Siloed in Breaking Silos

A Case of Interdisciplinary Curriculum (Mis)Alignment

JiaYing Chew

Higher Education Institutes globally are rapidly developing inter/ transdisciplinary education initiatives at varying scales. However, several operational challenges persist in interdisciplinary teaching as there are few incentives to share resources or engage in discourses for mutual deconstruction of knowledge frameworks. Nonetheless, collaboration and communication are vital to bridge the varying epistemic frameworks when different disciplines are brought together. Especially because the way individuals understand concepts contain traces of disciplinary-specificities; without clarity through a common platform, the messiness is reflected in the curriculum design, development and delivery of interdisciplinary courses. Reflecting upon a case study of an interdisciplinary graduate programme that was experiencing curriculum (mis)alignment; this paper illustrates how co-design can be adopted in curriculum development processes to overcome existing operational challenges of interdisciplinary teaching.

Keywords: Interdisciplinary, Transdisciplinary, Curriculum Design, Co-Design, Student Experience

Introduction

Higher Education Institutions (HEI) globally are developing multi-, inter- or trans-disciplinary education programmes in varying scales (e.g., from projects, modules to degree programmes). However, these cross-disciplinary efforts are often vaguely established and implemented within the context of HEI as highly specialised structures (Godemann, 2008). Most HEI initiatives that claim to be inter- or trans-disciplinary remain paradoxically homogenous in their setups and curriculum design (e.g., Ertas, Maxwell, Rainey & Tanik, 2003; Tully, 2013; Self & Baek, 2017).

HEI have traditionally been built upon siloed disciplinary boundaries representative of the industrial age (Steinberg, 2010; Bourgon, 2011). Such divisions of knowledge no longer match the needs of contemporary society's challenges that are complex, ever-changing and cannot be definitively described (Buchanan,1992; Rittel & Webber, 1973; Dorst, 2015). Thus, the concept of mixing disciplines is increasingly welcomed to provide more holistic and comprehensive solutions to global challenges.

Synthesizing definitions most consistently established on the spectrum of mixing disciplines (Nicolescu, 1999; 2005; Ramadier, 2004; Gasper, 2010; CERI, 1972); this research adopts the following working definitions:

- Multidisciplinarity suggests separate input from each discipline, typically presented independently with no interaction.
- Interdisciplinarity describes interaction between disciplines and can range from simple communication of ideas, to the mutual exchange of understandings and organization of research.
- Transdisciplinarity leverages on interdisciplinarity in an approach to complex issues that are beyond comprehension of individual domains— emphasizing, understanding, and embracing disciplinary differences beyond contribution to individual disciplines.

However, the main challenge of interdisciplinary education lies in dismantling existing institutional setups that

are already deeply in place— the persisting focus on specialisations in universities (Russell, Wickson, & Carew, 2008) and a relative lack of an integrative platform for knowledge exchange (Jahn, Bergmann & Keil, 2012). Even when provided with a heterogenous setup, it is critical to acknowledge that interdisciplinarity is not reactive— collaboration derives from both top-down and bottom-up initiatives, and communication is required to bridge the varying epistemic frameworks that drive different problem-solving approaches (Klein, 1996, p.195).

HEI curriculum has typically been developed within "disciplinary conceptual worlds" (Land, 2012b, p.38). Involving others in this traditionally autonomous process may invoke discomfort and tensions as it threatens existing power structures that requires giving up control (Sanders & Stappers, 2008). Furthermore, there are little incentives to share resources or engage in discourses for mutual deconstruction of knowledge frameworks (Gasper, 2010; Land, 2012a), creating misalignment and poses obstacles to interdisciplinary collaborations.

Looking towards parallel examples in organisational transformation (e.g. Collopy & Boland, 2004; Martin 2009; Kimbell 2011), design is recognised as a tool to bridge different disciplines (Bremner & Rodgers, 2013) in existing cross-disciplinary initiatives, especially when focusing on wicked problems (Rittel & Webber, 1973) and service innovation (Yeo & Lee, 2018; Kimbell, 2015).

Co-design has been oft-featured in facilitating multidisciplinary collaboration, creating collaborative platforms, providing a shared language through visualisation, and guiding future-oriented solution-envisioning activities (Hyysalo, Marttila, Perikangas & Auvinen, 2019; Lee et al., 2018; Hyvärinen, Lee & Mattelmäki, 2015). Moreover, extant literature around interdisciplinary discussion in education often surface with the term design or design thinking as a problem-solving logic, bonding different tools and different disciplinary epistemologies (Jahn et al., 2012; Ertas et al., 2003; Garbuio, Dong, Lin, Tschang & Lovallo, 2018).

