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PBL 2.0. Interdisciplinary, multicultural transformative sustainable education for design students.

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Abstract: This paper will explore the pedagogical implications of a multicultural and interdisciplinary sustainable design workshop organized in two geographically distant but vibrant cities of the world. Students and faculty from four design disciplines came together over seven days to explore sustainability index and design intervention process within dense urban communities in their socio-cultural-economic context. The workshop took place simultaneously in both countries to enable continuous knowledge sharing. Lecturers encouraged integration of practices and knowledge from different disciplines in order to develop design solutions for micro living spaces under a human-based design process.

Participants experienced a multicultural and dynamic learning environment where 'learning from the community' was paramount. The workshop produced solutions that transcended disciplines. Participants appreciated the process of design and the way of approaching a problem as well as the self-learning process of understanding sustainability, closely linked to lifestyle and culture. The understanding of sustainability is no longer static but dynamic – placed in context.

Keywords: Interdisciplinary Education, Sustainable Design, Multicultural Design, Design Education, Transformative Education

1. Education for social and environmental design

The mission of sustainable education is to promote familiarity with the socio-physical environment - personal responsibility and emotion for the environment - together with critical thinking toward human interaction with the environment. The discipline of design may be defined as 'the art of problem solving' through creativity and innovation. With this in mind, a workshop was convened to enrich student's ability to create from different disciplinary points of views and utilizing different professional methods, and at the same time to open the conceptual understating of different cultural definitions of design. Students' learning relied on a design process that included different physical environments, different social settings and challenges and different cultures. All that was incorporated into a general system-thinking outlook for long-term sustainable solutions. The workshop aimed to transform students' perception of their role as sustainable change agents and their wider responsibility for society and the ecosystem.

2. Sustainability in design education

2.1 The need for sustainable design education

One of the biggest challenges of our times is to design products and spaces for the more than 7 billion human beings on this planet, while living within the means of fast-depleting non-renewable natural resources. Our environment not only provides us with the fossil fuels on which we have become addictively dependent, but also water, air, soil and the whole gamut of resources without which life may not be possible or 'comfortable'. Conventional designs often consume huge quantities of material and natural resources, deplete non-renewable resources, have high-embodied energy and pollute the air, water and soil in the process of manufacture.

Huberman & Pearlmutter (2008) claimed that the construction sector has become one of the most intensive in the use of energy and raw materials. The main reason for this is the introduction of modern building materials that, unlike traditional materials, increase the embodied energy and carbon footprint of the constructions as they are made far away from where they are finally used and are produced through costly manufacturing processes.

In both participating institutions, graduate level design education has minimal sustainable thinking incorporated within the syllabi except as electives or subjects of choice. Awareness on environmental issues and concerns occupies a negligible portion of design curriculum even though studies indicate a direct correlation between students who choose such subjects and who later pursue higher education in sustainability or practice (Pradhan & Yehuda, 2015). Sustainable design thinking must begin early in the learning process and not as an after-thought to design because the greatest influence of a design on sustainability is at the conceptual stage (Perullo, 2013).

2.2 Interdisciplinary sustainable design pedagogy

Educating designers for social and environmental sustainability within the disciplinary structure has proved to be a challenging task. In order to encourage creation of feeling, values and skills for sustainable design, a certain level of relevant sustainable literacy must be achieved (Orr, 1992), yet isolated disciplines, such as industrial design, architecture, or even interior design, find it difficult to accept new terminology. Gated disciplines generate graduates that will not be able to tackle complex challenges such as answering human needs while maintaining the integrity of the supporting ecosystem (Capra, 1996). Beside the disciplinary structure, another major barrier to the integration of

sustainability in Higher Education (HE) is content-based learning (Wals, 2010), which narrows the student's point of view and ability for system thinking.

Many researchers call for pedagogical shift from education that encourages knowledge and skill accumulation to education based on facing real life complex problems. They call for education that encourages contextual understanding of the physical sources together with the human values and perceptions that caused the problem. There is a quest for education that will teach students that it is their professional responsibility to lead toward sustainable change (Sauvé, 2005), (Pe'er, Yavetz, & Goldman, 2013).

Sustainability may be perceived as a new field, created from the combination of many traditional fields. This abundance is fertile ground for innovation, which can be intensified through academic collaboration with organizations and industries (Nidumolu, Prahalad, & Rangaswami, 2009).

Transformative Learning (TL) pedagogy is part of the constructivist education paradigm. This paradigm focuses on the relativity of understanding and the subjectivity of the perception of reality. One of its core pillars is the principle of awareness to the constant change of knowledge. Students' knowledge creation begins with personal interpretation of the knowledge following up with its reconstruction through dialogue with ever-changing reality (Moore, 2005). TL pedagogy successfully overcomes many barriers such as gated disciplines, detachment from community and environment, and more, by focusing on the principle of interdisciplinary learning and the creation of multiple connections with surrounding environments and communities through active learning and creation of solutions (Mezirow, 1997), (Sipos, Battisti, & Grimm, 2008), (Brundiers & Wiek, 2011).

