

Towards a framework for interdisciplinary collaborative online learning spaces

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Abstract

This paper presents the findings from a longitudinal, inter-institutional Design-Based Research (DBR) study that commenced in 2020 with a focus on developing design principles for interdisciplinary collaborative online learning. The draft design principles as presented at HEAd'21 were further refined during the first iteration of the project and an updated framework is presented in this paper. The conceptual framework draws on elements of Future Learning Spaces (FLS) and sociomateriality to better understand and contextualise the design principles as it applies to pedagogy, space-time activities and technology. The Interdisciplinary Collaborative online Learning (ICoL) framework focuses attention not only on the practical decisions made by academics in the learning space but also maps the underlying theoretical decisions that influence and shape the learning experience.

Keywords: *interdisciplinary collaborative online learning; future learning spaces; sociomateriality; design principles.*

1. Introduction

To ensure a responsive learning experience for our students, we embarked on a three-year-long Design-Based Research (DBR) study to redefine interdisciplinary collaborative online learning spaces. The study was prompted by complexities arising in Higher Education (HE) learning environments, the realities of our own socio-eco-cultural contexts in South Africa and further challenges posed by COVID-19.

In this paper, we continue to develop the draft design principles as presented at HEAd'21 (Authors, 2021) by incorporating the concepts of Future Learning Spaces (FLS) and sociomateriality. Both these concepts assist in shifting our thinking to the call for continuously being mindful and adaptable to dynamic changes (Klimek & Klimek, 2021).

The paper is structured around a short literature overview of the two main concepts namely FLS and sociomateriality followed by introducing the design-based research (DBR) method that was applied. The outcome is the development of the Interdisciplinary Collaborative online Learning (ICoL) framework with its four associated design principles.

2. Literature Review

2.1. Sociomateriality

Sociomateriality as a theoretical framing offers an opportunity to consider highly complex and embedded concepts within the online learning space such as socio-cultural, human and non-human entanglements and power-communication dynamics. Engaging with and designing for such concepts in the online learning space has proven to be challenging (Carvalho & Yeoman, 2021; Klimek & Klimek, 2021) but necessary if one seeks a learning space that not only prepares students for the world of work but also to be responsible and responsive global citizens.

The emerging literature on sociomaterial theories of learning (Fenwick *et al.*, 2011, 2012) is specially equipped to deal with recent shifts to the 'hybrid' and 'inter/transdisciplinary' lines of inquiry (Fenwick & Edwards, 2019). Such lines of inquiry move away from a linear and overly predetermined understanding of both learning and teaching, to an entangled space where the social and material render each other capable - or incapable.

The significant interplay between the social and material has long been ignored within learning in general and online learning in particular to the detriment of the student as a future professional (Carvalho & Yeoman, 2021). Sociomateriality provides an opening in the learning space to engage with the socio-eco-cultural setting by being context-specific and context-sensitive.

2.2. Future Learning Space

The sudden transformation to digital/online learning environments during the COVID-19 pandemic heightened the complexity and uncertainty that reside in the design of learning spaces. The Horizon Report 2021 calls on Higher Education Institutions to exert agency over the future of their institutions by anticipating alternative futures for higher education (Pelletier *et al.*, 2021). Within these alternative futures, we explore the design of Future Learning Spaces (FLS) and what this may entail in post-pandemic hybrid spaces and times. These transformative space-time entanglements demand innovative, creative and experimental pedagogical models and within this construct, the iterative refinement of design principles.

Future Learning Space (FLS), incorporates the future of work (authentic collaborative learning that mirrors work environments), new theories on learning that enable knowledge building, and advanced tools and technologies that support learning in new and transformative ways (Hod, 2017, as cited in Tietjen *et al.*, 2021). Within such spaces, it is important to understand the sharing of knowledge and how to create opportunities for participatory practices and the adoption of innovative pedagogical models for FLS.

From sociomateriality and FLS, we engage further with the elements of pedagogy, space-time and activities (Tietjen *et al.*, 2021) and technology to better understand and contextualise the design principles proposed.

3. Method

Design-Based Research (DBR) as a methodology aims to increase the impact, transfer, and translation of education research to improve practice. Within a DBR study, the emphasis is on theory building within an iterative process to develop and refine design principles that guide, inform, and improve both practice and research in educational contexts (Anderson & Shattuck, 2012). Design research foregrounds innovativeness, responsiveness to evidence, connectivity to basic science, and dedication to continual improvement (Mckenney & Reeves, 2020).

A DBR study is longitudinal and consists of a collection of sub-studies that are reported separately. In this paper, the updated design principles from the first iteration as part of Phase 3 of the overall DBR study are discussed as it pertains to the Interdisciplinary Collaborative online Learning (ICoL) Framework. The framework depicts the pedagogy, space-time activities and technology affordances for a FLS that will be implemented during the second

iteration from February 2022. Figure 1 provides an overview of the phases of the larger DBR study with the blue block indicating the next phase of the project.

