

Chapter 14

Embedding Cultural Competence in Science Curricula



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Introduction

Effectively incorporating cultural competence into tertiary institutions is paramount to the creation of cross-cultural settings where undergraduates and academics can develop understandings of how culture and belief systems influence professional decision making. Processes that incorporate cultural competence are viewed as particularly challenging in science disciplines, particularly non-vocational science disciplines where “western” or reductivist ways of teaching and “doing” science remain dominant. Transformative educational practices across science begin with including cultural competence in all academic pursuits, providing opportunities to foster acceptance of multiple evidence-based knowledge systems, and integrating cultural perspectives into the science curriculum. Of course, there are multiple ways to approach the challenge of bringing western science and cultural competence together, many of which involve practical activities that inspire new ways of thinking and doing.

Institutional context is important. In 2011, The University of Sydney adopted a new Indigenous Strategy. More recently, and in direct response to the Universities Australia (UA) guiding principles in the *Indigenous Cultural Competency in Australian Universities Best Practice Framework* (UA, 2011), cultural competence features in the University’s 2016–2020 Strategic Plan (i.e. mission statement) as a university-wide graduate quality. Within the Faculty of Science, some schools

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(e.g. School of Life and Environmental Sciences [SOLES], and Sydney School of Veterinary Science [SSVS]) are implementing the Indigenous Strategy locally, with a goal of building teaching and learning environments that understand and value cultural competence, including the appreciation of Indigenous cultures and knowledge systems.

Initiatives to date within SOLES and SSVS include an Indigenous seminar series on cultural competence and Indigenous Knowledge (IKs); online modules and units of study within Sydney University's Open Learning Environment (OLE); inclusion of new content and curriculum scaffolding across certain units and the introduction of a cross-faculty unit of study. While positive progress has been made in the faculty, further embedding of cultural competence within science curricula will require ongoing mindfulness of potential challenges to faculty involvement and effective engagement with academics and students in schools, facilitating professional development opportunities for both academic and support staff, and liaising with appropriate external individuals and organisations that can contribute their expertise to the developing curriculum.

This chapter addresses why cultural competence is essential in tertiary science curricula, the process undertaken by the authors to integrate cultural competence into curricula, and reflections on the National Centre for Cultural Competence (NCCC) conference and insights from the conference workshop on this topic.

What Is Cultural Competence and Why Is It Important in Science?

Culture defines our sense of self, our sense of identity, our sense of community, our sense of time and place, and our personal and communal ontologies and epistemologies. Therefore, cultural competence refers to both an understanding of ourselves and others, and the myriad philosophies, values, beliefs and contexts through which all knowledge is produced, shared and interpreted (Cross, Bazron, Dennis, & Isaacs, 1989). Culturally competent individuals have an increased awareness of and capacity not only to acknowledge but also to understand different worldviews, beliefs, customs and practices, and have evolved from an ethnocentric lens and reduced unconscious bias via a process of critical reflection and cultural self-assessment (Fitzgerald, 2001).

The purpose of cultural competence is to build a regenerating, multidimensional worldview with the aim to foster the capacity to imagine, create and collaborate across and within multicultural, transcultural and intercultural spaces. Building cultural competence can enable professionals to work effectively and sensitively in cross-cultural contexts (Cross et al., 1989). Cross-cultural communication and acceptance of other worldviews is a skill that is often lacking among trained scientists

who do research with Indigenous¹ communities and people but is fundamental to fostering constructive interactions. Therefore, a commitment to embedding cultural competence into science curricula reinforces the nation-wide challenge of actively addressing injustice, racism, exclusion, inequity and bias.

Embedding cultural competence into higher education begins to address long-term, historical social justice and environmental justice issues. It starts with acknowledging that mainstream science is derived largely from a white, western, male-dominated tradition and that this tradition enabled exploration, invasion and colonialism. This resulted in consequent dominance over Indigenous people, societies, cultures, languages, knowledge and ultimately science. The science and technological innovation and invention that were not destroyed, were classified and trivialised by western scientists as “art” and “myth” (Battiste, 2002; Sepie, 2017). Historic “scientific” studies that were conducted on, about and with Indigenous people were most often exploitative, positioned science with power and dominance over IKs, and reinforced colonial control. An Indigenous Alaskan saying captures this impact: “researchers are like mosquitoes; they suck your blood and leave” (Cochran et al., 2008, p. 22). In some cases, Indigenous people have been the recipients of damaging and destructive experiments carried out in the name of science (e.g. nuclear testing in remote South Australia, see ABC, 2016).