One of the successful TL constructivist pedagogies is Problem-Based Learning (PBL), which is the case of this paper. Under the PBL pedagogy, students learn through social, cognitive experiments by facing real-life challenges and people (Major & Palmer, 2001). The workshop utilized different components of environmental education such as knowledge, skills, emotion and behaviour, together with project-based learning, interdisciplinary team and deep involvement of communities. Students started the workshop by learning about the problem, participating in the problematic situation, designing solutions with the community, and finally publicly presenting their solutions to the communities (Joseph & Blumenfeld, 2006).



Figure 1. Interdisciplinary design education through team work of architecture, engineering, product and interior design students.

2.3 Multicultural education for sustainability

One of the theoretical foundations of the workshop is the principle of cultural education, based on the theory of Wurzel, J. (1988) of multicultural education. Participants experienced multicultural education through team work, case study communities, and people they met during field research and design.

The students who participated in the workshop came from Israel and India. The Israeli students themselves originated from different local communities and from different socio-economic backgrounds. The Indian students also belonged to different native states and differed in their socio-economic backgrounds, religions and age.

Case study communities in Mumbai and Jerusalem were deliberately culturally diversified. In Jerusalem, students met with people from: Ultra-Orthodox community; Palestinians living in Israel; Urban commune; Social housing project; Old-age home. In Mumbai, the students met with people from: Dharavi slums; Chawls (worker's tenements of colonial times); Cooperative Housing Society; House-hold Help Quarters in a gated community towers; and elderly people living in bungalow.

The students were instructed to explore the design of minimal housing spaces after E.F. Schumacher "Small is Beautiful, a study of economics as if people mattered. The relative size "small" and aesthetic terms "beautiful" are related to culture and tradition. The students observed and learned the concepts above by encountering the various cultures, while examining their own culture in comparison to their subjects.

Both local and visiting students who participated in the workshop experienced a multicultural learning process and dealt with experiences that had elements of transformative learning through challenging their personal prejudices, and the development of multicultural awareness. For example: a secular student from a middle-class family is facing the socio-physical reality of an ultra-orthodox family of 8 members of a family living in a 36 square meter apartment. Understanding the basic concepts of culture, values and priorities in other people's daily life is imperative to this learning process.



Figure 2. Multi-cultural design education of joint student team from India and Israel at Dharavi slums, Mumbai

3. The Workshop

The week-long workshop took place simultaneously at the Rachana Sansad's Institute of Environmental Architecture in Mumbai (RSIEA) and at Bezalel Academy of Arts and Design in Jerusalem in August 2016. The goal of the workshop was to explore the pedagogical implications of a multicultural and interdisciplinary approach to sustainable design organized in two geographically distant but vibrant cities of the world – Mumbai and Jerusalem. The workshop was planned for participants to approach a systems thinking through the integration of design disciplines addressing a case study. Each participant representing a discipline would have a unique approach to problem solving and this integration of knowledge through discipline-specific terminologies would enhance the learning process.

The theme 'Small is Beautiful' adopted from E.F. Schumacher's work addresses the optimization of resources at the individual and community level. Participants were asked to engage in questions such as 'what is small? Is it the ego or the consumption? What is beautiful? Is it people and their spaces or their shared values?

The workshop also called on the participants to address the question in their design case study exercise of 'what can you learn from these spaces that you can adopt and recommend? The theme aimed to understand and apply design values through the learning from compact spaces, and communities living within limitations of socio-economic factors. It encouraged participants to derive practical lessons for designing new spaces through the analysis of standard modern nuclear and the traditional spaces linked to community.

As Schumacher puts it: "While many theoreticians – who may not be too closely in touch with real life – are still engaging in the idolatry of large size, with practical people in the actual world there is tremendous longing and striving to profit, possible from the convenience, humanity and manageability of smallness.