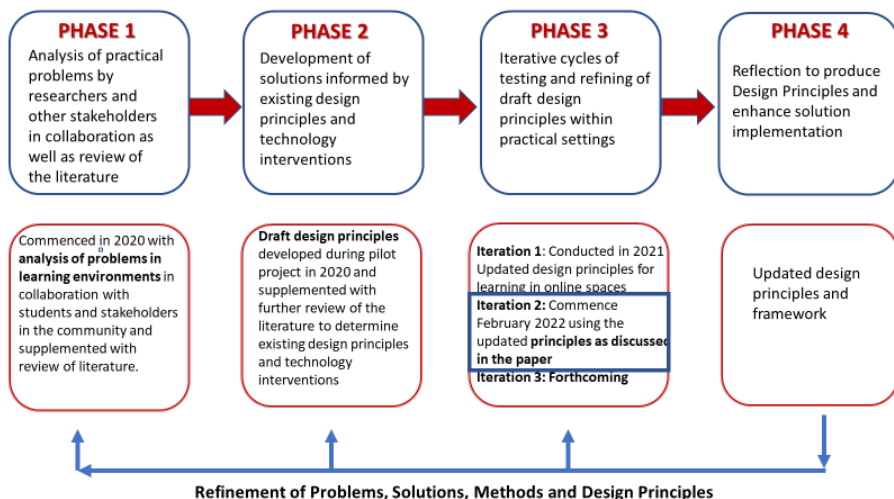


Figure 1: Design-Based Research Process (Source: Adapted from Reeves, 2006)

4. The ICoL Framework and its Four Design Principles

The four design principles as refined during the first iteration are further developed and refined in this section in preparation for the second iteration in 2022. The concepts of pedagogy, space-time activities and technology (affordances and tools) are applied to define the learning space.

4.1. Context-sensitive learning

The first design principle focuses our attention on two pedagogical drivers, namely embodiment and awareness of diverse contexts and perspectives. Embodiment recognises continuous reconfiguration of social systems where students are exposed to continuous movement across physical and virtual spaces (Tietjen *et al.*, 2021). This provides a special challenge in the online learning space as the human body is represented by ‘avatars’ lacking certain essential human qualities with which students make themselves known to their peers and express themselves. One way for students to make themselves known is by tapping into their own local lived (embodied) knowledge in the learning activities we design.

Consideration should also be given to diverse contexts and perspectives, shaped by different socio-eco-cultural influences and disciplinary realms. We do not submerge the vast socio-eco-cultural differences in our student body but rather apply them to enrich the learning space.

Space-time activities should apply principles of responsiveness, agency, ubiquity and connectedness. Activities need to emphasise (i) cooperation and collaboration; (ii) group and community work; (iii) discussion and dialogue; (iv) self-determination (v) valuing ‘difference’ (vi) trust and relationships reflected through weak and strong ties; (vii) reflexivity at the core of processes; and (ix) the use of technology to connect and mediate learning activities (Carvalho and Yeoman, 2018).

4.2. Co-constructing knowledge

Collaborative online learning approaches provide an opportunity to foreground student engagement as a key element of co-constructing knowledge (Gourlay & Oliver, 2018). Within the online space, this requires the use of multiple platforms for engagement, regular peer and facilitator feedback and the pacing of project deliverables to allow enough time for groups to collaboratively consider and incorporate existing and new knowledge and feedback.

Another pedagogical consideration is the co-constructing potential of both the human and non-human actors in the learning space. Sociomateriality provides an opportunity to focus attention on the students-facilitators-communities-learning tools-technology entanglements.

Space-time activities should acknowledge and design for all the differing ‘contributors’ (human and non-human) to the learning event. The space-time activity concept is essential in this case where we have to think about creating continuous opportunity via differing spaces (personal vs. public vs. professional, range of online platforms), at differing times (synchronous vs. asynchronous, class time vs. out-of-class times) and representing space-time in scaffolded, collaborative learning activities.

4.3. Socio-technical and socio-cultural entanglements

Socio-technical refers to the intra-action between the human and technology within the learning space whereas socio-cultural refers to the complex human and socio-economic-cultural setting. Within this context, it is important to shift from a humanist view to engage with the complexity of socio-technical-cultural entanglement and how to conceptualise the cognitions between human and technical participants (Hayles, 2017). Against this backdrop, we further grappled with this entanglement and the underlying pressures of social inequalities, the digital divide, connectivity issues, vulnerabilities and differing worldviews.

The learning needs to take place in a continuous meandering flow of activity and unfolding through a process of zooming in and out (Nicolini, 2009). By zooming out to a macro level to recognise the histories, cultures, and communities within which both the participant and the emergent activity resides and zooming in to the micro level to consider the local context (Tietjen *et al*, 2021).