Despite its dark history, the western scientific tradition has produced advances in technology, but current generations are keenly aware of the damage and destructive influence on nature that often follows “scientific” revolutions (e.g. the industrial and green revolutions). Shifting our focus to sustainability in science education requires focusing on Indigenous people’s long-term sustainable relationship with the land and how this is underpinned by IKs and, as an integral part of that, science (Kimmerer, 2002). Doing this may provide valuable insight into the nature of human beings, how humans can live together with other species and with this planet in a renewable, regenerative way (Sepie, 2017). The Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services (2015, p. 103) defines “Indigenous and Local Knowledge” as:

A cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment [G]rounded in territory, Indigenous and Local Knowledge (ILK) is a dynamic body of integrated, holistic, social-ecological knowledge, practices and beliefs ILK is often an assemblage of different types of knowledge (written, oral, tacit, practical, and scientific) that is empirically tested, applied and validated by local communities.

Although IKs are often scientific, and may be underpinned by analytical methods and positivist understandings (Alessa et al., 2016; Snively & Williams, 2016; Whyte, Brewer II, & Johnson, 2016), they differ from western science systems as they include holistic, intuitive and spiritual knowledge and do not differentiate between the secular

¹While the authors acknowledge that cultural competence goes beyond a focus on Indigenous Knowledges (Abrams & Moio, 2009), this is the core focus of the University-wide strategy Wingara Mura–Bunga Barrabugu.

and the sacred (Harmsworth & Awatere, 2013; Kimmerer, 2002; Mazzocchi, 2006; Nakashima & Roué, 2002). Unlike the mainstream western science curriculum, IKs are comprehensively integrated. Astronomy, biology, ecology and geography are taught and learned as sophisticated cultural narratives. Further, the practice of Indigenous science required the observer to be acknowledged as a participant in the process of scientific observation. Therefore, within IKs, not only are the “-ologies” integrated but the culture, laws and language of the people making observations are interdependent, interrelated and interlocked (Harmsworth & Awatere, 2013; McKinley, 2005).

As a result of these characteristics, IKs can complement mainstream science (e.g. in the fields of ethnobotany, ethnobiology, and ethnomedicine; see Berlin et al., 2014), provide contextual detail and richness that is excluded in much scientific methodology (e.g. local long-term trends and intimate understandings of local environmental processes and ecologies; see Butler, Tawake, Skewes, Tawake, & McGrath, 2012; Cross et al., 2017; Montanari, 2014; Pan et al., 2016) or provide valuable insight into phenomena that the natural sciences cannot explain due to their inherent limitations (e.g. exclusion of moral, personal, spiritual and cultural dimensions; see Bobo, Aghomo, & Ntumwel, 2015). Further, IKs connect the sciences to other disciplines and broaden the scope of what can be considered interdisciplinary. It is this holistic ontological and epistemological worldview that is key to enabling truly sustainable living (Sepie, 2017) and, if embedded into science curricula, offers a way forward to mend the fragmentation between peoples, between people and nature, and perhaps, between this world and the spirit world.

Challenges with Implementing Cultural Competence

The key underlying challenge that stymies true efforts to embed cultural competence into science curricula is that the underlying assumptions of the scientific tradition are unquestioned; as a consequence, IKs are largely not considered or disregarded (Thaman, 2003). The dominant system of knowledge in Australia is founded in colonial superiority and fosters an “ideology of knowledge that supports its own elite status [and] has assisted the exclusion and disqualification of innumerable ‘subjugated knowledges’” (Foucault, 1980, in Scott, 1996, p. 69). The relegation of IKs and therefore Indigenous sciences to “myth,” “legend” and “superstition” or, as Sepie (2017, p. 30) puts it, “pre-modern error made by early or ‘primitive’ humans,” has led scientists to label this knowledge as fictional or, at best, anecdotal. As Scott (1996, p. 69) summarised:

While there is no a priori reason to expect that knowledge generated out of non-Western paradigms or social processes should be empirically or predictively less adequate, it has been an effect of Western ethnocentrism to construe non-Western knowledge processes as “pseudoscientific;” “protoscientific;” or merely “unscientific.”