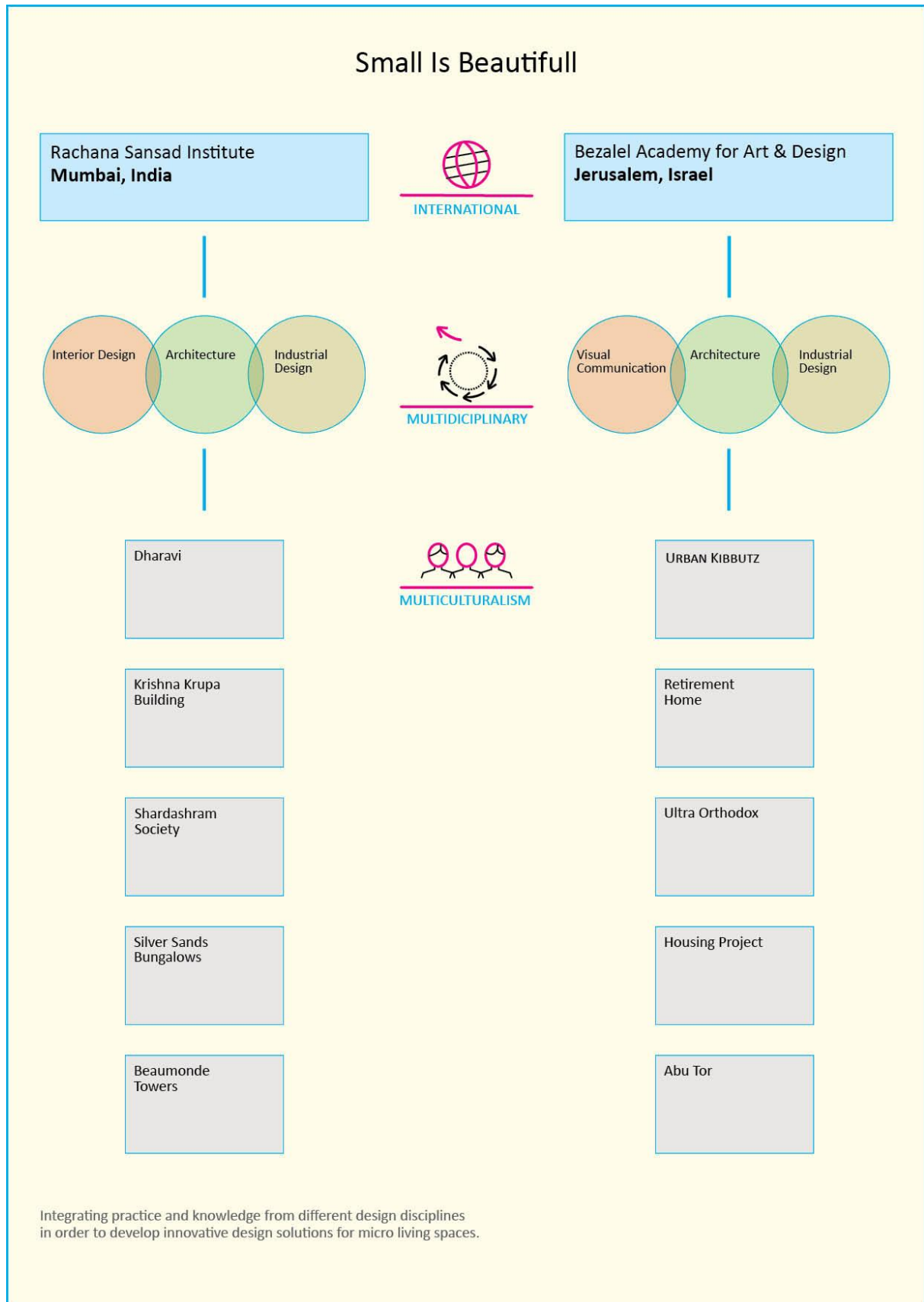


Figure3. Interdisciplinary and multi-cultural course structure

Students and faculty from four design disciplines, that is, architecture, industrial design, visual communications (applied arts) and interior design, came together over seven days to explore sustainability index and design intervention process in spaces within dense urban communities in their socio-cultural-economic context.

The participants comprised a mix of students and practicing professionals most of whom (85%) were below 30 years of age. There was equal participation by both genders in both cities and an equal number (54%) who were single or married or in a relationship. Fifty per cent of the participants were graduates and the remaining were pursuing or completed post-graduation, even pursuing doctoral studies. Architects comprised 50% of the participants, while visual communication and industrial designers had 23% and 15% representation respectively.

Indian and Israeli students and professionals from different design disciplines worked in mixed design discipline groups. The groups were assigned case studies of dense living spaces in Jerusalem and in Mumbai and they explored different aspects of their living and environmental conditions. Based on this analysis, they were asked to design solutions of various kinds: architectural configurations, products and services that will advance a more efficient use of space, energy, food, etc. as well as design campaigns that will encourage changes in behavioural patterns that influence human habit of consumption.

Throughout the sessions, the focus of the workshop remained on the aim of developing a humanistic, interdisciplinary approach to sustainable design of habitats and its components. Following were the main underlying aspects of the workshop:

- Design that is accepted by people
- Design that can influence human behaviour for sustainability
- Involving stakeholders in the design process
- Multilateral and interdisciplinary
- Promotion of experimental didactic and research
- Development of an Index as an innovation model towards sustainability
- Testing and dissemination of sustainable solutions for society

The workshop addressed various issues related to sustainability: current trends of increasing housing size, different opportunities of resource, space and infrastructure sharing, design for low-income families, cultural and behavioural-driven design, etc. all of which will lead to saving of resources and the reduction of pollution. Workshop lectures and panel discussions covered a wide range of topics pertaining to sustainable design including methodologies and principles of working with the community, introduction to sustainability: the most pertinent issues related to architecture, industrial design and visual communications, and a panel discussion on Strategic Sustainable Design.

3.1 'Small Is Beautiful' utilizing a web platform

The fact that the workshop took place in Jerusalem and in Mumbai simultaneously required utilization of various Internet platforms. The workshop's syllabus deliberately implemented methods such as video conferences, joint presentations, a blog-platform for uploading contents and references related to the course as well as relevant researches and documentations. All this was done in order to create an unbroken dialogue and a stream of continuous communication.

