

## Thematic Working Group 7 - Future Learning Environment: Integrating Digital and Physical Learning Spaces

*Jo Tondeur (Vrije Universiteit Brussel & University of Wollongong) (TWG co-leader)*  
*Sarah Howard (University of Wollongong & Vrije Universiteit Brussel) (TWG co-leader)*  
*Petrea Redmond (University of Southern Queensland)*  
*Matt Bower (Macquarie University)*  
*Lakshmi T G (Shikha Institute of Education)*  
*Ana Amélia Carvalho (University of Coimbra)*  
*Marijke Kral (HAN University of Applied Sciences)*  
*Douglas Agyei (University of Cape Coast)*  
*Fredrik Mørk Røkenes (Norwegian University of Science and Technology)*  
*Bent B. Andresen (Aarhus University)*  
*Watsachol Narongsaksakul (Illinois State University)*  
*Dominik Petko (University of Zurich)*  
*Louise Starkey (Victoria University of Wellington)*

### Introduction

In Thematic Working Group 7 (TWG7), we explored the future of learning environments through theories, empirical evidence, good practices, and experiences during the great online transition (GOT) (Howard et al., 2022), to inform this evolving space. From this exploration, the aim of the group was to generate design principles for the field and implementation of integrated digital and physical spaces. This was a new thematic working group added to EDUsummIT in 2022 proposed by the group leaders, Jo Tondeur and Sarah Howard. The first step of this TWG was to gain some understanding of how we think about learning spaces. To capture our collective thinking, each of the group members completed a short questionnaire, including four open questions: 1) What do you consider a learning space?, 2) What's in the learning space?, 3) What are we doing in the learning space?, 4) How does space matter? These questions helped us to start thinking about learning spaces: what they are, what they do and why they are important. This was an important step in finding out what we thought as a group. Moreover, this guided us toward a stronger focus of our TWG. More specifically, in TWG7, we focused on the integration of the digital and physical learning environment in schools.

Next, we explored the 'state-of-the-art' in our specific research field. Each TWG member was invited to explore relevant literature, interesting empirical studies, great projects, good practices, etc. related to physical and digital learning spaces. This was an important foundation for our hybrid August 2022 [meeting at the University of Wollongong](#). Figure 7 presents a word cloud from the keywords we discussed about good practices.



Figure 7 TWG7 20220825, Online Whiteboard for Visual Collaboration (miro.com)

TWG7 has worked face-to-face, online, hybrid/synchronous or asynchronous, based on the principles of our TWG, integrating digital and physical learning environments. We began prior to the hybrid meeting in Wollongong and continue to do so. Figure 8 presents those TWG7 members who were able to make it in person to the hybrid meeting in Wollongong.



Figure 8 TWG7's participants in the hybrid meeting in Wollongong

This two-day hybrid meeting gave us the opportunity to work across physical and digital spaces, as we evaluated the research and identified good practices. Between the Wollongong meeting and EDUsummIT in Kyoto, we held monthly catch-up meetings and asynchronous work in our online environment. We used Miro boards to capture individual and collective

thinking at each phase of the work. This data indicated the depth and breadth of the challenge we were undertaking. One of the final tasks for TWG7 was for each individual to bring one case study related to learning spaces to the EDUsummit meeting in Japan. Figure 2 presents TWG7's face-to-face participants in Japan.



*Figure 9 TWG7's participants in Japan - EDUsummit2023*

## **Moving forward to new educational realities in the digital era**

New educational realities due to the GOT (Howard et al., 2022) - the global shift to online remote teaching because of the global COVID-19 pandemic - catalyzed a significant shift to the (digital) learning environment in all educational levels. The COVID-19 lockdowns have ended but significant questions remain about how to carry on with opportunities afforded through online learning spaces and associated digital tools, in ways that support student autonomy and flexibility in learning. In this respect, the pandemic has brought a great opportunity to not only consider the online space but to also reconsider physical learning spaces and to better understand the impact of learning environments. Given these changes, our TWG argued that it is time to revise the interplay between physical learning environments and the potential of digital learning environments adopted during the GOT (cf. Nortvig et al., 2020).