The impact of this has been the continued oppression of people via repression of their knowledge systems (Hauser, Howlett, & Matthews, 2009), a phenomenon that Sepie (2017, p. 2) concluded “is an extension of the global colonial project.” Therefore, the capacity to teach science through different cultural lenses can be inhibited by the very discipline of one’s expertise. To embed cultural competence in science curricula, a major challenge will be acceptance of the science of other cultures, by overcoming a reliance on a one-dimensional view of reality as a physical entity that can be cut up and measured to produce the only decisive fact and truth (Thaman, 2003). Decolonising the scientific tradition, for those who have been indoctrinated into it, is an essential prerequisite for culturally competent educators (Hauser et al., 2009; Nakata, 2011; Ryan, 2008; Sepie, 2017; Smith, 2012).

Finding ways to integrate different forms of knowledge can be very successful; however, it can also be problematic to fit IKs into scientific paradigms. Doing so can reinforce the superiority of one knowledge system over another, may obscure or distort the knowledge, or may strengthen the assumption that only those parts of another knowledge system that can fit a scientific paradigm are valid, while the rest is dismissed. Recognising that different knowledge systems can be integrated at certain intersections is paramount for introducing culturally inclusive material (Aikenhead, 2001; Casimirri, 2003). However, the complexity of IKs, and its embeddedness in spirits, peoples, species, landscapes and environments, means that its very nature as an *in situ* knowledge system juxtaposes against the *ex situ*, generalisable and material nature of mainstream science (Agrawal, 1995). As Aikenhead (2001, pp. 344–345) warned, “inadvertent assimilation will take place in a science classroom if the local knowledge is taken out of its epistemic context.” The perceived difficulty of navigating ways to introduce Indigenous science into mainstream science has led to some educators avoiding any inclusion at all. Fear of introducing “token” content or seeing it as “not my place” to introduce knowledge from another culture is a common and often valid barrier to introducing cultural competence content into teaching (McKinley & Stewart, 2012).

Beyond this, practical challenges with effectively embedding cultural competence into higher education programs include the receptiveness of students, and the capacity of lecturers and tutors to prepare and deliver strategies and/or content, as well as potential resistance from both groups (Abrams & Moio, 2009; McKinley & Stewart, 2012). A lack of readiness to discuss and process racism, oppression and white privilege can generate feelings of anger, resentment and guilt in both students and staff, thwarting efforts to build cultural competence (Abrams & Gibson, 2007; Julia, 2000). In addition to this, academics do not always have the necessary capacity to generate constructive dialogue around issues of race and difference and may not be prepared to deal with the personal and interpersonal emotions that these types of discussions can invoke (Abrams & Moio, 2009).

A further challenge in science is the lack of clear goals and measurable learning outcomes for cultural competence. However, as Abrams and Moio (2009) argued, having quantifiable outcomes to determine whether or not a student is culturally competent is diametrically opposed to the very philosophy underpinning cultural competence—it is a formative, ongoing process that involves cognitive, affective

and behavioural changes that take time to manifest. Encompassing culture as a non-static concept also adds to this challenge (Kumagi & Lypson, 2009). In addition to the above points, having the full support of the University, with structures, frameworks and strategies in place to aid the development of cultural competence at the teaching level, is paramount. At The University of Sydney, the Indigenous Strategies and Services initiative and the Wingara Mura–Bunga Barrabugu program, as well as the University’s hosting of the NCCC, have provided the necessary framework and support network for embarking on this challenge in the natural sciences (Sherwood & Russell-Mundine, 2017).

What Strategies Can Integrate Indigenous Knowledges into Science Curricula?

Although cultural competence has been strongly integrated into the medical and health sciences over the past two decades, with clear evidence-based goals for interacting with patients embedded in learning outcomes and accreditation (Downing & Kowal, 2011), the focus on cultural competence in natural sciences is decidedly less well-developed (Hauser et al., 2009; Snively & Williams, 2006).