Mutual topics and parallel cases were selected to create interaction and collaboration between all the students. The projections of some cases triggered creativity in the way of offering practical solutions. For instance: a group that was concerned with the use of a certain space throughout a 24-hour span

in Sun n Sand Society, Mumbai, consulted the Jerusalem group who thought of a similar solution for residents of a local old people's home.

For an additional contact between the ten groups MEDIUM platform was used.

<https://medium.com/small-is-beautiful>

<https://medium.com/small-is-beautiful2>

4. Research method

The aim of this paper is to develop a pedagogy that is intensive, international, multicultural, interdisciplinary and dynamic involving learning and experience from the community. The goal of the research was to help lecturers improve pedagogical tools that will sharpen the students' learning outcomes in future workshops and to understand the value of multicultural and interdisciplinary education of sustainable design. In order to cover as much as possible from the first workshop, a mixed method was developed. The method utilized three sources of information: qualitative, quantitative, and visual analysis, which maximized the possible validation of the results in light of the small number of students and complexity of the learning process.

The method started with open student interviews, followed by an online questionnaire that examined the students' social and environmental behaviour, positions and knowledge with 21 closed and three open-ended questions. A special space was devoted to different nuances within the interdisciplinary experience. From 31 students in total, 26 replied to the questionnaire. Furthermore, a visual analysis of the workshop outcome was conducted in order to learn about inter-disciplinary design skills developed in the workshop. Eventually, all results were combined into a report that will be used as pilot research for further development.

5. Research findings

5.1 Pedagogy of sustainable design

In general, it was reported by the participants in the workshop that pedagogy for sustainable design:

- Is developed outside the classroom, as part of one's own realization and maturation process - facing real challenges through field work (80% of participants)
- Interdisciplinary studies help to break out of the box and expand the perspective (54% of participants)
- Elective courses are effective (34%) as also theory and studio (30%)
- Sustainability is best obtained through enrolling in professional courses (42%)
- Academic activities must be channelized towards overall development of the human being and society.

A lot of information about environmental sustainability is available in the Internet; however, participants in the workshop felt that learning about sustainability with peers and experts in an academic setting provides insights and avenues for thinking. Beyond a conceptual framework, visiting sites and communicating with people and stakeholders, discussing in groups and presenting outcomes is a useful exercise. Key learning by participants (in their own words) are summarized below:

- "Self-educated consciousness and maturity is key to understanding sustainability";

- “Sustainability is a lifestyle not skills or technology”;
- “Working in an Eco-village made all the change (in my understanding of sustainability)”;
- “Sustainability is not just about ecosystems but also humans and their lifestyle, comfort and necessities”;
- “Conservation is part of our culture but personal development and questioning regarding contribution to a better future for children has created realization and consciousness regarding sustainability”;
- “The current globalized consumerism is polluting and wasteful; interdisciplinary approach and outcome based approach is required.”;
- “Comprehensive approach and multi-layering process”;
- “Sustainability in every sense is the key to cumulative growth for all”;
- “Learning about sustainability in an academic setting and the workshop (helped develop the concept of sustainability)”.

88% of participants felt that the workshop (teaching methodology elaborated in section 3) had a moderate to strong contribution to new knowledge and personal behaviour towards sustainable and responsible design. 77% felt it contributed to new design methods while 73% felt it contributed to acquiring new design skills.

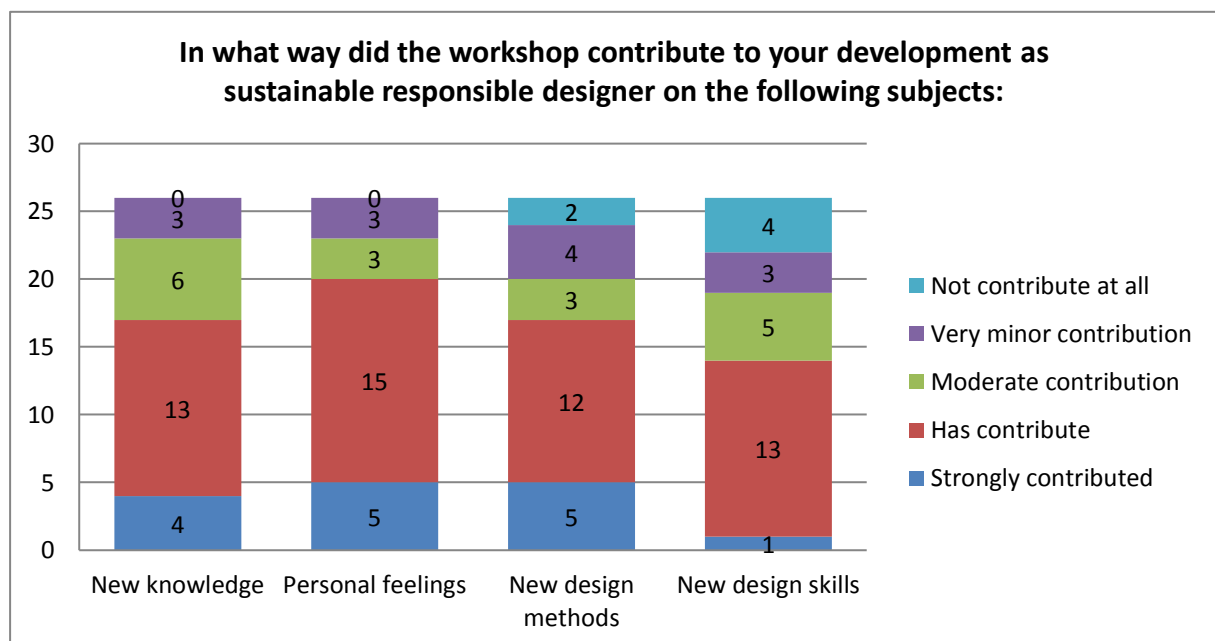


Figure 4. In what way did the workshop contribute to your development as a sustainable responsible designer?