Tapping on these qualities of design; this paper illustrates the value of co-design in navigating challenges of transdisciplinary curriculum development. Using the case study of a Nordic design school, this paper aims to uncover the dynamics and tensions present when multifarious stakeholders come together.

Case Study: IDBM Curriculum Development Towards Transdisciplinarity

This research looks at the case of the International Design Business Management (IDBM) graduate programme, Aalto University's flagship programme. Established as a multidisciplinary minor programme in 1995, the programme was conceived as an initiative between three discipline-based universities, in response to industry needs. Following the merger of three hitherto public universities into a single public-private university in 2010, the programme was then conferred as an interdisciplinary two-year major programme. Presently, the IDBM programme is offered to all graduate students across the university, from the Design, Business and Technology schools. The programme's setup features an equal-part disciplinary representation; students of the programme come from various cultural backgrounds and have differing levels of work/ industry experience. These heterogeneous conditions (Lawrence & Després, 2004; Ramadier, 2004; Klein, 2004) across the student body and faculty allows for a dynamic knowledge exchange across disciplines beyond the typical siloed structure of traditional HEI.

Central to the programme's structure (Figure 1) is the mandated exposure to different disciplinary perspectives, intended for students to embrace epistemological differences when collectively navigating the uncertainty and ambiguity within diverse teams. First-year students take a series of mandatory courses aimed at equipping each cohort with a foundational understanding in Design, Business and Technology disciplines, respectively. Thereafter, students are assigned to multidisciplinary teams where they get to apply their cumulative knowledge in a six-month long industry-based project designated by an industry collaborator.
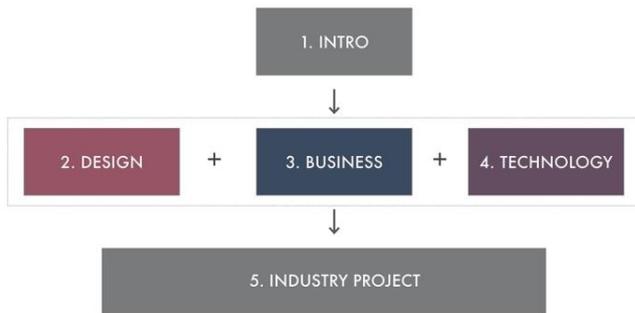
Figure 1. Programme structure, mandatory courses for first-year students

This structure was designed to create a "threshold concept (Land, 2012a, p. 176)" amongst students, to "lead to a transformed way of understanding, or interpreting concepts" that might be difficult for them to comprehend outside of their usual epistemic frameworks. The expectation is that students originating from different schools and distinct worldviews, capabilities and skills will foster creative abrasion that enables innovation through interdisciplkinary exchange (Koria, Karjalainen, Salimäki, 2009). However, despite the programme's long-standing history of experimenting with mixing disciplines in curriculum setups, it was observed that students consistently grapple with articulating their learnings or breaking out of their comfort zones beyond their disciplinary experiences when working on team projects.

Recognising these prevalent challenges, this research was conducted in Fall 2018, in conjunction with the revision of the programme's design and development in moving towards transdisciplinarity.

Curriculum Development Through Action Research

Guided by an action research approach (Ferrance, 2000; Carr & Kemmis, 2003; Stringer, 2008), insights were gathered from archival records, observations, in-depth interviews and co-creation workshops based upon the process of the programme's curriculum development timeline (Figure 2)—conducted over the span of six months (October 2018- March 2019).
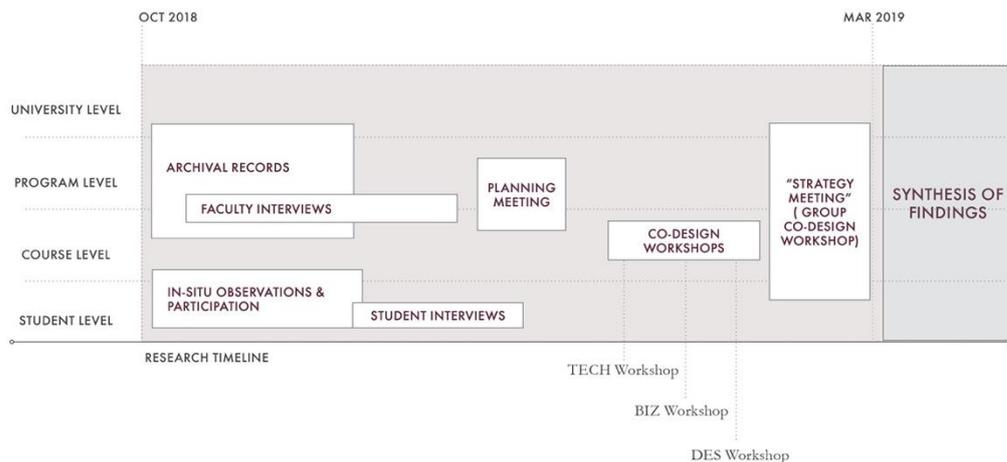