The higher education sector has been striving for decades to encourage science students to integrate and transfer knowledge and skills from one discipline and apply them to another. Skills and knowledge about effective communication and mathematics and statistics have been referred to variously as “generic skills” or “transferable skills”; for example, there is an expectation that students will integrate their numeracy skills from mathematics into their biology studies. Although the University has taken steps to include multidisciplinary, transdisciplinary and interdisciplinary avenues for students, this way of thinking has not shaken the underlying monodisciplinary silo structure of teaching and learning. Critical thinking and problem solving are also viewed as transferable skills. However (and as previously mentioned), rarely do scientists explicitly criticise the role of positivism or the underlying cosmological assumptions of their ontological, epistemological and methodological approaches (Aikenhead, 2001; McKinley & Stewart, 2012). Aikenhead (1997) argued that being critical of the scientific subculture, and never requiring students to adopt a scientific way of knowing as their own personal ontology, can help to introduce reflective thinking in science and avoid monodisciplinary mind-shaping; “scientism seems to penetrate students’ minds, like a hidden curriculum, when students learn to ‘think like a scientist’ and take on ‘other habits of the mind’” (Aikenhead, 2001, p. 337). Teaching science as a product of culture—a cultural transmission—helps reposition science as just one way of seeing and doing (Aikenhead, 1997). This breaks down perceptions of knowledge superiority, and privileges western science and IKs as different knowledge realms that have different contexts and purposes of their methods and practices (Nakata, 2010).

Aikenhead (2001, p. 341) also argued that sometimes we need not integrate different sciences, and rather, the teacher should become a “cultural-broker” that helps students navigate “border-crossings” between different ways of thinking; that “a culture-brokering science teacher identifies the colonised and the colonisers and teaches the science of each culture.” Nakata (2002) expanded on this concept, calling it the “cultural interface,” the place where we accept that all knowledge systems are embedded in culture and are therefore dynamic and continually evolving. The cultural interface helps combat educators’ perceived anxiety around introducing “token” knowledge or assuming they need to be aware of, and able to communicate, Indigenous perspectives. Nakata (2011, p. 5) explains that it is a space that asks for “the recognition of all the disruptions, continuities, discontinuities and convergences of knowledge in this space and appreciation of the complexities that exist there.” This means discussing white privilege and Indigenous oppression and the impact of this on the evolution and validation of different knowledge systems (Nakata, 2002; 2011).

Decolonising and Indigenising curricula by integrating IKs content into teaching and learning involve incorporation of “a discernible ‘Indigenous voice’ as Indigenous people insert their own narratives, critique, research, and knowledge production into the corpus” (Nakata, 2007, p. 8). It can also provide a pathway for engaging and retaining Indigenous students. Nakata (2011) explained that Indigenous students in science can more readily navigate the cultural interface if IKs are embedded in curricula. In practice, Aikenhead (2001) suggests the introduction of a new topic that threads together western and Indigenous science to achieve this. He discusses the practicalities of doing this in a high school science curriculum in Canada and details the introduction of a new course called “rekindling traditions.” Although the course integrates bicultural and bilingual examples of scientific phenomena, it goes further than just including content in a scientific framework and instead, starts by building an Aboriginal framework through which to view and review content (Aikenhead, 2001). The units of study always have a practical “on-Country” aspect where students meet with Elders and traverse Country. Spirituality and a connection to place and nature are cultivated before a “border-crossing” takes place and the content is explored through the lens of western science. During the “border-crossing,” differences in values and language, and distortions of Indigenous science, are highlighted; for example, students look at the difference between “what is a wolf” and “who is the mahihkan” (Aikenhead, 2001, p. 345). This pedagogical approach employs storytelling in science teaching, reflecting knowledge as a narrative, embodying interdisciplinarity and highlighting the real-life context and application of science (Kimmerer, 2002; Kumagi & Lypson, 2009). It also emphasises Indigenous languages, a factor that McKinley (2005) argued is foundational to integrating IKs into mainstream science education. Most importantly, this approach does not try to replace science with IKs but finds ways of looking at the same natural phenomena in “both ways” (Aikenhead, 2001). As Nakata (2010, p. 55) articulated:

in this process, it is critical that our marine knowledge, transmitted through stories and through practices *in situ*, is not inadvertently codified into any science curricula in a way that confuses [students] about how we came to our knowledge and how science has evolved its particular way of doing knowledge. Nor should we entertain the deception that a science

curriculum populated with Torres Strait content is a substitute for traditional forms of transmission and practice. Nor should we assume that our traditional marine knowledge can be a substitute for science.

