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# Sustainability integration in industrial design education: a worldwide survey

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## ABSTRACT

Industrial design course leaders from 221 schools around the world responded to an online survey on sustainability integration within their undergraduate degree programs. The survey showed that the majority of the programs had either compulsory or elective subjects on sustainable design. Prescribing materials with lower environmental impacts, design using recycled or reused materials, design for disassembly and recyclability, as well as life cycle analysis, were the most commonly used approaches for teaching and learning sustainable product development. Respondents reported a very broad range of sustainable design activities initiated within their programs, either as final-year projects or embedded within studio courses.

More than half of respondents considered themselves as being interested or very interested in teaching sustainable design, and believe that design for sustainability should be integrated into design studio courses, either fully or partially. The great majority consider themselves as being adequately informed about sustainability issues in product design, and consider these issues relevant and important in most design studio projects in their institutions. 72 percent believe that their ID graduates demonstrate a reasonable understanding of sustainable design issues and strategies. In spite of these, many of the respondents highlighted hardships in integrating sustainability into their industrial design curricula, particularly when the current programs of study are already “full” and there are other competencies that need to be covered for a well-rounded design education.

## INTRODUCTION

Indubitably, sustainability has become a buzzword of The Noughties and will likely be in decades to come. The adverse consequences of humankind’s unsustainable activities in the recent century are becoming more manifest in our contemporary lives. Climate change is the topic of the day, and the whole planet is enduring from its long-term effects.

Industrial designers are often implicated in this environmental crisis, due to their active involvement in promoting a culture of product obsolescence, flooding the market with unnecessary products, and encouraging mass material consumption (Fletcher & Dewberry, 2002). In one of the world’s most widely read books on design, *Design for the Real World*, Victor Papanek (1971) detailed how industrial design (ID) has become one of the most harmful of professions.

It can be argued, however, that industrial designers can be both the problem as well as the solution (Yang & Giard, 2001). Industrial designers play crucial roles in seeking out alternative solutions to the wasteful lifestyles of contemporary society, and in influencing positive change through the creation of more responsible goods and services. Designers have an enormous potential and opportunity to propose solutions that could mitigate the global ecological crisis, and use the power of design to inspire people to act for the benefit of our natural environment and to improve the quality of life of human society in the future: this should be the design challenge of this generation (IDSA, 2001).

As there can be no responsible design without a responsible designer (Findeli, 2001), design education should be redirected to the development of an ethical designer, one who could rethink and radically “design out” design that begets environmental problems (Fry, 1993). It is imperative that ID practitioners and students comprehend the potential ecological impacts of our profession, and that we persistently work to minimize these impacts (IDSA, 2001). Indeed, design education for sustainability can help usher a promising future by transforming the industrial designers of tomorrow.

The United Nations declared the years 2005 to 2014 as the Decade of Education for Sustainable Development, which is a challenge for all educators to reorient their teaching, research, and community outreach towards sustainability. Over 300 university leaders in 49 countries have signed the Talloires Declaration ([www.ulsf.org](http://www.ulsf.org)), an international sustainability literacy action plan in which institutions commit to “ensure that all university graduates have the awareness and understanding to be ecologically responsible citizens”.

So how has the design education community responded to these challenges? Is sustainability now sufficiently integrated within industrial design academic programs? Do studio projects engage students into long-term visioning into the environmental and societal implications of their design outcomes? Are academics and students adequately informed of strategies for sustainable product development, and if they are, do they exercise those in their design teaching? Are students provided with opportunities for imagining solutions that foster sustainable behaviors of production and consumption? Are sustainability aspects considered along with traditional design criteria in assessing student works? Do graduates exit university with a sense of responsibility towards promoting sustainable design?

To find answers to the above questions, an online questionnaire was fielded internationally to academic staff in

universities that offered undergraduate ID degrees. The survey aimed to determine the current extent of sustainability integration within ID education programs around the world.

