Design and Technology Education: An International Journal Special Edition

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In this special issue of the journal we are presenting a selection of papers from the third DRS/CUMULUS conference. Entitled Learn x Design, and held in Chicago, it had an ambitious range of topics from theoretical research to practical application. The assumption was that at a career level, the intention in the study of design is to create a well-crafted, aesthetic fit of form to function, materials, and tools. We can interpret each designed product in terms of a narrative about the culture from which it evolved, about the person who produced it, and the values and practices of both. Design academics who have engaged in scholarship and research to develop theories and principles about learning had the opportunity to present their work at the event. For many the classroom could be a laboratory in which they test and validate new approaches and thus extend policy and practice.

For the Design Research Society this event was led by the Design Pedagogy Special Interest Group (PEDSIG).The conference was the third for which PEDSIG has been the DRS lead, each of them involving collaboration with CUMULUS. It was preceded by the inaugural DRS/CUMULUS conference in 2011 in Paris, and the second in Oslo in 2013. For Chicago the partnership was joined by the DESIGN-ED Coalition as lead organizers.

 With over 200 delegates the conference was international and it aspired to be a springboard for sharing ideas and concepts about contemporary design education research and the teaching of design. The range and quality of the papers provided evidence of the vitality of research and scholarship in design pedagogy.

Conference delegates were welcomed by the president of the School of the Art Institute of Chicago, Dr Walter Massey. His erudite and insightful address set the tone for the conference, which was both international and grounded in the Chicago tradition. Indeed in many ways the city provided both the context and the inspiration for delegates. The conference boat trip along the Chicago River was a marvellous way to experience the fine architecture of the city. And the main location for the conference was in the School of the Art Institute which is directly opposite the Art Institute of Chicago museum and gallery. It claims to have been voted the world's leading attraction of its type and this claim could be justified as it contains a stunning collection of art and design.

Thus inspired we were able not only experience the rich range of individual contributions but also collective events when the conference came together. The papers were corralled into six streams ranging from visual literacy, to philosophy and management. And the overall activities included interactive debates where contributions from the floor appeared as on screen questions and comments.

The conference succeeded in getting us to reflect on the theory and practice of design education. The lifetime achievement award to Professor Victor Margolin was a suitable climax at the end of conference dinner. His thoughtful reflection on his personal role in developing design history and research was a useful reminder of the distance the discipline has travelled and why we should be optimistic about its future. We are pleased to be able to produce the text of his acceptance speech in this volume.

We also include six papers from the conference which have been selected for their quality and relevance for the journal.

Michael R. Gibson's paper 'Designing backwards' is presented here as a means to utilize human-centred processes in diverse educational settings to help teachers and students learn to formulate and operate design processes to achieve three sequential and interrelated goals. The first entails teaching them to effectively and empathetically identify, frame and analyze complex social, technological, economic, and environmental or public policy problems, or problematic situations. The second involves helping them cultivate understandings from these problem-framing processes to develop and then assess the relative efficacies of specific prototypes which could improve some aspects of these situations. 'Prototyping' is defined as a heuristic process that allows students to test how operating various strategies and procedures, or deploying particular interventions which can yield insights about how to affect useful, constructive transformations. The third goal challenges students to correlate the knowledge they gleaned from engaging in the first two processes to work with given groups to develop and implement more relevant, effective and appropriate outcomes to the complex challenges that directly or indirectly affect specific aspects of their lives.

There is a long history of learning from and being inspired by nature in design. Recently the use of nature in the field of design has continued to offer novelty and it often brings success in solving problems in a sustainable way. In their paper 'Exploring Biomimicry in the Student's design Process' Miray Boga-Aykol and Sebnem Timur-Ogut take the case of industrial design education. It seems to be a

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promising method to mimic nature in designing new products; however different dynamics effect and sometimes prevent students using natural analogy in their projects. Industrial design students are reluctant to use biomimicry in their design projects although they learn about it in different courses as a creativity method. The study aimed to investigate two issues related to the matter, to understand the reasons for this reluctance and to discover ways this could be overcome so they could do more than simply using nature as a source of inspiration.