Other skills that are increasingly recognised as weaknesses in scientists, especially when engaging with Indigenous and/or local knowledge systems, are community engagement, action research and participatory research approaches (Aikenhead, 2001; Weerts & Sandmann, 2010). Community engagement, facilitating dialogue and developing co-science in collaboration with IKs holders, is essential for authentic engagement with IKs. Participatory action research processes aim to break down researcher–participant power relations and address issues around the use of knowledge, ownership over knowledge and entitlement to knowledge (Cochran et al., 2008). Producing students with skills to engage effectively with IKs holders and communities, and to conduct research which respects multiple knowledge bases, is essential for fostering cultural competence and scientific literacy and for reinforcing the concept of science as a social and cultural practice (Roth & Lee, 2004).

In Australia, some universities have embedded cultural competence by mandating the completion of a university-wide junior-year subject in Indigenous studies across all undergraduate programs. Although this approach ensures that all students are exposed to IKs, Ranzijn, McConnochie, Day, Nolan, and Wharton (2008) warned against reliance on this approach alone. Integrating cultural competence across core and elective units of study, majors, minors and courses provides an avenue to weave together some of these transferable skills, in a way that cuts across disciplines and begins to introduce culturally different ways to produce and transmit knowledge. Most authors advocate a multipronged approach consisting of both standalone courses and integration into existing courses (Ranzijn et al., 2008; Hill & Mills, 2013). Others push this notion further and suggest that most research, teaching, learning, engagement and outreach within a faculty need to engage with cultural competence and include IKs (Hauser et al., 2009).

Opportunities to include IKs are present in all sciences including the natural sciences. Realising these opportunities requires working in collaboration, and navigating a way forward together, with students and staff, including Indigenous students and staff, and IKs holders and communities, to find respectful and appropriate ways to introduce content and develop cultural competence.

Integrating Cultural Competence into the Natural Sciences Curricula at the University of Sydney

The SOLES and the SSVS have aimed to embed cultural competence firstly, through a process of critical reflexivity, and secondly, through the introduction of innovative learning, teaching, research and engagement strategies. Initially, these innovations are being introduced predominantly from the standpoint of Aboriginal and Torres Strait Islander cultures. In the future, the program will be expanded to fully

embrace the cultural diversity of the University, our region and the wider international community. This chapter outlines some of the key strategies implemented in these schools.²

1. Reviewing and updating science graduate attributes related to cultural competence

Engaging faculty in curriculum renewal is difficult, with academic staff facing significant, competing workload pressures in teaching, research and administration (Edwards & Roy, 2017). Curriculum reviews that ask academics to embed concepts from outside their traditional suite of disciplinary material may be particularly challenging (Blackmore & Kandiko, 2012; Tagg, 2012). Of the nine graduate qualities (GQs) at the University, one of the most challenging for academics in the Faculty of Science is cultural competence, which is at least partly owing to its perception as more relevant to the humanities (Boutte, Kelly-Jackson, & Johnson, 2010). Analysis of learning outcomes and their alignment with the University-level GQs showed few ($n = 6$) science course components that had alignment gaps with cultural competence. However, of 91 learning outcomes aligned with cultural competence across the Faculty's course components, 34 (37%) were unacceptable or inappropriate, and a further 40 (44%) were unclear. Thus, very few learning outcomes were truly aligned with cultural competence. Feedback from academic leads during the learning outcome revision process suggested that many were unaware of how cultural competence is defined; that cultural competence constitutes more than working in diverse groups; and that cultural competence assessment needs to be spread across a major, stream or program, rather than individual units of study.

2. Seminar series on IKs

In an effort to expose staff and students to IKs and its integration with science, an Indigenous seminar series was developed and hosted by the SSVS, with the aim to inspire and foster dialogue between staff and students about cultural competence and IKs. Guest speakers (often IKs holders and scientists) are invited from outside the University and their talks are recorded in an effort to archive this knowledge as a permanent resource. In 2018, guest presenters spoke on Australian native plants, Aboriginal participation in science, technology, engineering and mathematics (STEM) subjects, and the astronomy and navigation of Aboriginal people.