Space-time activities need to be designed in a fluid and adaptable way to acknowledge the changing nature within a bigger framework of the macro elements. The activities need to incorporate student reflections and peer/facilitator feedback on group platforms and as individuals in blogs with opportunities for feedback from peers and scaffolding from facilitators. A further consideration is to provide the opportunity for groups to recalibrate, pivot or change. The project follows an Agile methodology with short sprints to accommodate change and flexibility with a focus on the process and not the outcome. Students follow a process that incorporates design thinking to develop prototypes and the creation of a minimum viable product (MVPs). Assessments and rubrics need to be co-created to enable flexibility in zooming in and out of the bigger reality.

4.4. Relationality and agency

Both relationality and agency manifest through a shared learning experience where both responsibility and power are being shared. Relationality has specific significance as we have to design the learning space with several intra-actions in mind such as individual students as part of a peer group, students and technology, students within their respective socio-cultural settings or communities and student groups with facilitator and external roleplayers. This principle shares many similarities with principles 4.2 and 4.3 and illustrates the entangled nature of the collaborative interdisciplinary online learning space.

Agency can be developed by tapping into different kinds of existing knowledge, as mentioned above, be it disciplinary, technological or lived community knowledge. Sobko *et al* (2020) provide guidance when suggesting that a focus should be on sharing agency where no single actor (human or non-human) has preference over the other.

Learning activities should focus attention on shared ownership of the learning process by providing ample opportunity and freedom for student groups to collaboratively decide how they want to engage and showcase their work.

The four design principles with their associated pedagogy, space-time activities and technology affordances and applications are illustrated in the ICoL Framework, figure 2, below.

In summary, the ICoL framework provides guidance in thinking with FLS and sociomaterial elements when designing a learning space. The next phase of this study is to test the successes and challenges both students and academics experienced within this complex learning space.

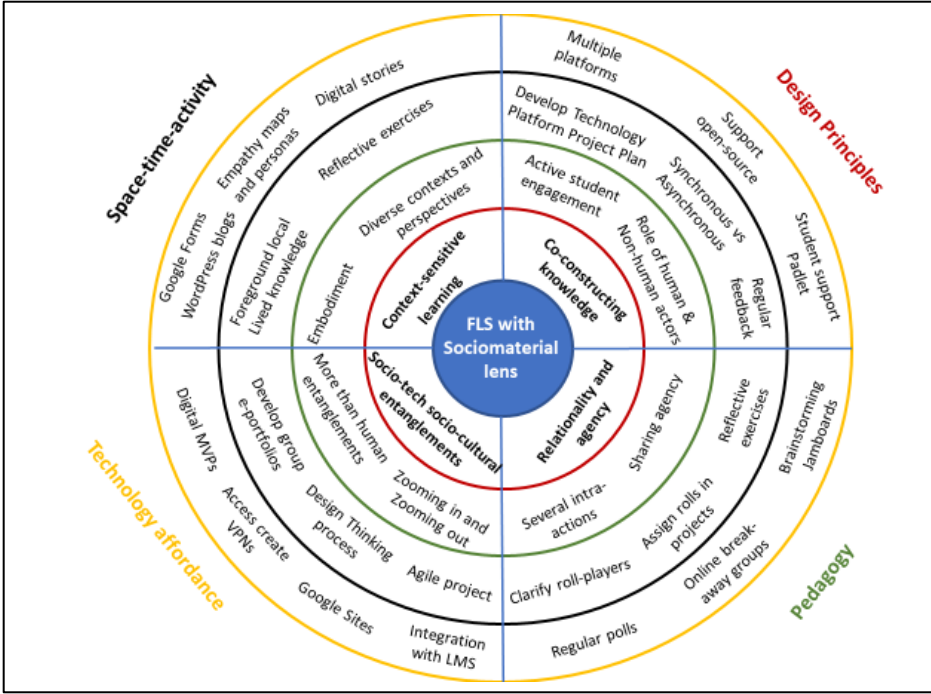


Figure 2. Interdisciplinary Collaborative online Learning (ICoL) Framework

5. Conclusion

Within the context of the highly complex and entangled real-world challenges faced by students and added pressures within HE, further amplified by COVID-19, we embarked on a process of developing a framework to guide interdisciplinary collaborative online learning. This process took the shape of a three-year-long DBR inter-institutional project between the departments of urban planning and information systems.

Although the resulting framework draws heavily from educational theory, it also suggests possible applications by matching design principles to pedagogy, space-time activities and technology affordances.

While the higher education future is highly technology-driven, we argue with this framework for the foregrounding of design principles that encapsulate and afford an opportunity to engage with contextual complexity. This contextual complexity needs interrogation by our students as it defines the reality of the world of work that awaits.

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