### **New educational realities**

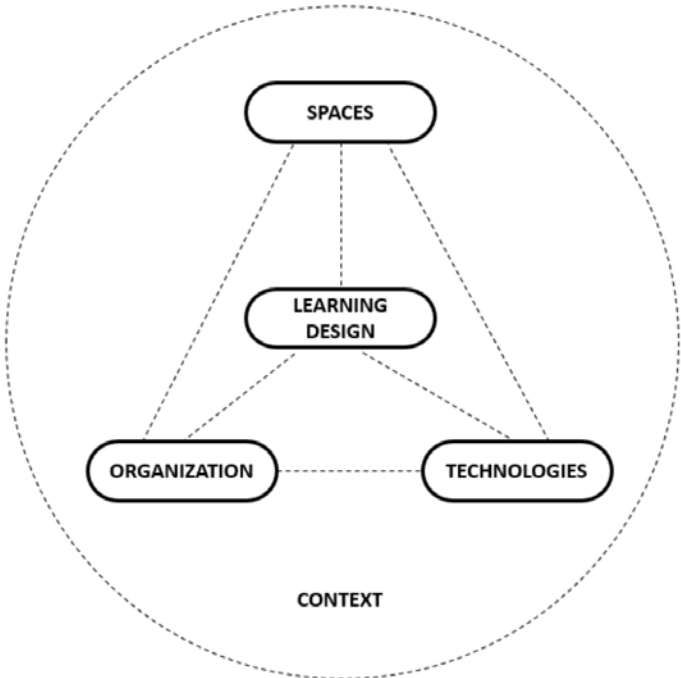
As stated above, education has undergone a rapid shift from face-to-face teaching to fully online remote teaching. When looking towards a post-pandemic future, educators are considering how new remote practices may evolve into a blended space, integrating the opportunities of both physical and online learning environments. However, this is not an easy process. Teachers have to decide what is being taught face-to-face and what can be learned in and/or through a digital space, and how these spaces intersect. They would be expected to redesign their online and physical space to support new learning experiences, but what are these and are they 'blended' or are they something else?

**Key contributions of the TWG to the new educational realities**

We argued that it is necessary to study the interplay between physical learning environments and the potential of digital learning environments. To do this, we propose employing a connected ecology approach to explore the learning environment (cf. Herman et al., 2021). This approach is informed by place, pedagogy, and design, exploring the richness of learning environments in the light of merging the potential of digital and physical learning spaces. This supports a holistic view of the learning environment and one that can include a range of contexts, actors and activities. Specifically, the TWG7 highlighted the necessity of aligning action at multiple levels in order to develop a knowledge base for the integration of physical and digital learning environments based on 1) a scoping review, 2) a set of cases that have highlighted the lessons learned and 3) design principles included in a conceptual model for integrating the physical and digital space.

The design of the space is central to effective learning and teaching. At the conclusion of the face-to-face session in Japan TWG7 created the Designing Teaching And Learning environments model (DTALE) see Figure 10. Outside the circle of the DTALE-model is the school culture and context. Inside the circle, teachers have the capacity to influence those elements. We present this model to guide K-12 educators on the use of space. The next section begins to unpack the key elements of the model.

**DESIGNING TEACHING AND LEARNING ENVIRONMENTs MODEL (DTALE)**



*Figure 10 The DTALE-model for designing teaching and learning environments*

## *Spaces*

Initial notions of space were narrow, based on physical and built spaces like school buildings and tangible infrastructure (Tondeur et al., 2017). But these notions were widened to encompass increasingly open and digital spaces. In a broader view, spaces provide dimensions, points of reference and boundaries (Herman et al., 2021). From an applied perspective, spaces are essential to position and relate objects and processes. In education, learning spaces - either physical or digital - provide teachers and students with an environment where they can interact with learning objects, learning-related tools and with each other. Going beyond traditional school buildings opens notions of open spaces, shared spaces, third spaces, or the non-space. Spaces are increasingly conceived as flexible and hybrid. There are also mixed spaces, incorporating virtual and augmented reality. Broadening our concept of what learning spaces can comprise enables us to make learning more inclusive and accessible to students.

## *Technologies*

Technologies are constantly changing. There are trends from static to more interactive, from 2D to more immersive, from desktop to mobile. More than 30 years of research indicates that technology can improve learning and teaching, but it is highly dependent on context and how it is used (Lai & Bower, 2019). Although there are numerous different affordances of different technologies, teachers need to be able to understand affordance requirements of tasks and technologies available to select and use appropriately. Effective use of technology might differ in different subjects, pedagogical approaches and for different students (cf. TPACK).

## *Organization*

Organization has been defined as the way humans work together to achieve specific goals. Four aspects of organizational theory are key in educational contexts: Goals, structures, culture and context (Bush, 2015). The introduction and use of digital technology in the schooling context is altering these aspects such as how the school and teachers interface with parents, expectations of the use of learning management systems, organizational structures such as timetables or how students are grouped and the loosening of the boundary between the school and the wider community.

## *Learning design*

Learning design concentrates on how to support students achieve learning goals through the way teaching and learning processes are organized and deployed. Designing a powerful learning environment requires the intervention and the mutual understanding of all components in the DTALE-model.

## *Context*

In this TWG we focus on design of individual classes (micro) in the context of school environments (meso) in a larger education system (macro). The latter relates to elements such as state or national policies, funding, curriculum, laws, teacher education, professional development, or cultural aspects. Context also relates to microelements such as the nature of individual students, class compositions, prior knowledge, interests, motivational dispositions,



and so on. Evidence continually suggests that consideration of context is essential in the design of a learning environment (cf. Brianza et al., 2023).