Surveys focusing on sustainable design education in architecture (Fowles et al., 2003), engineering (Nguyen & Pudlowski, 1997), interior design (Elliott, 2004; Metropolis, 2003) and mixed design disciplines (Metropolis, 2002) have generally shown that sustainability issues are hardly penetrating into core design programs. Among American ID educators, 12 percent reported ecodesign to be integrated in some fashion in their curricula (IDSA, 2001). A survey of Australian industrial design programs found that an average of 12 out of every 100 credit points earned have environmental sustainability content (Ramirez, 2006).

The Model Code of Professional Conduct for Designers, adopted by the International Council of Societies of Industrial Design, recognizes that every designer should “accept professional responsibility to act in the best interest of the ecology and of the natural environment” (IDA, 1983). In 2001 industrial designers worldwide declared that “industrial design will no longer regard the environment as a separate entity” and that “we, as global designers shall pursue the path of sustainable development by coordinating the different aspects influencing its attainment, such as politics, economy, culture, technology and environment” (ICSID, 2001).

## METHODOLOGY

A database of all ID programs around the world was initially created in preparation for the survey. Lists of universities with offerings in industrial design, product design, three-dimensional design, industrial design engineering, and design & technology were obtained from various online directories and through web search engines. A total of 836 schools were enlisted.

Asia had the most number of schools at 345 (41 percent), followed by Europe at 258, then South America at 137 (Fig. 1a). China had 161 universities offering ID degrees (19 percent). Brazil had 82, the USA 64, the United Kingdom 61 and Korea had 53.

Correspondence was established with the ID program leaders, first via email and then via fax for undeliverable emails. More than half of the emails bounced back for various reasons: user unknown, mailbox full, wrong address, and so on. The academics who responded to the initial contact were emailed a second time with an invitation to participate in a web-based survey on ID education, using the SelectSurvey software. The invitation was also circulated to various email groups, including PHD-DESIGN and IDFORUM.

At the close of the survey, the software reported 560 responses to the online questionnaire. However, a great number of the responses were invalid, half-finished or mostly unanswered. As a result, 298 (53 percent) were culled, and only 262 were considered valid for the study. The results of the online survey were later exported into the SPSS software for statistical analysis.

## RESULTS

A total of 221 universities responded to the survey; 27 had multiple respondents. The most respondents came from Europe (36 percent). By comparing Fig. 1a and 1b, it can be seen that the representative proportions of the Asian, North American and Oceanian universities in the survey are markedly dissimilar from their real world proportions.

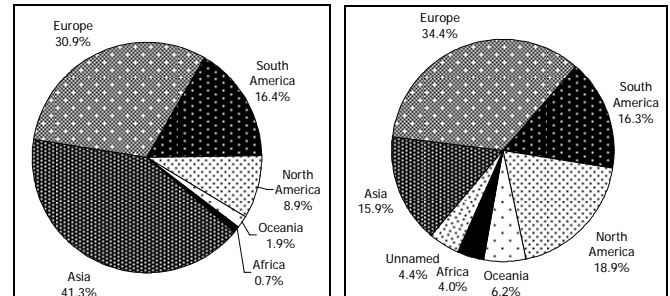


Fig. 1. (1a) Distribution of 836 ID schools worldwide and (1b) distribution of 221 respondent universities.

It can be speculated that the difference between the actual and expected geographic distribution of respondents could be due to language differences (non-English speaking academics not interested in filling in survey forms in English), limited access to the internet, infrequency in checking emails, institutional server firewalls which prevent receipt of broadcast emails, and the usual general unavailability of time for answering surveys.

The response rate could also suggest a lack of interest on sustainability issues among some ID educators. This study recognizes that some respondent bias could be present, since ecologically passionate design academics are more likely to answer the questionnaire than those with less concern for such issues. These survey results could thus depict a more affirmative view than what is actually the case.

Many respondents were leaders or senior teachers of their programs, holding such titles as “director”, “head”, “chair”, “dean”, “professor” and “president” of the ID departments of their institutions. Other respondents included “lecturers” and “senior lecturers”.

