The future of education in complex systems

Health and education systems are increasingly recognised as *complex adaptive systems*, characterised by high levels of uncertainty and constant change as a result of rich, non-linear interactions that cannot all be tracked.[1,2] This means that complex systems are inherently ambiguous and uncertain, and that they lack predictable outcomes or clear boundaries. As systems have become more complex and integrated at the beginning of the 21st century, it is no longer possible for individuals or even single disciplines to work effectively within them.[3]

The problems generated by complex systems have been called *wicked* problems and are not simply difficult, but impossible to solve.[4,5] These are the kinds of problems where different stakeholders have different frameworks for even trying to describe a problem, and where the constraints and resources necessary to work on the problem change over time.[4] They are 'messy, devious, and they fight back when you try to deal with them'.[5]

Wicked problems are also about people, vested interests and politics, making them very subjective, which is why they do not have stable problem formulations and predefined solution concepts, and why their outcomes are unpredictable.[5] The uncertainty of complex systems is therefore something that we need to be comfortable with, learn to engage with, be curious about and be sceptical of. In other words, wicked problems can't be managed or studied with formal, structured methods; we must adapt to working within them. Even though we cannot solve wicked problems, we can move them forward by learning how to adapt to change, generate new knowledge, and continue to improve performance.[1]

Interprofessional education may be a possible strategy to develop the requisite competencies necessary for health practictioners to work within complex systems. These competencies include, among others, the ability to develop relationships, emotional intelligence, group work, communication and self-management, all of which are difficult to develop and assess with students.[6]

The ability to drive progress in complex systems depends on the ability to generate and connect ideas, and to implement new processes based on them. Not only do these activities take time, but they are also highly social, as success often depends on who we work with.[7] Therefore, teams are not only important for effective work but also for the kinds of generative, creative work that 21st-century problems require. The knowledge, skills and attributes required to work with wicked problems in complex systems are so diverse that it is impossible for a single individual or profession to make any appreciable impact. The ability to work in effective, interdisciplinary and creative teams is essential if we are to address the health problems of the future.

However, higher education is not well positioned to help students develop the competencies needed to work with wicked problems in complex social systems. Social learning theories can help practitioners to work more effectively in non-linear, dynamic systems through inter-professionalism and shared tolerance of ambiguity.[2] However, adopting these approaches at the programme level in health professions education requires a significant change in curriculum and practice – one that traditional health and education systems are highly resistant to.[3] If we want to make any real progress in improving health and education outcomes in an increasingly complex world, we must start taking seriously the idea that radical curriculum reform is not only indicated, but required.

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