## Key insights from other TWGs

For teachers, the design of learning in new, hybrid, connected, digital and physical learning spaces places new demands on their competences, with clear consequences for teacher's professional development. TWG8 is focusing on teacher's professional development for technology enhanced and online education. Their insights about how to stimulate and support teachers to develop their agency and self-efficacy in this area, are directly connected. New forms of professional learning, in communities, with border crossing elements, experimentation and reflection (pedagogical reasoning) are needed. Next, there is also a clear link with TWG5: Learning beyond formal schooling: human-computer-human interactions in a digital inter-connected era. They point to the need to develop integrated and extended hybrid learning ecosystems that meld formal, informal and non-formal learning spaces through multiway digital connections.

## Strategies and actions

TWG7 believes that policy, practice and research should necessarily inform each other and should work together this following section provides an overview of recommendations.

### Strategies and actions for policy makers

*Focus on organizational flexibility and funding for development of innovative learning design of new teaching and learning environments.*

Policy-makers have the opportunity to formally recognize the contribution of innovative learning environments and spaces to the quality of learning outcomes by a) specifying an entitlement for all school children within their jurisdiction for access to digital and physical spaces in which to learn, b) providing requisite funding to schools to redesign spaces for effective hybrid/blended/digital teaching, and c) supporting professional learning to help equip teachers with the skills to effectively teach in blended physical-digital learning environments.

### Strategies and actions for practitioners

*Focus on communities of practice to design and support innovative teaching and learning environments.*

Practitioners need to assess their capacity to teach in new hybrid/blended/digital ways and undertake a range of professional learning in order to provide themselves with the capabilities they need. Professional learning could be through formal training, but also through engagement in professional communities of practice, independent investigation, online courses such as MOOCs, and so on.

## Strategies and actions for researchers

*Focus on new multidisciplinary research methods that are design-based and embedded in practice to inform infusion and sustainability of technology, innovative teaching and learning environments.*

Research is needed to understand the major issues and impediments to effective teaching in hybrid/blended/digital spaces, and effective strategies to overcome them. Research by Tawfik, et. al (2021) has provided a starting point for these investigations with respect to challenges for online teaching, but investigations of blended teaching involving both physical and digital spaces is underexplored. Research could also focus on the sorts of pedagogical design patterns (Laurillard, 2013) that are effective in hybrid digital and physical spaces, with particular emphasis on the role of the teacher.

## Future Actions from the TWG

The members of TWG7 will continue their collaborative work. Firstly, we will elaborate on the preliminary model by analyzing the existing knowledge about the components of the DTALE-model based on a literature review. Secondly, we will test and refine the model by applying it on existing cases from different contexts. This will lead to a joint scientific publication of the model in 2024. Thirdly, we will validate and refine the model by means of Design Based Research in K12, with a specific focus on the creation of design principles and scenarios. Our goal is also to explore the cross-cultural relevance of the model and to explore the value for other educational contexts such as higher education, vocational education, and workplace learning. Clearly, this is a crucial point in time for significant change related to learning environments.

## References

- Bush, T. (2015). Organisation theory in education: How does it inform school leadership?. *Journal of Organizational Theory in education*, 1(1), 35-47.
- Brianza, E., Schmid, M., Tondeur, J., & Petko, D. (2023). The digital silver lining of the pandemic: The impact on preservice teachers' technological knowledge and beliefs. *Education and Information Technologies*, 1-26.
- Herman, F., & Tondeur, J. (2021). Untangling the sociomateriality of the classroom: biographies of school spaces (c. 1960–2014). *Oxford Review of Education*, 47(5), 681-695. <https://doi.org/10.1080/03054985.2021.1924654>
- Howard, S., Tondeur, J., Hutchison, N., Scherer, R., & Siddiq, F. (2022). A t (r) opical journey: Using text mining to explore teachers' experiences in the Great Online Transition. In E. Langran (Ed.), *Proceedings of Society for Information Technology & Teacher Education International Conference* (pp. 930-935). San Diego, CA, United States: Association for the Advancement of Computing in Education (AACE). <https://www.learntechlib.org/primary/p/220833/>
- Laurillard, D. (2013). *Teaching as a design science: Building pedagogical patterns for learning and technology*. Routledge.
- Lai, J. W., & Bower, M. (2019). How is the use of technology in education evaluated? A systematic review. *Computers & Education*, 133, 27-42.
- Nortvig, A. M., Petersen, A. K., Helsinghof, H., & Brænder, B. (2020). Digital expansions of

physical learning spaces in practice-based subjects-blended learning in Art and Craft & Design in teacher education. *Computers & Education*, 159, 104020. <https://doi.org/10.1016/j.compedu.2020.104020>

Tawfik A. A., Shepherd, C. E., Gatewood, J., & Gish-Lieberman, J. J. (2021). First and second order barriers to teaching in K-12 online learning. *TechTrends*, 65(6), 925-938. <https://doi.org/10.1007/s11528-021-00648-y>

Tondeur, J., Herman, F., De Buck, M., & Triquet, K. (2017). Classroom biographies: Teaching and learning in evolving material landscapes (c. 1960-2015). *European Journal of Education*, 52(3), 280-294. <https://doi.org/10.1111/ejed.12228>