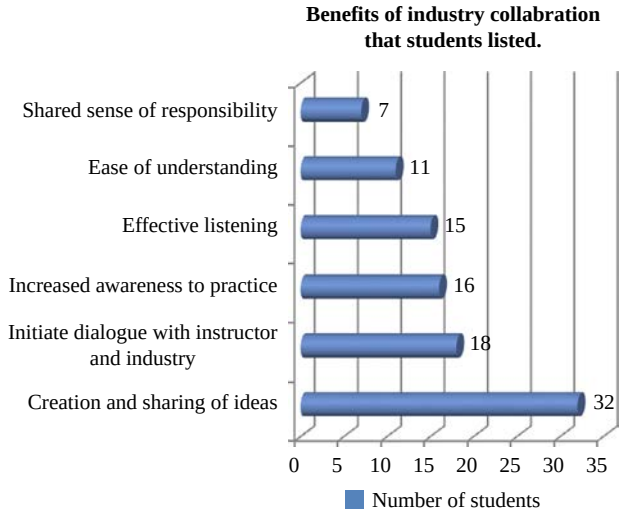

Figure 7.
Number of benefits of industry collaboration listed by 98 students

(2) expanding the process through increased use of technology, such as collaborating with firms around the world for greater information access and increased interaction.

According to Vygotsky's social development theory, learning does not occur in isolation. High levels of interaction contribute to increased positive attitudes toward learning, greater learning satisfaction, student engagement and motivation for higher achievement (Garrison, 1990; Ramsden, 1988; Wagner, 1994).

Conclusion

The findings contribute to an understanding that working with industry is an inevitable part of teaching sustainability in interior design education. As Salama (2008) suggested, in architecture education the learning environment is more effective if real-life issues are well integrated. The current study highlights the benefits of hands-on industry experiences versus theoretical exercises. Adopting such an approach encourages students' creativity, enhances their cognitive skills within the diversity of project partners and, works across design disciplines (Cassim and Dong, 2007. The Department of Interior Architecture and Environmental Design at Bilkent University is the first to introduce a sustainability course and create a responsive and social learning environment through industry collaboration.

Responsive learning environments, where student autonomy can be developed, are essential to increase the quality and flexibility of non-studio course content. Responsive social environments create a three-way conversation between the industry partner, student and instructor. Moreover, an active learning environment formulated with varying degrees of instruction methods and mediated with diverse design knowledge can improve the quality of design teaching.

This study's observations and findings show that the learning process and the process of working with industry were successful. However, it may not always be easy to collaborate with industry in non-studio courses and integrate sustainability issues in interior architecture education. There may be difficulties at the administrative level and/or with finding an appropriate industry partner to collaborate with higher education. The students themselves may have difficulty in collaborating with others and it may be challenging for the instructor to achieve the right balance between the scientific and socio-cultural dimensions of such a course. The process of working with industry may work best in high-level studio courses, such as in this study, where students are more mature and have achieved higher skill levels. The foundational knowledge of sustainability, however, could still be taught through group presentations at lower levels of interior design education.

Because this study has a small sample size and a limited context, it is not possible to generalize the results. Future research could include more participants from different years of interior architecture education and/or a comparative cultural study with other design schools that collaborate with industry to gather more information about the importance of working with industry in design education.

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