In 'Learning to Draw Through Digital Modelling', Stephen Temple considers the education of architectural designers. They begin by learning drawing and digital modelling as instruments of thinking in the design process. Arguments persist about which mode should follow the other and difficulties occur when one mode replaces the other. Students uninitiated in design seem to prefer the more immediate volumetric visualization of digital modelling over plans, sections, and elevations. Representational views which result from the un-real 'viewpoint' of the section-cut, are a means drawn out of reality through a way-of-looking which is not natural-to-experience.

The primary difficulty in learning to think through drawings is their abstraction from, rather than connection to, realness. Digital modelling offers virtual three-dimensional images that seem to students, by contrast, not quite as abstracted from natural experience, albeit framed by non-physical, seductive, machine 'otherness.' This paper proposes a drawing pedagogy that learns from digital modelling by making connections rather than distinctions to connect abstract to actual. Projects are demonstrated that manipulate three-dimensional forms to initiate drawing learning experience so that drawing and its abstractions can more readily be drawn out of experience and made ultimately more concrete for design thinking.

Understanding people's experiences and the context of use of a product at the earliest stages of the design process has in the last decade become an important aspect of both the design profession and design education. In their paper 'An Initial Model for Generative Design Research' Yekta Bakirlioglu, Dilruba Ogur, Cagla Dogan and Senem Turhan consider how generative design research helps designers understand user experiences, while also throwing light on their current needs, preferences and future expectations. Two complementary methods, the Generative Focus Group (GFG) approach and Experience Reflection Modelling (ERM), are presented through a research case. The focus is on the development of sustainable design considerations in the use of resources, and product maintenance and repair. The first

method makes use of generative tools to gain feedback from a group of experienced users, using group discussions to develop potential design directions. In contrast, the second method utilizes a special toolkit of abstract two- and three-dimensional product parts to reveal the needs, preferences, and expectations of the individual. The paper proposes an initial model that brings together these two methods, incorporating generative tools and techniques that are adaptable, participatory and engaging, and discusses their implications for design education.

To be successful in the competitive workforce markets, graduates need more than just disciplinary skills and knowledge. The changes in how businesses operate have brought about the need to develop a skilled workforce equipped with generic skills, such as communication, creativity and problem solving, next to their discipline-relevant knowledge. In their paper 'A Project-Based Approach to Learning' Nusa Fain, Beverly Wagner, and Nikola Vukasinovic describe how in providing these sets of skills universities are engaging in project-based learning with industrial partners.

Such modules can provide the development of both sets of skills and produce highly employable students. In this paper the perceptions of marketing and engineering students of the project-based learning outcomes are explored, to determine how they rate the acquisition of relevant employment skills in the studied modules. The findings show that the students appreciate the project-based approach, specifically with relation to their project management and team-working skills. However improvement is possible in the discipline-based aspects of their learning.

We live in a designed world. In 'STEAM by Design' Linda Keane and Mark Keane present a transdisciplinary approach to learning that challenges young minds with the task of making a better world. STEAM (Science, Technology, Environment, Engineering, Art, and Math) teaching and learning integrates information in place-based projects accessing everyday technology such as virtual field trips, digital interactives, apps, and contemporary art, science and design practices.

It develops designing minds across fields to develop social, cultural, technological, environmental and economical responses to issues. Design adds Art and the environment to the STEM equation to contribute to creative economies. Documented case studies at the elementary, middle and high school level demonstrate the ease of delivering STEAM by Design and reveal the

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inherent creativity of students to cultivate new knowledge, skills and values. Designing place-based projects, K-16 students acquire STEAM aptitude and better understand the use of STEM fields in solving contemporary problems through access to everyday technologies.

These papers demonstrate the depth and breadth of design pedagogy research being undertaken, covering many levels of school and university teaching. And the future of design education research conferences seems to have been secured with the welcome confirmation that the next DRS/CUMULUS conference will be held in London in 2017 and hosted by Ravensbourne College.

EDITORIAL