Figure 2. Research process and methods adopted within at various phases of action research

The emic-etic (Pike, 1967) outlook of action research enables a situated response and reflection within and around the context, focusing on the improvement of an existing practice that is based around a problem, dilemma, or ambiguity from the situation in which practitioners find themselves in (Muratovski, 2015). As such, it makes a dual commitment to study a system and simultaneously collaborate with members of the system in collectively changing it to what is regarded as a desirable direction (Huntjens et al., 2014). Taking this approach allowed the researcher to influence decisions and actions during and throughout the research process, rather than suggestions after.

Data collection began with reviewing archival records and conducting participatory observations of the mandatory first-year courses. Then, 13-in depth interviews were conducted with key actors of the programme: two members of management; five faculty members (two administrative staff and the three instructors who taught the business, design and technology courses) and six first-year students (two representatives from each discipline, of varying cultural and education backgrounds). Each interview lasted 45- 60 minutes focusing on key themes presented in Table 1. All interviews were recorded and transcribed verbatim.

Table 1. Key themes of interviews

To Faculty Members	*To Students*
• Their understanding of transdisciplinarity and its implications for the programme • Programme's goals, aims and directions • Experiences in course and programme planning, design and delivery • Student expectations towards the programme • Their understanding of how individual courses fit into the larger picture of the programme • Challenges and opportunities for the programme from a faculty perspective	• Rationale for choosing a cross-disciplinary graduate programme • Their understanding of transdisciplinarity • Programme experience thus far vs expectations when they applied for the programme • Experiences with individual courses and learning outcomes • Mapping their transdisciplinary understanding of the programme based on the courses • Challenges and opportunities for the programme from a student perspective

Coinciding with the conclusion of the three compulsory first-year courses, the fresh memory of course experiences allowed participants to reference examples when articulating their thoughts. In these interviews, participants were asked to reflect on their understanding of cross-disciplinary concepts in relation to their individual experiences with the programme. They were also asked to provide suggestions for future improvements and were encourage to talk about their backgrounds, educations experiences and expertise to allow the researcher to better understand their perspectives and possible disciplinary and cultural influences. A recurring theme that surfaced throughout the interviews, was the lack of common ground and clarity. Even though the overarching programme objective of interdisciplinary learning was understood by all, the concept of interdisciplinarity held different meanings for individuals. As a result, curriculum intent and learning outcomes were loosely interpreted and mostly mismatched.

(Mis)Alignment: Expectations, Intentions and Actions
Interview findings indicated that the students experienced difficulty in navigating their expectations and applying their learnings as they had expected to make sense of the courses as part of a collective programme experience, rather than individual instructional settings. When asked about experience with the first-year course structure, one student expressed:

> *I did not know it was meant to be a Design course, I thought it was more Business. And on top of that I did not know it was supposed to be that we were taking Design-Business-Technology courses within the programme. It's complicated... If it's listed somewhere or explained to make it clearer, it might help.*
> *(First-year student from design)*

The practice of individual courses being independently designed in attempt to align with the programme curriculum, creates confusion and struggle for both students and faculty members to map their understanding of the programme and its core components.
It appears that legacy from the merger has left deep implications in terms of governance and administrative practices, as well as distinct operational cultures that had been built up over the last century (Koria, 2016). This is reflected in the approach individual instructors adopt to crafting the course curriculum and learning outcomes in response to societal and industry needs and trends, while balancing elements of interdisciplinarity within their courses. Evident that interrelations between the courses were critically missing; identifying these aspects of dissonance enabled a clearer overview of the influences and processes that shape curriculum development and delivery.

Co-Design for Alignment: Guided by Student Experience

Based on the insights, it was apparent that communication was lacking amongst the faculty members and that discussions around the programme were required to create coherence and relevance. A series of co-design workshops were conducted with the key faculty members as a means to create collaborative settings for open discourse around concerns, practices and dissonance. Using Biggs' (1996) constructive alignment model as the common denominator to allow for disciplinary-neutral engagement, the goal was to allow the instructors to articulate their rationales around their course design and discuss curriculum delivery challenges.