### A. ID Degrees Offered

Most respondents taught degrees in industrial design (70 percent); 39 percent taught product design. There were less of those who taught industrial design engineering (12 percent), three-dimensional design (9 percent) and design & technology (8 percent). Some universities offered more than one type of ID program.

The overwhelming majority taught 4-year degrees. Those who taught in 4-year degrees were twice as many as the 3-year ones and five times more than the 5-year degrees.

Slightly more than half reported that their degrees had an almost equal balance of engineering and “art and design” orientations. Around 4 out of 10 categorized their degrees as “art and design” based, meaning, oriented towards concept innovation, form development and styling. Only 10 percent taught in engineering-based degrees, which were more focused on mechanical detail and technical resolution. Six

percent had craft-based programs, which were oriented towards designing objects for one-off or small volume production.

More than 4 out of 10 reported that, of the total units of credit needed by an ID student to graduate, roughly half are considered as “studio” type courses.

### B. Sustainable Design in the Curriculum

For the purposes of this study, sustainable design is defined as the design of products and systems which comply with the principles of economic, ecological and social sustainability; in other words, design that is not only economically viable but also environmentally benign and socially equitable. Survey participants were not briefed with this definition and they were allowed to have their own views of sustainable design. Most participants seemed to interpret sustainable design as being identical with ecological design or green design, which focuses mostly on minimization of environmental impacts and usually not covering the aspects of promoting an equitable society.

Respondents were asked for the total number of credits that a student needs to earn in their institution in order to graduate with the ID degree. 52 percent of respondents reported that sustainable design courses are compulsory or core subjects in their curriculum; 37 percent said they were optional courses or electives; and 11 percent said that their curriculum doesn’t include any subjects covering sustainable design.

Those whose programs offer any courses or subjects touching on sustainable design were asked to fill in the credit points or units earned in the following subject types:

- Studio-type subjects which are dedicated solely to working on sustainable design projects
- Studio-type subjects which include some projects on sustainable design but also other projects not focused on sustainability
- Lecture-type subjects which discuss sustainable behaviors or environmentally responsible solutions, but do not include sustainable design projects
- Lecture-type subjects which partly touch on sustainable design issues but also discuss other topics not related to sustainability

The units earned in the four types of sustainable design subjects were aggregated per respondent, and then compared with the total number of units necessary for the degree. The responses ranged from as little as 0.3 percent to 100.0 percent of credit units covering sustainable design.

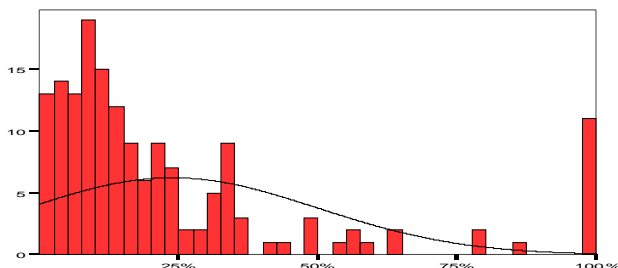


Fig. 2. Proportion of credit points of courses with sustainability content in respondent universities.

Analysis of the data shows that a mean of 24 percent of the credit points earned in universities worldwide touches on sustainable design strategies or issues either fully or partially; the median sustainability credit point proportion, however, is lower at 14 percent. The histogram in Fig. 2 shows that most degree programs are clustered around the brackets of 0 to 17½ percent, indicating that the majority of the ID programs include about 17½ percent or less of sustainability content into their curricula.

The most widely covered topics on sustainable design (Fig. 3) are prescribing materials with lower environmental impact; designing using recycled or recyclable materials; and designing for disassembly and recyclability. It is acknowledged that these three sustainability strategies are closely intertwined. A lesser number covered life cycle analysis, lengthening product life, and efficient usage of energy, water or fuel. Less than half of the respondents covered the topics of environmentally efficient distribution, cleaner manufacturing, dematerialized solutions, or product service systems.