All participants felt that the course lectures and guests had moderate to strong influence on the subject, 97% felt that conducting the workshop by visiting communities and meeting and involving them in the design process contributed to understanding of subject, 93% felt that having interdisciplinary participants and faculty was useful, 89% felt a moderate to strong influence of multicultural learning and dealing with case study with real, complex challenges.

The workshop influenced the participants most on ‘space efficient design’ (100% of participants) followed by ‘human-centric design’ (96% of participants). It next most influenced ideas on ‘ecological footprint’ (85% of participants) and ‘waste’ (84% of participants) followed by ‘climate sensitive

architecture'. 80% of participants felt that it influenced 'design activism', 77% on 'waste generation' and 'energy use'. Its influence was least on 'water use' (65% of participants).

Working in groups and learning viewpoints of people from another discipline were key learning sources for participants in the workshop. 96% of participants felt that different viewpoints beyond the scope of their discipline contributed the most to their learning experience, 92% felt that peer learning in the group contributed to learning, while 89% felt that aspects of another discipline incorporated in the design proposal contributed to the learning experience.

5.2 Interdisciplinary design education

About a third of the participants of the workshop chose not to speak about 'interdisciplinary'. This could be due to lack of clarity on the perceived role of interdisciplinary in their overall understanding. Except for a marginal number, most participants experienced 'interdisciplinary' as a process in which several knowledge fields, combined together into a new harmonized field. Only 11.5% (3 people) felt that 'interdisciplinary' was not an important part of their experience in the workshop.

5.3 Analysis of workshop design outcome

Multidisciplinary design solving challenges in crowded apartments in Ultra Orthodox community, Jerusalem:

Example A - The sustainable design solution proposed for an ultra orthodox community house in Jerusalem by an interdisciplinary and multicultural team comprising participants from the fields of visual communication, industrial design and architecture, and from both countries, were presented on an online platform. The solutions were focused on redesign of interior spaces and climatically responsive architecture, keeping in mind low-income users. The solutions were based on needs of residents, and their acceptability of design with respect to deriving a better quality of life within the limitations of their cultural setting. The solutions proposed improvement of environmental indicators such as climatic conditions, lighting, air-flow, etc. The ability of the team to communicate their