Co-design workshops were first conducted individually with the three instructors teaching the foundational Design, Business and Technology courses. Instructors were tasked to reflect on their own curriculum plans and existing practices, going over the format of the current curriculum enabled identification of key issues creating dissonance for each course. Thereafter, they suggested possible improvements to their existing curriculum. In these sessions, the instructors had not made significant changes to what they were intending to teach but visualising and verbalising their thoughts (Figure 3) allowed them to sound out what the main priorities were, as well as the pitfalls for the existing curriculum. The one- to-one sessions also allowed the researcher to seed a shared vocabulary as a platform for discussion.

Figure 3. Individual co-design workshop guided by visualisation processes

Thereafter, in the group co-design workshop with all key faculty members, the agenda was broadly listed as curriculum planning for the following academic year. This provided a frame of mind for participants as they anticipated discourses around roles, rescheduling and improvements to the existing curriculum. In this setting, the visual artefacts generated from individual settings were put up on the walls to facilitate sharing around the existing syllabus and curriculum format of individual courses (see Figure 4).

Figure 4. Group co-design workshop, strategy meeting

With intention to generate a Curriculum Blueprint— an education adaptation of the Service Blueprint (Shostack, 1982; Bitner, Ostrom & Morgan, 2008); a blank timeline of the academic year was provided in the group setting to allow for visualisation of how the individual course components fit into the overall programme design. The hands-on group workshop served as a tangible way for instructors to express abstract ideas (Comi & Whyte, 2018) around the intent and pedagogy within and around their courses, as well as identify synergistic opportunities that were present in the larger context of the transdisciplinary programme. Additionally, the three instructors reflexively partook as co-facilitators in leading the collective co-design workshop. This allowed them to articulate their individual concerns and rationales, while creating a common understanding for the rest of the faculty. The workshop also provided an exemplified understanding of the nuances and underlying tensions that persist within existing siloed structures.

Discussion: Breaking the Silos

Through thematic analysis (Braun & Clarke, 2006) of the research data from observations, interview findings and co-design insights, it was observed that several factors were causing the misalignment and dissonance in curriculum design and delivery, and can be largely categorised as follows:

- Solitary course design dilutes interdisciplinary knowing
- Lack of common platform generates syllabi incompatibility
- Traditional course design creates dissonance and misalignment

The following sections feature discussions around findings under each theme, explaining why and how these challenges persist.

Solitary course design dilutes interdisciplinary knowing

The concept of interdisciplinarity may be a shared concept by the faculty, however, it is important to recognise that our understanding of concepts exhibit specificities of our disciplinary locations (Klein, 1996 p.50). Since research methods and epistemic frameworks differ radically across disciplines (Ingold, 2018), it is unwise for transdisciplinary course design to be done solitarily, based on existing norms and practices within a discipline. Doing so results in courses designed to be standalone, reverting to disciplinary-based setups where students are left on their own to make connections of various concepts (Figure 5, left).

For example, when individual instructors attempt to infuse interdisciplinary elements from other disciplines to provide students with an interdisciplinary experience, this creates multiple perspectives towards interdisciplinarity around the programme structure and causes confusion. Instead, integrating different disciplinary perspectives from the various experts (Mieyeville, Gaultier, Peche & Silberzahn, 2015; Ramadier, 2004) while retaining discipline-specificity generates (Figure 5, right) presents opportunities for more conceptual teaching content and allows students to understand how subjects taught are transferable and

applicable to other projects they are working on. This creates a common understanding amongst instructors; instructors to students; and amongst students— all of which are integral and instrumental parts of transdisciplinary teaching and learning. Furthermore, communicating differences and negotiating conflicts while co-designing the programme curriculum shifts ownership from individual courses to programme development instead of relinquishing control (Sanders & Stappers, 2008).
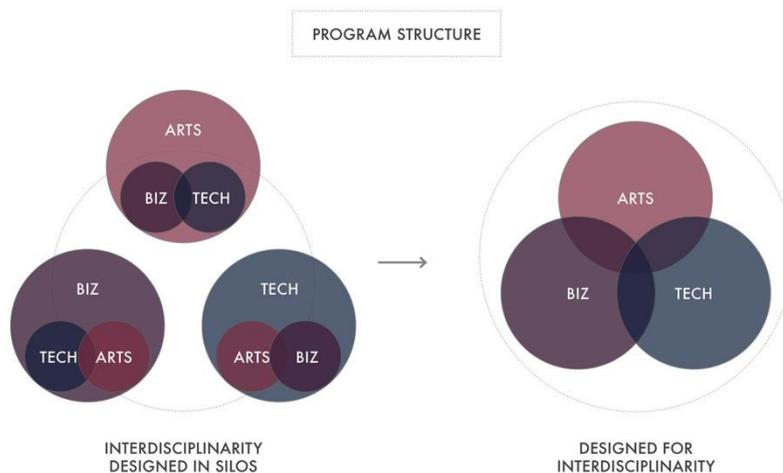