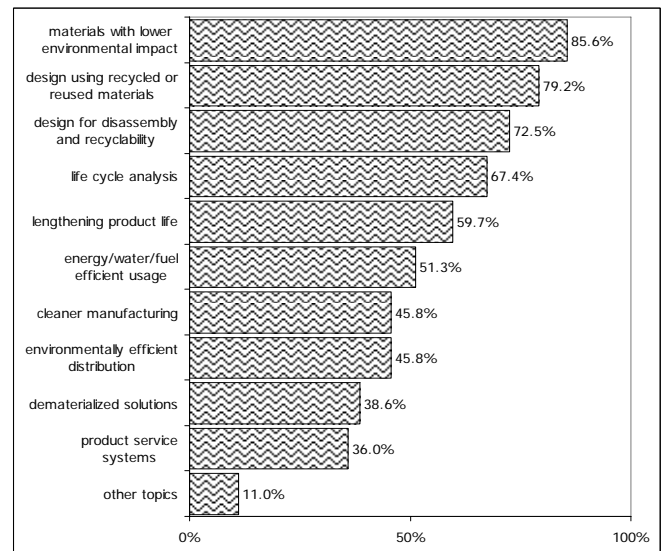


Fig. 3. Sustainable design topics covered in respondent universities.

Some of the projects mentioned by respondents as activities students did in their sustainable design studio courses include:

- Social sustainability: design for community needs, regenerative design, inclusive design, service design, social equity projects
- Ecological sustainability: cradle-to-cradle solutions, reusable products, sustainable packaging, promotion of consumer environmental awareness

### C. Respondent Views on Sustainable Design Issues

When asked if the respondents personally consider themselves as being interested in getting their students to understand sustainable design, 94 percent claimed that they were either “very interested and passionate” or “interested”. A small bunch (6 percent) admitted that they were “only a little interested”. Nobody ticked the “not interested at all” choice.

Almost half (48 percent) believed that sustainable design should be fully integrated into design studio subjects: that is, all design projects should consider aspects of sustainability and their impacts to the environment and to society. A similar number (42 percent) thought of partial integration, which means that some projects in the studio would have a sustainability focus while others wouldn't. Only a few (5 percent) are of the opinion that sustainable design strategies and sustainability issues should be covered in lecture-type subjects, not in the studios.

One respondent commented that “most design faculty members are not qualified to speak of sustainability: it is a complex issue driven by culture, economics and political forces”. It would be desirable to see sustainability as being automatically thought of when designing, just like ergonomics, according to another respondent.

The overwhelming majority of respondents (87½ percent) believe that sustainability issues are relevant and important to consider in most design studio projects in their universities (Fig. 4). Eight in ten respondents personally considered themselves as being adequately informed about sustainability issues in product design.

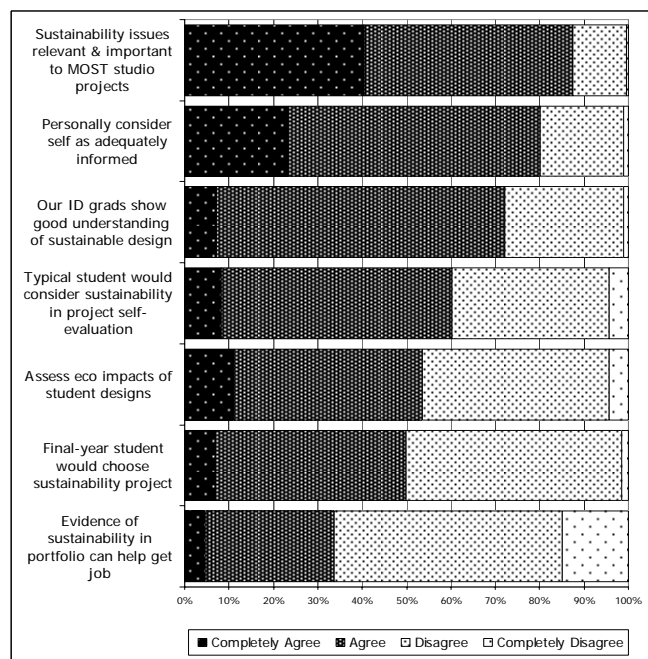


Fig. 4. Respondents' views on sustainable design education.

