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Design thinking, the value of collaboration, the importance of context … serendipity in research threads

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Unlike the Guest edited section in this issue, articles in the general section have not been submitted with a particular theme in mind. However, whilst those in this issue are from an incredibly diverse range of contexts, there are, by happy chance, some clear threads running through. Design thinking features in one way or another in all research articles, whether the focus is on six year olds collaborating in a design task, considering university- industry links or using design thinking as a lens for problem based learning. Throughout the articles there is also a focus on collaboration – sometimes in the context of design thinking, but also in exploring the value of team approaches and of professional collaborations that support the development of design education curricula. Finally, there is a strong thread of the importance of embedding design and technology activities in relevant contexts, whether working with marginalised communities in India or innovative designing in the context of maternal and neonatal care in the United States.

The DATE journal prides itself in its broad and inclusive approach to research in Design, Design and Technology and Technology Education across age ranges spreading from early years learners to postgraduate students. The belief is that all that are interested in nurturing design and/or technological capability can share and learn from each other. Taking together the articles selected by our guest editors and those in the general section, we hope you find that this issue responds to this belief.

In keeping with tradition, we begin with a reflective piece from Richard Kimbell. In 'Cycles' he reflects on the cyclical ways in which history develops, seeing the rise and fall of empires, cultures, ideas and so on. His particular focus is on the cyclical rise, and now fall, of take up for public examinations in Design & Technology. Reflecting on the history of the subject, he encourages teachers to seize the opportunity and regain control of the heart of the subject in moving forward to a new phase in the cycle.

We then move the research section with an article focusing on how six-year-old children collaborate during designing. In their article *Peer collaboration of six-year-olds when undertaking a design task,* Virpi Yliverronen (University of Helsinki), Päivi Marjanen (Laurea University of Applied Sciences) and Pirita Seitamaa-Hakkarainen (University of Helsinki) focus on children's verbal and embodied interactions alongside the social roles visible when collaboratively designing. Using

Vygotsky's theory of sociocultural learning they track the interactions of the children, which indicate that they can successfully collaborate whilst solving problems and that embodied expression plays a notable role. The article provides a broad backcloth of related research with young children and situates their own research in the context of Finland where craft, along with design and technology, is very much part of the school curriculum. Analysing video recordings of children working in teams, they created a classification schema categorised through verbal collaboration and embodied collaboration. Highly detailed analysis is presented that illustrates the nature of design discourse and quality of interactions and abilities of young children when working collaboratively. These insights provide excellent illustrations for educators working at all levels of education, reminding us of where nurturing design capability starts and what can be built on.

Resonating with articles presented in the Guest edited section, Amaltus Khan and Puneet Tandon (PDPM Indian Institute for Information Technology, Design and Manufacturing) discuss *Design from Discard: A method to reduce uncertainty in upcycling practice*, proposing "Design from Discard" as a new method to help designers conceptualise products that genuinely meet stakeholder needs by upcycling materials from discarded waste. In their research, they worked with interdisciplinary teams of Masters level design students from backgrounds in mechanical engineering, electronics and communication engineering, industrial and product design and computer science engineering. They focus on research gaps in upcycling, such as how 'discards' should be handled and the multiple considerations in upcycling, such as incorporating marginalised communities. Working from stakeholder interests and customer preferences, the students worked through an iterative process, focusing on Draw, Identify, Split, Correlate, Associate, Rectify, and Deliver that, collectively, create the acronym 'DISCARD'. Providing detailed insight into the process, and illustrating this through case study, the research indicates how the approach supports handling uncertainty and brings a clear focus on usability. The article provides a strong illustration of designers working within a distinctive contextual situation and the value this brings for the relevance of the work undertaken.

The next article focuses on a very specific context– that of designing medical devices. Jules Sherman, Henry C. Lee, Madeleine Eva Weiss and Alexandria Kristensen-Cabrera (Stanford University) present a fascinating study *Medical device design education: Identifying problems through observation and hands-on training.* A comparative research project involved two groups of students, with a shared focus on design thinking but where, for one group, an experiential, hands-on learning pedagogy was adopted, while the other focused observational learning. The groups were multi-disciplinary (engineering, design, medicine, business, law, humanities, education, earth sciences) and multi-level (undergraduate and post graduate), with co-teaching by a design academic and medical clinicians. Both groups were focused on acquiring and synthesising knowledge and understanding towards medical design innovation in the context of maternal and neonatal care. The students were immersed in the context by being provided initially with information on maternal haemorrhage and infant resuscitation and through being on-site in the neonatal unit. The study revealed that, while the quality of ideas and execution of both groups were similar, those that had hands-on experience during the course showed a higher level of

excitement. Moreover, the study provides detailed insight into the positive impact of multi-disciplinary students having an in-depth immersion in both the specific context for which they are designing and in a design thinking process.

Continuing the thread of design thinking, Heilyn Camacho, Mette Skov, Tanja Svarre and Thomas Ryberg (Department of Communication and Psychology, Aalborg University) provide an article entitled *Pathway to support the adoption of PBL in Open Data education*. This article may not be an obvious one for the Journal, as it focuses on teaching and learning Open Data (OD) from a Project Based Learning (PBL) perspective. But it offers those interested in design and technology education at any level of education extremely useful and interesting insights into the pedagogies of OD and PB through a lens of design thinking, including a focus on the teacher as designer. Based on research undertaken by a research consortium involving Greece, Malta, the UK, Belgium and Denmark interviews were conducted to help understand teaching practices in OD and PBL. These provided insights into what were perceived as successful teaching practices, such as focusing on relevance, hands-on exercises and sharing competences within a learning group. They also identified a set of challenges, such as the complex and abstract nature of OD and a lack of experience in teaching OD, a relatively new area. A workshop was conducted which revealed, amongst other things, the importance of teacher as designer. For design and technology education communities, the article is particularly useful in providing insights into pedagogies of problem based learning and their link with design thinking and the teacher as designer, alongside some very helpful background on Open Data teaching initiatives.

Finally, Onder Erkarslan and Zeynap Aykul (Izmir Institute of Technology) present their research in *Review of Curriculum Development for University-Industry Collaborations with a Comparative Analysis on Master of Industrial Product Design Education*, which focuses on university-industry collaboration in a comparative analysis of the curriculum of a Turkish and a Swedish university. To undertake the comparative analysis, two approaches were taken; first to compare curriculum and second to conduct a survey with design industries. In the curriculum analysis, there was a particular focus on professional design practice, design studies and design thinking. The survey was structured through questions about the company itself and then on what companies expect from graduates. The study identified a need to develop the curriculum to include more teamwork and innovative and collaborative activities and more development of design thinking characteristics. The article indicates the value of exchange of ideas between universities, particularly when linked to detailed analysis of curriculum. Early in the article the authors raise the issue of industry involvement brings too much instrumentality to the learning. While the industry survey did show an expectation mismatch in relation to technical skills and project management, what they were keen to see being developed were teamwork and concept development – a further indication of the value of dialogue between interested partners.

To close this issue, Wendy Fox-Turnbull (University of Waikato) has reviewed a new book by Gill Hope, *Mastering Primary Design and Technology*. The book is in the Mastering Primary Teaching series, published by Bloomsbury Academic.