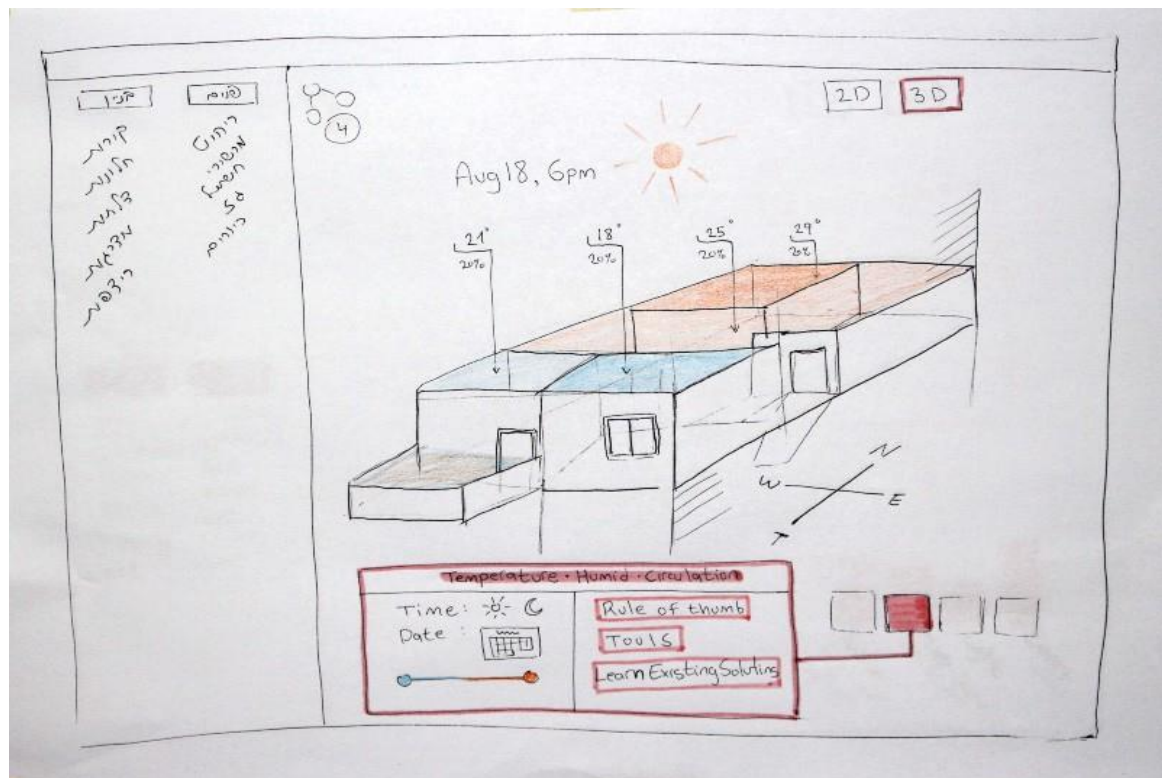


knowledge and solutions with residents was enhanced by the confluence with the visual communications field.

Figure 5. A 36sqm with 8 residents at an ultra-orthodox apartment in Jerusalem. Group members –Noa Afek from Visual Communication, Einav Afgin from Industrial design, Pooja Dawalkar from Architecture

Figure 7. Schematic drawing for web platform interface. Group members –NoaAfek, Einav Afgin, Pooja Dawalkar

Example B – This solution was proposed by an interdisciplinary and multi-cultural team in Mumbai comprising architecture and visual communications. The case study is of Shardashram, which is the first Co-Operative Housing Society of the post-independent era in India. Its buildings were occupied since 1949 by mostly Maharashtrians (natives of the State of Maharashtra in India) and a few families from different castes living in 139 flats, and forming a closely-knit society. Due to their similar cultural background, residents celebrate festivals together and arrange communal recreational activities. For these, they use a single community space of around 200 sq m. The students' analysis identified that this space is not utilized efficiently: lack of partitions impeded the possibilities of performing different activities simultaneously and the storage solutions did not match their needs. Therefore, the proposed



design suggested a versatile furniture for activities and storage, while helping utilize the space in more flexible way. In addition, they have developed a communication platform in order to better manage the furniture's usability.

This is an example of an interdisciplinary outcome of a continued collaboration of students and practitioners from different disciplines. The outcome designs incorporate knowledge and practice from each discipline: Architecture - the new utilization of the space; Service design - the definition of the services and their performance; Product design- the design capability for the device; Communication design - the integration of communication platforms.