The group was almost uniformly divided when asked if they assess the environmental impacts of their students' design proposals in their studio projects, giving sustainability a similar value to what they would give to form, functionality, user-friendliness and other criteria.

Respondents were split equally on the question of whether or not a typical ID student in their university would choose to work on a final-year major project topic that will help promote sustainability. More people deemed (6:4 ratio) that a typical ID student in their university would include sustainability criteria in evaluating their own concepts when given an open or free-to-choose project brief.

There were significantly more respondents (66 percent) who disagreed with the statement: “Evidence of sustainability projects in a student's portfolio can be a key factor in obtaining a design job in my country.”

Seventy-two percent feel that their ID graduates demonstrate a reasonable understanding of sustainable design issues and strategies.

More than half of respondents foresee sustainable design as being integrated into mainstream ID curricula within the next 1 to 5 years, while almost a quarter views its integration within the next 6 to 10 years. One in ten don't see it being fully integrated at all, and 4 percent believe that it would take beyond 10 years before sustainability becomes assimilated into ID education.

## DISCUSSION

It can be said that sustainability aspects are gradually becoming integrated into ID education and practice. The offering of either compulsory or elective courses in sustainable design in the majority of ID programs is a very promising sign of education for sustainability. Having 17½ percent of sustainability content in the curricula is a good start, and a greater proportion would be desirable. Through such courses students are provided with a diversity of strategies for sustainable product development and are challenged to minimize the environmental and societal impacts of their designed products or systems.

The results hint at a subtle paradox where the overwhelming majority of design educators profess deep-seated beliefs in the importance of teaching sustainability in the studio, yet only half use sustainability criteria in assessing student projects. It appears that although academics consider sustainability as a topic that design students need to be exposed to, the classic design assessment criteria – aesthetics, functionality, ergonomics, manufacturability, etc – are still deemed to be the overriding determinants of what constitutes good design, and impacts to society or to the environment do not hold the same significance.

A growing number of universities are giving extra emphasis on sustainability education for designers, via undergraduate specializations in sustainable design:

- Aston University, UK: BSc Sustainable Product Design
- Bournemouth University, UK: BSc Sustainable Product Design
- Central Saint Martins College of Art and Design, University of the Arts London, UK: BA Arts Design and Environment | Artefact
- Goldsmiths College, University of London, UK: BA EcoDesign\*
- London South Bank University, UK: BSc Product Design and the Environment\*

\* Leaders of the specialized programs at Goldsmiths College, University of Derby, and London South Bank University revealed that the sustainable design degrees have been withdrawn from their offerings due to the sustainability aspects now being fully incorporated into the mainstream design studies in their institutions.



- Politecnico di Torino, Italy: Laurea Magistrale ad Honorem in Ecodesign, Laurea Specialistica in Design del Prodotto Ecompatibile
- Tokyo University of Art and Design, Japan: B Design | Sustainable Projects
- University College for the Creative Arts at Farnham, UK: BA Product Design | Sustainable Futures
- University of Derby, UK: BSc Product Design (Innovation and Ecodesign)\*
- University of Huddersfield, UK: BA Product Design | Sustainable Design
- University of Teesside, UK: Product Design (Futures)

Perhaps as proof that sustainable design is starting to be embraced by ID practice, the Industrial Designers Society of America (IDSA), possibly the world's largest association of ID professionals with 3,300 members, has established an "Ecodesign Section", which distilled a set of ecological principles and ecodesign practices that were later adopted by IDSA (IDSA, 2001). They have also published a practical toolkit for ID practitioners to improve the environmental performance of products (White et al, 2000) and introduced the Okala curriculum on ecological design for ID students, whose modules were designed to be easy to incorporate into existing product design classes (White et al, 2004).

In Australia, a similar curriculum resource kit was produced for ID teachers to improve understanding of design for environment principles and strategies (CfD, 2005).

