Chapter 10
Problem Solving at the Edge of Disciplines

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ABSTRACT
This chapter outlines a new perspective on disciplinary collaboration that draws inspiration from ecology that observes that the edges where ecosystems meet tend to have greater biodiversity than the ecosystems themselves. This thinking is applied to a typical University Faculty consisting of three Schools to show that the potential for collaboration across disciplinary boundaries is rich. The chapter proposes a new degree structure that embeds problem solving skills as core to the production of “pi-shaped” people, defined as those that have disciplinary depth in two areas and the ability to work outside of their core area. In this regard, problem solving is considered an area where a student can achieve depth of knowledge. The degree is designed such that it produces an exchange of students across disciplinary boundaries and also structured so that it takes students on a journey through different models of disciplinary collaboration. The degree is seen as a key enabler of achieving so called “Mode 2” knowledge production.

INTRODUCTION
Since the industrial revolution, the organization of knowledge into distinct scientific, technical or creative categories has resulted in educational systems designed to institutionalize, reproduce and validate particular occupations or career structures. Typical this results in situations that perpetuate traditional thinking, for example Engineers create Engineering Education, which produces Engineers who reproduce Engineering Education. The methods by which students are exposed to different kinds of education or knowledge are critical in creating and reproducing individual, professional or cultural identities. Today, however, a number of different trends indicate that traditional approaches to education and the formalisation of knowledge needs new approaches. On one hand, the emergence of more open, creative, convergent and socialised technologies – and the entangled, emergent practices arising alongside them – creates

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new challenges for traditional discipline-based ways of knowing. Alongside this, there are a growing number of social, economic and environmental problems facing the modern world those fall in to the category of “wicked problems” (Rittel & Webber, 1973). These complex, interconnected problems span disciplines, knowledge bases and value systems and are not tractable to being solved using traditional discipline based thinking (Brown, Harris, & Russell, 2010; Max-Neef, 2005).

This chapter will present the design of an interdisciplinary experience in such a way that it will prepare graduates to take their places in attempting to resolve the challenges presented by the wicked problems facing our global community, both now and in the future. It has been observed that challenges exist in ensuring that students develop sufficient disciplinary knowledge, as simply recombining traditional disciplinary approaches to learning can result in more superficial outcomes as a result of the limited time frame for typical University degrees (Sosa & Connor, 2015). Planning for designing interdisciplinary learning experiences has reached the conclusion that the role of creative technologies programmes should be to produce “T-shaped” thinkers that have both breadth and depth in terms of capabilities (Connor et al., 2016).

The normally held view of “T-shaped” individuals is that they are people possessing functional or disciplinary expertise and the ability to apply knowledge across different contexts (Barile, Franco, Nota, & Saviano, 2012). In this chapter we propose new thinking about the nature of the “T” that is drawn from observations around how undergraduate students can cross boundaries of discipline in an existing interdisciplinary degree, the Bachelor of Creative Technologies. This degree is designed around the use of transformative play spaces (Connor, Marks, & Walker, 2015), which encourage risk taking by embracing “failure” as a positive learning experience (Connor, Berthelsen, et al., 2014) to develop entrepreneurial mindsets in students (Connor, Karmokar, & Walker, 2014).

It has been observed that the most interesting ideas emerge on the boundaries between disciplines that maintain interesting parallels with the concepts of “ecotones” (van der Maarel, 1990) and “edge effects” (Laurance & Yensen, 1991) in ecological systems. By exploring these ideas, we propose the production of a pi-shaped person where there is a dual depth of knowledge. The first of these knowledge areas is related to ideation ability, problem solving skills and creativity, whilst the second is related to a traditional discipline area. In addition, such a person has a breadth of knowledge across different disciplines, but gained in such a way that it does not limit their ability to transcend the normative thinking that accompanies such disciplinary knowledge.

The ability to develop such graduates comes from the potential offered by the Faculty of Design and Creative Technologies at Auckland University of Technology, particularly at the intersection of the School of Art & Design, the School of Communications & Media Studies and the School of Engineering, Computer & Mathematical Sciences. This potential to incubate ideas and knowledge creation draws from the disciplinary “habitats” that exists at the boundaries of the disciplines. As with many ecosystems, this environment that exists on the edges of others is potentially rich in diversity. The goal of the learning experience is to challenge traditional degree structures; to stimulate new forms of connective, imaginative and explorative learning, and; to equip students to creatively and proactively respond to changing career opportunities. Learning is conceived as an emergent process; initiated, realised and self-managed by students through critique and open peer review (Connor, Buchan, & Petrova, 2009).

We note the observation of Meyer and Land who suggest that the dynamic processes of change and the gaining of new insights on the world, initiated through learning, may also involve the “loss” of one’s “old self” or known (disciplinary) identity, for teachers as well as students (Meyer & Land, 2005, pp. 374-375). This positive erosion of so-called “disciplinary egocentrism” (Connor, Karmokar,