Figure 5. Shifting ownership from individual course development to programme development

Lack of common platform generates syllabi incompatibility

Due to the solitary practice of course design, there was a lack of shared platforms or standardisation in the way the syllabi and curriculum are structured for individual disciplinary courses. The dissimilarity and incompatibility made it challenging to cross-reference and make comparisons across the course descriptions (assessment modes, session formats, content and study material). The syllabus from individual courses were varied in format, presentation and choice of platforms for dissemination; there was use of jargons and discipline-specific terminologies and frameworks that made it difficult for communication, much less an avenue to design and develop the curriculum together.

Unlike disciplinary-based programmes that typically use similar metrics for evaluation and intended learning objectives, it is critical to recognise that different disciplines have different approaches in teaching and learning (Land, 2012b). One of the main struggles identified in the co-design workshops, was the lack of shared practices for reviewing and crafting the programme's syllabi collectively as every discipline has their own modus operandi: this poses a considerable obstacle in developing a transdisciplinary programme curriculum as there are diverse viewpoints. As such, it is essential to distil commonalities or leverage on existing pedagogical frameworks (i.e., Biggs' (1996) Constructive Alignment as used here), in order to create shared platforms or standard practices for the development of syllabus and curriculum.

Traditional course design creates dissonance and misalignment

Traditional course design that prioritises "content to be imparted" over "intended learning objectives" does not work well in interdisciplinary settings, where diversity and representation are vital to its success. In courses that are content- heavy, students often feel overly challenged without basic understanding of the topic, otherwise under-stimulated if they are already familiar with the subject. Thus, finding a common goal to guide curriculum development (cutting across the different disciplines) is instrumental. Apart from disciplinary-neutral pedagogical frameworks such as Biggs' (1996) constructive alignment model, student experience was another common factor that gelled the teaching team together.

Visualising how students would experience and interact with materials throughout the programme, the curriculum blueprint brought the intended learning outcomes to the forefront. This allowed the instructors to recognise overlaps and gaps between and across their courses, in turn refining and shaping their courses for better coherence and relevance throughout the collective programme experience. This process is referred to as "designing backwards"—first establishing the level of outcomes and standards required before deciding on the logistical details (Angelo, 2012). Moreover, engaging students as informants to (Arnstein, 1969) in the

curriculum design process highlights aspects of dissonance, legitimising the faculty's immediate shift of attention towards issues present. Adopting this approach enabled better discourses and participation in the co-design workshops.

Conclusion and Future Work

The enigmatic nature of transdisciplinarity gives rise to circumstances where there is a constant need to engage stakeholders, resolve underlying tensions, and creating a collective understanding. As inter-/ transdisciplinary nature of problems continues to gain currency, universities increasingly find ways to equip students with relevant skills to solve complex problems. Thus, this research provides actionable insights for inter-/ transdisciplinary programmes that may be facing similar predicaments of dissonance and misalignment. This paper illustrates how co-design can be adopted in curriculum development processes to overcome existing operational challenges of interdisciplinary teaching. This approach creates a collaborative platform to uncover tacit issues, while aligning and bridging different expectations, intentions and disciplinary-specific knowledge within multidisciplinary teams (Hyysalo et al., 2019; Lee et al., 2018; Hyvärinen et al., 2015).

In terms of limitations, this study took place only within a time period of six months and features only a temporal snapshot of an ongoing process towards transdisciplinarity. Furthermore, the programme studied did not face as much inertia as other, more uni-disciplinary programmes. Thus, this study primarily features dynamics and tensions of operational challenges within an optimal setup. This negates other obstacles to transdisciplinarity including organisational infrastructures; resistance from stakeholders; and administrative or operational challenges within more siloed institutional setups.

Therefore, future research should include longitudinal cases in different institutional contexts that could highlight various tactical and strategic challenges. Finally, on a more practical level, propositions in this paper should be developed into design interventions and tested in future inquiries featuring different settings.

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JiaYing Chew
University of the Arts London, United Kingdom
National University of Singapore, Singapore
j.chew0520201@arts.ac.uk
Multidisciplinary by training, JiaYing constantly treads the peripheries of design. A PhD student at the University of the Arts London, her current research interest focuses on design-driven transdisciplinary higher education and the role of design in systems-level change. Concurrently, she holds the position of Education Design Strategist at the National University of Singapore, where she is piloting a team-taught transdisciplinary innovation module.