The Delft University of Technology in the Netherlands has been offering courses on Design for Sustainability since 1992, and has been involved in internet-based ecodesign curriculum development in developing countries like India, Tanzania and Central America (Diehl, 2001). A large scale project, Ecodiseño Centroamérica, has resulted in demonstration projects and a Spanish-language manual and website on sustainable product development. The Indian European Ecodesign Programme has commenced ecodesign courses for ID students and professionals, but continued implementation appears to be hampered.

## CONCLUSION

The move in many universities to integrate sustainability aspects in their regular ID degree offerings, or to offer specialized degrees in sustainable design, is highly commendable and encouraging. These set a model for precedence and hopefully other design programs around the world would follow in their footsteps. It also sends a strong message to industry that more industrial designers are graduating with an increased awareness of their responsibilities to the environment and to society, and that this generation of graduates could potentially push for sensitivity to sustainability in the products that are about to be designed, produced and consumed.

The views expressed by the survey respondents are promising and show that ID educators are informed, interested and even passionate about sustainable design. They are convinced of its relevance and importance in studio projects. Optimistically, sustainability aspects will be

standard criterion for the assessment of student works in the future.

In general, the ID education community can be viewed to be positively responding to the challenges and to its responsibility in preparing tomorrow's industrial designers to become responsible practitioners who can envision the sustainability implications of their design works.

## ACKNOWLEDGMENTS

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## REFERENCES

- CfD. (2005). *National Eco-design Curriculum Development*. Melbourne: RMIT Centre for Design.
- Diehl, J. C. (2001). *(Internet based) ecodesign education in the Netherlands and the rest of the world*. Paper presented at the 7th European Roundtable on Cleaner Production, Lund, Sweden.
- Elliott, J. (2004). *Teaching sustainability to tomorrow's interior designers*. [www.metropolismag.com/cda](http://www.metropolismag.com/cda).
- Findeli, A. (2001). Rethinking design education for the 21st century: theoretical, methodological, and ethical discussion. *Design Issues*, 19(1).
- Fletcher, K. T., & Dewberry, E. L. (2002). Demi: a case study in design for sustainability. *International Journal of Sustainability in Higher Education*, 3(1).
- Fowles, B., et al. (2003). *Report of the Sustainability Special Interest Group (Architectural Education)*. London: Centre for Education in the Built Environment.
- Fry, T. (1993). Re-thinking ecodesign. *Object*, 43 Autumn(31).
- IDA. (1983). *ICOGRADA/ICSID/IFI Model Code of Professional Conduct for Designers*. Milan: International Design Alliance.
- ICSID. (2001). *ICSID Seoul 2001 Industrial Designers Declaration*. Seoul: ICSID.
- IDSA. (2001). *IDSA Ecodesign Section*. [www.idsa.org/whatsnew/sections/ecosection](http://www.idsa.org/whatsnew/sections/ecosection).
- Metropolis. (2002). Teaching green: making sustainability integral to every designer's education & business. *Metropolis*, 22(Nov).
- Metropolis. (2003). School survey 2003: taking the pulse of sustainable design education in North America. *Metropolis*, 23(Aug/Sep).
- Nguyen, D. Q., & Pudlowski, Z. J. (1997). A comparative study of the perspectives of academics, students and industry on environmental education in engineering courses. *Global Journal of Engineering Education*, 1(3).
- Papanek, V. J. (1971). *Design for the real world: human ecology and social change*. London: Thames & Hudson.
- Ramirez, M. J. (2006). Sustainability in the education of industrial designers: the case for Australia. *International Journal of Sustainability in Higher Education*, 7(2).
- White, P., Belletire, S., & St Pierre, L. (2004). *Okala ecological design: course guide*. Portland OR: Industrial Designers Society of America.
- White, P., Goodrich, B., Kusz, J., Brawer, W., & Geurin, S. (2000). *Business-ecodesign tools: ecodesign methods for industrial designers*. Portland OR: IDSA.
- Yang, Y., & Giard, J. (2001). *Industrial design education for sustainability: structural elements and pedagogical solutions*. Paper presented at the IDSA Design Education Conference.