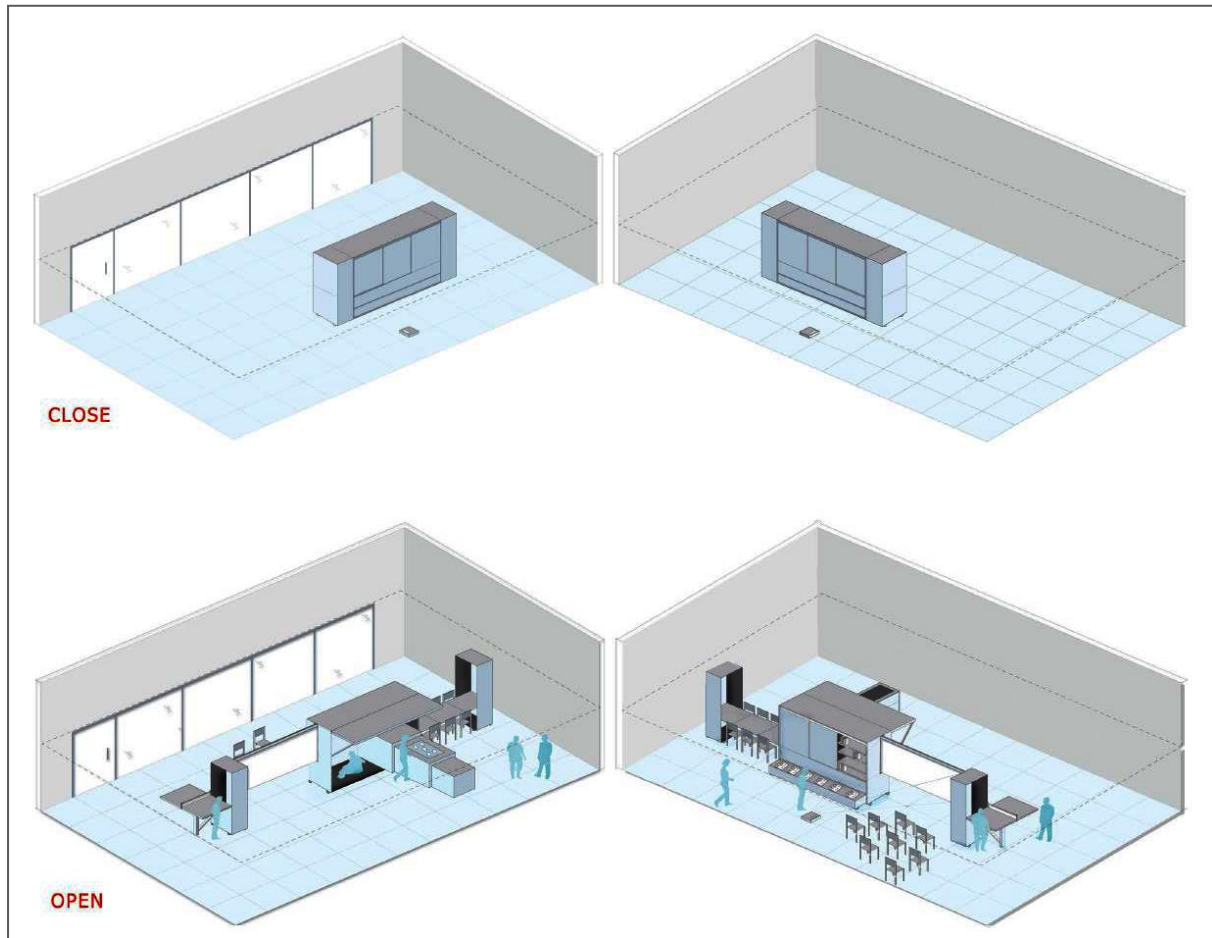


Figure 9. Proposed design for retractable community activity center in Shardashram Co-Operative Housing, Mumbai. Group Members are: Ankita Kirtane, Anil Bhingarde (Mumbai) Nofar Shalev (Jerusalem) from Architecture, and Arya Pillai from Visual Communications

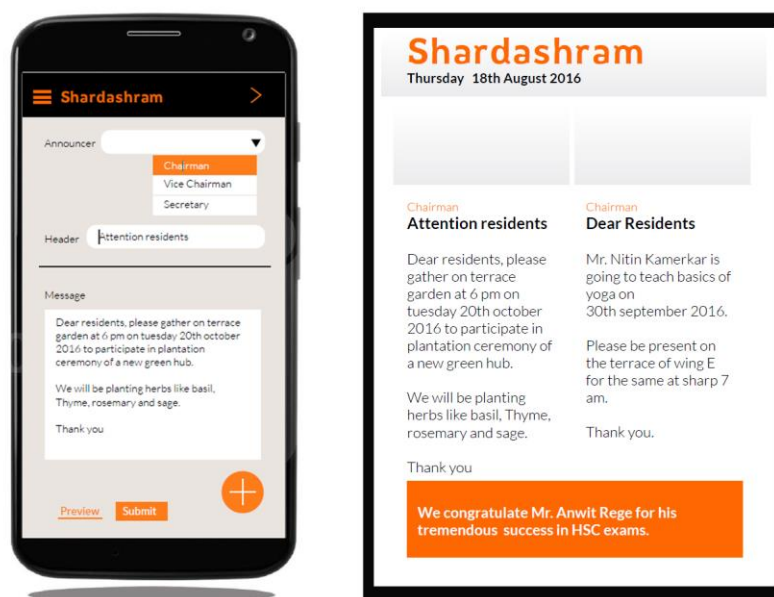


Figure 10. Proposed design for Communication platform for the in Shardashram Co-Operative Housing community

6. Discussion

With its theme of ‘Small is Beautiful: A study of Design as if people mattered’, the key approaches of the workshop included multicultural, interdisciplinary, a combination of theory on sustainability and design application through studio. Together with site visits, first-hand experience of meeting with people, listening and understanding the real issues they grapple with in terms of the design of their houses and neighborhoods, the participants developed a broader perspective of sustainable design. Their design thinking approach was broadened through interdisciplinary interaction with other participants within their group, participants in the workshop and expert lectures.

From the pedagogy tested in this workshop, two main questions arise: the first is regarding the role of interdisciplinary in sustainable design. Is it a key to transformative sustainable education? The second question looks into the effectiveness of students’ exposure to multicultural values in a global environmental context. Literature review places interdisciplinary as a desired tool for sustainable education. Nevertheless, the main academic discussion is about general education, and very little theory has been developed directly about sustainable design education. There is a smaller volume of literature about multiculturalism as an educational tool and even lesser quantity of research about multicultural design education.

7. Conclusions & Way Forward

The workshop through its teaching methodology, steered participants in redefining sustainability and sustainable design, and brought the focus on people and human-centric design. The final outcome by participants for each of the case studies exhibited a solution that went beyond physical space planning and architectural solutions to visual communications and industrial design solutions.

The participants left the workshop with a thought and not a product. In their own words during the concluding session, ‘...they (we) learnt a way of approaching a problem’. The different disciplines within a group allowed participants to approach the design problem ‘through different perspectives’. The workshop also brought a ‘degree of humility’ among the ‘designers’ in the workshop about their limited knowledge of dealing with the complex problems of real world (and the ease with which people find their own solutions).

The theme of the workshop ‘Small is Beautiful’ was about efficient space design. An important conclusion as uniformly seen through all presentations by groups was the fact that space in society has gradients. This includes the private realm - living and sleeping space (and other functional spaces within the house) but equally important are the open and semi-open spaces outside the house, the public meeting grounds, the footpaths, staircases and other such ancillary spaces. In poor neighborhoods, it was observed that residents most often are unable to maintain such public infrastructure that is even more significant than the private spaces in such communities.

