Editorial: The value of collaboration

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This issue of the journal contains four research articles which, while being varied and aimed at different educational stages, all share a focus on working across traditional disciplinary, subject or technological boundaries, by taking down walls and using pluralistic approaches. By working across traditional boundaries, the authors have shown how, through collaboration, we can help to shape and develop our own design practices and those of others in new and exciting ways. Our first research article shows how we can use concepts from science in school-based design, discusses the impact on teachers and learners, and highlights the importance of empathy in going beyond traditional design concepts and developing a broader understanding of design thinking. Our second and third articles are both transdisciplinary, firstly with design educators and ethnographers working together with undergraduates, and secondly with academics and industry collaborating to develop digital prototyping tools. Our final future article is future facing, discussing using VR as a teaching tool. We also have a reflective article which celebrates the contribution of George Hicks to the development design and technology education.

Our first issue of 2025 will be 30.1, marking the thirty year anniversary of the first DATE publication. Moving into our thirtieth year we have updated the journal's website URL to https://openjournals.ljmu.ac.uk/DesignTechnologyEducation and having a new acronym for the journal: DTEIJ – both URL and acronym a better match for the journal's title.

Thirty years ago Richard Kimbell stepped down as editor of the journal and for two decades wrote reflections for the journal on the state of play in design and technology education. For this issue he has returned with a reflection on the huge and critical impact that George Hicks, a "founding father" of modern-day design and technology education, had on the development of the subject, particularly within the UK. George Hicks sadly died earlier this year. In *George Hicks: A personal appreciation*, Richard reminds us of how significant George Hicks was as a leader, educator and thinker, in many ways decades ahead of his time. Anyone truly interested in the history of the development of design and technology education will find the article full of the visionary thinking and action of a man who contributed massively to the foundations of a progressive design and technology education, whose ideas and ideals are as important and relevant today as they have ever been.

The first research article in this issue focuses on a fascinating study of using Adaptive Comparative Judgement (ACJ) with secondary school students. In *Defining and Evaluating Argumentation Quality in the Context of Design Thinking: Using High School Students' Design Critiques from Foundational Engineering Course*s, Wonki Lee, Nathan Mentzer and Amiah Clevenger from Purdue University, USA, along with Andrew Jackson from the University of Georgia, USA and Scott Bartholomew from Brigham Young University, USA report on gaining insight into the extent to which students could critique designs by analysing the quality of their ability to use argumentation to explain and justify their critique. ACJ is an approach to making judgments by comparing pairs of design work multiple times with multiple judges, to create a

rank order of the quality of the design work in process. The research focuses on learning - both by educators and students. The students were on a foundational engineering design course where design thinking was seen as an iterative, non-linear process, illustrated in their article by a particularly helpful diagram. Participants were given pairs of designs for a backpack, asked to judge which was best and to justify their decisions. The team's analysis employed a *Claim, Evidence, Reasoning* framework which emphasises empathy, ideation and insight. Where they found high quality argumentation there was evidence of user-focused empathy, design inspirations, logical rationalizations, multi-criteria evaluations, aesthetic considerations, and cultural awareness. The flip side identified vagueness, uncertainty, brevity, inappropriateness, irrelevance, gender bias, and cultural stereotyping. This article provides valuable insights for other educators and researchers into a student's ability to understand and develop creative and empathetic approaches to designing. Much previous research had used ACJ at the end of a design activity but the research reported here used the process during and at the end of the project, revealing for example, more insight into students' progress. The article is beneficial in providing an approach that can help both teachers and learners in develop deeper insight into design thinking.

