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## Complex systems and interconnected worlds: Crafting transdisciplinary higher degree research programs in an Australian context

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Complex systems incorporating interconnected social, ecological, and technological components are often the subject of analysis and intervention. Such systems frequently give rise to wicked problems [1-4] – problems that “prove to be highly resistant to resolution through any of the currently existing modes of problem-solving” [2-3]. Such problems require a transdisciplinary approach – one where multiple perspectives and realities can inform decisions for intervening in the system. This is well understood in many policy-relevant fields. Inquiry into climate change impacts or water policy, for example, can only proceed effectively with some understanding of the “partiality, plurality and provisionality of knowing” [5]. In working with these types of complex systems, transdisciplinary teams capable of effectively engaging with many worldviews and ways of creating knowledge [2] are increasingly seen as essential for carrying out impactful research-based work. Despite the increasing importance of transdisciplinary practice, educational programs designed to help students effectively carry out this work remain rare, and researchers engaging in this kind of practice often must navigate institutional structures designed to reinforce rather than permeate boundaries between disciplines.

The School of Cybernetics at the Australian National University is one of an increasing number of institutions where transdisciplinary practice is a norm rather than an exception. Staff have been recruited from diverse scholarly and professional backgrounds and career trajectories, and activities encourage engagement in transdisciplinary inquiry. This is in service of the central mission of the School: to identify and develop the knowledges and practices required to take AI-enabled cyber-physical systems safely, responsibly and sustainably to scale in the world. Experimental transdisciplinary masters and PhD programs have been convened since 2019 to help achieve this mission.

In this presentation, we will draw from the authors’ collective experience as supervisors, instructors, and students in these and other programs to provide guidance on designing and delivering effective transdisciplinary educational programs for higher degree research students. We will address the following aspects of postgraduate education: the student selection process, in

which careful cohort selection is essential for identifying students likely to effectively engage in transdisciplinary work; our experience using formal and informal hands-on training in a range of research and relationship-management skills to support transdisciplinary practice; institutional structures and scaffolding to support transdisciplinary cultures and incentives; and ways of supporting students and supervisors to thrive through the creation of diverse and respectful research communities of practice that support collective learning.

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