Designing common physical spaces such as common kitchen in Abu Tor or vegetable garden in government housing project in Jerusalem, has the potential to transform social and cultural experience of a community. All aspects of design need rethinking when we consider the time spent by people in different spaces – be it the privacy of home, the public spaces such as community center or garden, their daily mode of transportation (such as public transportation used by the ultra-orthodox community) and the work space. A radical change in design thinking is required.

This paper aims to contribute to sustainable design education through the following values:

- Developing a process of learning which involved a dynamic rather than static understanding of sustainability – based on communities, their culture and lifestyle.
- Teaching the significance of space-efficient design for sustainability
- Transcending the realms of space (private, semi-public and private) and modes of expression in creating sustainable solutions
- Involving in the design process elements of exposure to a site and community, lectures, discussion in multicultural and interdisciplinary context, presentations to and feedback from the community

The authors are looking to expand the platform of 'Small is Beautiful' and to include more design disciplines and cultures by inviting academies to join this academic initiative. Overall results indicate that a positive level of transformative sustainable education has been achieved. It is proposed by the authors that in future workshops, a booklet describing tools and process for human-based design, inter-disciplinary and multi-cultural sustainable education practice will be developed.

References

- Brundiers, K., & Wiek, A. (2011). Educating Students in Real-world Sustainability Research: Vision and Implementation. *Innovative Higher Education*, 107 - 124.
- Bergen, D. (2002, Spring). The role of pretend play in children's cognitive development. *Early Childhood Research & Practice*, 4(1).
- Capra, F. (1996). *Epilogue - Ecological Literacy*. New York: Anchor Books, Bantam Doubleday Dell Publishers Group, Inc.
- Chen, C.-w., You, M., Liu, H., & Lin, H. (2006). A usability evaluation of web map interface. In E. Koningsveld (Ed.), *Proceedings of the 16th World Congress of the International Ergonomics Association* [CD ROM]. New York: Elsevier Science.
- Desmet, P. M. A., & Hekkert, P. (2007). Framework of product experience. *International Journal of Design*, 1(1), 57-66.
- Huberman, N., & Pearlmuter, D. (2008). A life-cycle energy analysis of building materials in the Negev desert. *Energy and Buildings*, Vol 40. No 5, 837-848
- Joseph, K., & Blumenfeld, P. (2006). Project Based Learning. In K. Sawyer (ed), *The Cambridge Handbook of the Learning Sciences*. Cambridge: Cambridge University Press.
- Khalid, H. M. (2001). Can customer needs express affective design? In M. G. Helander, H. M. Khalid, & T. M. Po (Eds.), *Proceedings of Affective Human Factors Design* (pp. 190-198). London: Asean Academic Press.
- Major, C., & Palmer, B. (2001). Assessing the Effectiveness of Problem-Based Learning in Higher Education: Lessons from the Literature. *Academic Exchange Quarterly*.
- Mezirow, J. (1997). Transformative Learning: Theory to Practice. *New Directions for Adult and Continuing Education*, 5-12.
- Moore, J. (2005). Is Higher Education Ready for Transformative Learning?: A Question Explored in the Study of Sustainability. *Journal of Transformative Education*, 76-91.
- Nidumolu, R., Prahalad, C., & Rangaswami, M. (2009). Why Sustainability Is Now the Key Driver of Innovation. (*Harvard Business Review*, 57-64.
- Orr, D. W. (1992). Ecological Literacy . In *Ecological Literacy – Education and the Transition to a Postmodern World* (pp. 85-95). Alban: State University of New York Press.

- Pe'er, S., Yavetz, B., & Goldman, D. (2013). Environmental Education for Sustainability as Value Education. In M. B. Peretz, *Embracing the Social and the Creative: New Scenarios for Teacher Education* (pp. 135-152). Lanham: Rowman & Littlefield Publishers.
- Roth, C. E. (1992). Environmental Literacy: Its roots, evolution, and directions in the 1990s. *ERIC Clearinghouse for Science, Mathematics, and Environmental Education*.
- Sauvé, L. (2005). Currents in environmental education: Mapping a complex and devolving pedagogical field. *Canadian Journal of Environmental Education*, 13-37.
- Sipos, Y., Battisti, B., & Grimm, K. (2008). Achieving transformative sustainability learning: engaging head, hands and heart. *International journal of Sustainability in higher Education Vol. 9 No. 1*, 66-86.
- Wals, A. E. (2010). E.J. Wals, (2010) "Mirroring, Gestaltswitching and transformative social learning: Stepping stones for developing sustainability competence. *International Journal of Sustainability in Higher Education*, 380 - 390.
- Wundt, W. (1905). *Fundamentals of psychology* (7th ed.). Leipzig: Engelman.
- Schifferstein, H. N. J., Mugge, R., & Hekkert, P. (2004). Designing consumer-product attachment. In D. McDonagh, P. Hekkert, J. Van Erp, & D. Gyi (Eds.), *Design and emotion: The experience of everyday things* (pp. 327-331). London: Taylor & Francis.
- Wurzel, J. S. (1988). Toward multiculturalism: A reader in multicultural education. Yarmouth, Me: Intercultural Press.

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