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Great Expectations for the O-Shaped Designer

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Economic and environmental considerations are putting more responsibilities on engineering and design students, academics and professionals to explore, create, try out and implement innovative solutions for a sustainable future. Here, Francesco Mazzarella and Clare Brass ponder this massive challenge

The 2015 and 17th Engineering & Product Design Education (E&PDE) conference was an impressive affair, providing an international panel of representatives from education, research and industry with a forum for discussing current issues in the disciplines of engineering and design, and shaping new approaches for education. E&PDE was hosted by Loughborough Design School, in partnership with the Design Education Special Interest Group of the Design Society and the IED. 'Great Expectations: Design Teaching, Research & Enterprise' was that conference theme, articulated in a rich programme of strands, ranging from pedagogy to learning paradigms and environments, to research into problem- and project- based learning, including social and ethical issues, innovation and technology transfer.

Under the 'Exploring Design Education' track, a paper by Clare Brass and Francesco Mazzarella, titled 'Are we asking the right questions?', reflected on how the current economic and environmental crisis is creating growing expectations on engineering and design students, academics and professionals to explore experiment and implement innovative solutions for a sustainable future.

Here, the co-authors share with Engineering Designer their insights on what informed that paper:

In the face of complex challenges such as climate change, biodiversity loss, ageing population, austerity, mass migration (to name but a few), engineering and design students are broadening their skills sets to address issues outside of the traditional remit of their discipline.

At the same time, academics are finding ways to integrate new methods to satisfy the changing needs and interests of students in the transition towards sustainability. Within this context, education plays a key role in shaping a new kind of professional as driver of a sustainable future, able to accelerate the transition from a consumerist economy, towards a sharing and circular economy, shifting from material consumption to collaborative consumption. If we accept Einstein's view that 'we cannot solve our problems with the same thinking we used when we created them', it is clear that a new ecology of engineering and design culture is needed, challenging many of their traditional paradigms.

With this in mind, we believe it is time to move away from the traditional 'T-shaped designer', who has a broad set of skills and specialisation in one sector, towards one that is 'O-shaped', with a circular and systemic mind-set. Such a professional focuses on the processes and services necessary to drive new ecosystems that go beyond the design of physical things.

However, if we want engineering and design to be part of the solution, are we asking the right questions? Both in postgraduate engineering and design education and businesses, briefs tend to focus on products, market and on economic growth, following a linear problem solving approach. Instead, we – as citizens, policy makers, businesses and educators – should pose more suitable briefs, which incorporate strategies, services and systems, addressing holistic sustainability.

Driving Sustainability

The reframing of questions has been embedded into teaching practice at the Royal College of Art, largely thanks to SustainRCA, an independent research unit set up in 2011. SustainRCA has been fundamental in driving sustainability as one of the core learning objectives and assessment criterion across the college, with a particular focus on Innovation Design Engineering (IDE), a two-year postgraduate programme, with students from a variety of backgrounds. SustainRCA provides tutorials, workshops, talks, exhibitions and a network of experts to encourage students to address sustainability challenges in innovative and entrepreneurial ways, following a rigorous double-diamond process.

The broad brief given in the initial phase stimulates deep research into a specific issue and stretches the emphasis from products to include systems, stakeholders and the relationships between them. A detailed brief is generated during the next phase and ideas that are viable in the real world are explored, with a focus on economic models and the potential of technology to scale up their innovative ideas within future scenarios. After mapping and imagining possible futures, students are encouraged to zoom in, exploring users and their journeys, in order to define the product and service needs of the system, and pursue lifecycle analysis, using specialist tools. Finally, to develop and assess their concepts, students are asked to zoom out again to the real world and generate compelling stories to explain their ideas.

Briefing Radical Innovations

This teaching practice has led to the development of new tools and methods, as well as some innovative outcomes. A research project funded by WRAP (Waste and Resources Action Plan) in 2016 was set up to develop new service design-led business models, tackling the environmental impacts of clothing. The project brought in students from two business schools to work together with MA Service Design and MA Fashion Design students, not only with the aim of addressing the end-of-life recycling of fashion and textiles, but also to explore circular business models for the sector, encouraging extended use, maintenance, care, reuse and repair. Repeatedly in this kind of process, the most successful ideas were those that started with goal-focused questions, provoking radical innovations that reimagine lifestyles and behaviours in the future.

Another project, ‘Ooho!’, designed by a group of IDE graduates, is an open-source, do-it-yourself, cradle-to-cradle water ‘packaging’ concept. This started not from the brief of ‘designing a sustainable water bottle’, but from the question: ‘How can we carry water with us on the move and have a net-positive impact on the environment?’ By mimicking the way nature encapsulates liquids using membranes, ‘Ooho!’ is an edible gelatinous structure made of brown algae and calcium chloride, grown around a sphere of frozen water; the disposal of the membrane into the biosphere would provide a nutrient to the soil.

By asking students to consider a different question at the start of a project, cutting-edge ideas can be brought into discussion. The idea that nature is ‘a mechanical artefact open to scientific investigation in the pursuit of rational progress, to be dominated by humans’ has driven our world-view since Elizabethan times and has pervaded our training as designers

and engineers. In this universal mind-set, humans are positioned at the centre of the universe and all other living beings are evaluated in relation to their usefulness to us.

Instead, we believe in a new narrative of bio-centrism, acknowledging humans as one species amongst many, all with intrinsic and instrumental values, and focusing on the sustainable interdependence between diverse ecosystems. This bio-centric framework was applied by SustainRCA, for example, in the Chicken Run project, with the aim to improve the environmental impact of the poultry industry and enhance the welfare conditions in modern chicken production facilities. In all, 25 students worked in groups together with a leading team of scientists to holistically explore the world of poultry. A series of personas and user maps were created, following the journey of a chicken from egg to plate, that focused on three main stakeholders: farmers, consumers and chickens.

Finally, a good example of a young social entrepreneur tackling environmental issues is Nell Bennett, MA/MSc Innovation Design Engineering. Her project, Coral3, is a 3D printed rock, whose alkaline structure is designed using a natural algorithm that allows water flow to dissolve the structure over time, increasing the pH value of the ocean water surrounding endangered coral reefs. This project is envisioned as a large-scale social enterprise involving many stakeholders, providing local communities with economic and environmental benefits, as well as increased awareness.

Building New Narratives of a Sustainable Future

In conclusion, we believe that engineering and design education are at a critical point, opening up the opportunity to nurture cross-disciplinary collaborations between academia and the outside world, and reframe a mindful agenda. New briefs are being set, asking students to explore ‘wicked problems’ through a palette of new tools, and assessing the viability and scalability of projects according to sustainability criteria. Reframing the brief through asking the right questions is a critical element for creating the new narratives of a sustainable future.

About the Authors

Francesco Mazzarella is a PhD researcher at Loughborough University (UK), within the Sustainable Design Research Group, funded by the AHRC Design Star CDT.His research project aims to explore how the service designer can contribute to identifying pathways for transitioning textile artisans’ communities towards a sustainable future. He has international experiences as a design researcher, teaching assistant and practitioner. His work has been published in international peer-reviewed conference proceedings, presented at PhD symposia and included in academic poster competitions.

Clare Brass is founder and head of SustainRCA, a cross-departmental research centre for sustainability at the Royal College of Art, and co-founder of Department 22, an educational and training organisation for sustainability and circular economy. She coaches in various design and business schools, helping participants use their creative skills to find circular economy responses to social and environmental issues through tutorials, as well as national and international workshops. She is also senior design tutor for Sustainability and Enterprise in IDE (Innovation Design Engineering) and a mentor for the Ellen McArthur Foundation.