The following article, also from Purdue University, has particular value in using a transdisciplinary approach involving co-teaching an undergraduate course entitled "Designing Technology for people" by academics from a Department of Anthropology and a Department of Technology Leadership & Innovation. In *Engaging ethnography in the human-centered technology design classroom*, *Sarah* Renkert, Jung Han, Sherylyn Briller, Todd Kelley and Abrar Hammoud focus on the impact of using ethnographic methods for teaching human-centred design. The course is an undergraduate elective and in the first stages students are introduced to ethnographic methods with a particular focus on participant observation, semi-structured interviews and triangulation of findings. Initially students undertake ethnographic research on their own and then work in teams and identify a user group as a focus for their designing. The article provides a case study of one team who have chosen a particularly novel user group – squirrel watchers. The team's initial ethnographic research starts by squirrels being seen as creating problems for humans, despite them being deemed 'cute' and enjoyable to watch. But as the research progresses the team's perspective shifts from solving squirrel problems to how squirrel-related experiences - for both squirrels and humans, can be enhanced. This shift in perspective moves the focal point of the research to human-centred design and design development more about opportunities than problems. A key message from the research is the benefit created by bringing together design educators and ethnographic researchers, a factor highlighted by the students themselves. The article shows how the approach impacted on students' thinking. The article also provides a constructive pause for thought for the reader!

In *Development and Evaluation of a Novel Technological Product Development Tool for Education and Industry* Jack Rutherford, Ross Brisco and Robert Lynch from Strathclyde University, UK report on the development of a digital product development tool to aid with the ideation process to generate design concepts. The growth in the use of digital whiteboard tools such as Miro, Mural and Figma for concept development among design students and educators has been impressive, but not all students enjoy their digital nature, preferring a more hybrid approach, mixing digital and physical. A 6-3-5 digital product development tool was developed with the Design Engineering Team at the National Manufacturing Institute Scotland (NMIS) where 6 team members produce 3 ideas each in 5 minutes. Team members then exchange

drawings and refine each other's concepts for another 5 minutes, repeating for a total of 6 rounds. The tool was tested with focus groups and compared to more traditional paper-based equivalents, with two-thirds preferring the digital version. Some students expressed frustration at trying to draw their concepts on-screen, especially those with little previous experience of digital sketching, but most acknowledged that this would be less of an issue with practice. Participants particularly welcomed the ability to store, export and reuse concepts, making the design process more efficient, and also noted the potential of the application for enhancing learning. Educators may welcome the enhanced traceability of an individual's design process journey, which can be difficult to follow with traditional collaborative digital whiteboard tools.

Our final research article *Virtual Reality as a Supportive Tool for Design Education* by Abhay Chavan and Somik Ghosh, University of Oklahoma, USA focuses on using VR as a supportive teaching tool in design education. The study evaluated the effectiveness of using immersive VR in developing the technical and spatial knowledge of first year architecture students, showing how successful it can be when used as a supportive tool to scaffold learning alongside traditional teaching content, rather than replacing traditional content delivery. VR content was created for courses requiring visualisation, such as means and methods, and history of contemporary architecture, with students using virtual environments as supportive educational tools. Most students had little previous experience with using VR, yet most reported that VR had made a positive contribution to their understanding of the environments, their ability to retain technical information, and was a more effective way of learning 3D content based on visual memory. While some students reported discomfort through using the VR equipment, most rated the quality of VR material and ease of use positively. The authors suggest that VR tools have the potential to enhance learning outcomes and student engagement if used in conjunction with traditional teaching content. Overall, this study contributes by addressing a gap in current literature by testing the effectiveness of immersive virtual reality technologies as a supportive tool in education, particularly in the field of 3D design.

In this issue we also have reviews for three, quite different but equally valuable books providing insight into quite diverse aspects of design and technology education.

Marion Rutland has provided a review of an edited book on Maker Education - a close relative of increasing importance in Design and Technology education. The book is entitled *Maker Education meets Technology Education: Reflections on Good Practice.* It is edited by Remke M. Klapwijk, Jianjun Gu, Qiuyue Yang and Marc J. de Vries, who also contribute chapters and is published by Brill Academic Publishers. This is followed by a distinctly different book, written by John Dakers and reviewed by Matt McClean. The book*, A Nomadic Pedagogy about Technology: Teaching the Ongoing Process of Becoming Ethnictechnologically Literate* is also published by Brill Academic Publishers. The final book, *Future Prospects of Technology Education* is the fourth volume in a series from the Center of Excellence for Technology Education (CETE), published by Waxmann publishers and is reviewed by David Gill, Canada and Alexander Taylor.

We hope that you enjoy this issue and we look forward to seeing you in 2025.