3. Developing and offering units of study within Sydney University's Open Learning Environment

Academics from SOLES and SSVS helped to develop and implement a new OLE unit, OLET1607 Cultural Competence in Natural Science. This unit has been tailored to science students, providing them with a reflective space to develop cultural competence. It aims to introduce students to the basic tenets of cultural competence and encourages students to discuss and critically reflect on cultural competence values

²The authors would like to acknowledge that other Science Faculty schools have developed and implemented cultural competency initiatives which are not mentioned in this chapter.

and practice in research, placements and professional practice. This unit is aimed at achieving effective communication skills to ensure constructive interactions with clients and co-workers in diverse groups, and communities and environments across cultural boundaries. Academics involved in these units have also helped to build and teach into other open learning modules and units on cultural competence.

4. Introducing new content and curriculum scaffolding across select units

Reviewing the Agricultural and Environmental Sciences Curricula

In what was the Faculty of Agriculture and Environment (now part of SOLES), a review of the existing curriculum was undertaken (Cross et al., 2014) to assess the extent of, and future potential for, the inclusion of IKs. This study resulted in the development of a database of resources pertaining to the potential inclusion of new content, as suggested by lecturers; determined other potential avenues including research projects, for collaborating with IKs holders; aided the renewal of the teaching curriculum by providing and sharing resources and discussing their inclusion; and determined challenges, issues and constraints in respect to the inclusion of new material in the curriculum.

While many of the units of study to which this research refers were cut or redeveloped during the restructure, four key challenges were identified:

- **Curriculum constraints** in science-based units, i.e. the “pure” sciences (e.g. chemistry, microbiology) were not perceived to be amenable to the inclusion of IKs. Academics explained that some units had no room for the inclusion of IKs as they were an amalgamation of two previous units.
- **Lecturers’ lack of capacity** was also seen as a major self-reported limiting factor. Many academics explained their lack of exposure to, and knowledge of, Indigenous issues or potential content and described it as a hindrance to their ability to include cultural competence. Some explained that they would be afraid to introduce knowledge that might be perceived as “token” due to their lack of expertise.
- **A lack of resources and networks** from which to draw inspiration, as well as the time needed to engage to develop capacity, were also limiting factors. To overcome these challenges, increasing staff capacity via training and exposure was recommended. A land, food and water cultural competence training unit for staff was suggested, and a new unit of study (AGEN 3008, discussed further in a separate section) was proposed to facilitate experiential co-learning for both staff and students, and to be an avenue for potentially sparking new collaborative research ventures between scientists and IKs holders and land managers. Interestingly, these results concur with Abrams and Moio’s (2009) review of cultural competence in social work degrees, where they concluded that lack of faculty preparation was the biggest barrier to embedding cultural competence in degrees.
- **A lack of incentive** to engage with cultural competence training and content inclusion in lectures. For some academics, there was no perceived reward for investing time and energy into incorporating cultural competence. Beyond this, a lack of perceived professional advantage was also voiced: “[there is a] problem

with focusing on Indigenous Knowledge—an academic I know worked on native crops publications, citations, forget it with Indigenous stuff, you are pushing it uphill” (Cross et al., 2014, p. 11).

Threading Indigenous Language Through the Biology Curriculum

Acknowledging IKs require first acknowledging and paying respects to the traditional custodians, past, present and future, upon whose lands our campuses stand. Language is of critical importance for Indigenous people globally (McKinley, 2005). There have been many calls from Aboriginal and Torres Strait Islander Australians that before IKs are shared, and potentially exploited, we first need to address the issue of waking the sleeping languages of this country. In a biologically focused project on The University of Sydney campuses, we offer the language of the Sydney basin, provided by Patyegarang, a young Aboriginal woman, in the early days of colonisation, and documented at the time by William Dawes, a British officer and scientist, (Troy, 1994). Students have been working alongside academic staff to offer the “Sydney Language” names of the plants and animals in the biology curriculum (Quinnell, Troy, & Poll, 2018).

Embedding Cultural Competence in Veterinary and Animal Sciences

The SSVS has embarked on an effort to scaffold cultural competence into all degrees they offer, by embedding cultural competence into the graduate attributes and learning outcomes for the Doctor of Veterinary Medicine, and the Animal and Vet Biosciences, programs. In total, the school has implemented an estimated 40–60 h of cultural competence and IKs across 13 undergraduate and professional programs. One example is the unit of study called AVBS1003: Animals and Us, which explores how cultural backgrounds influence our relationships with animals and emphasises critical thinking as a learning outcome. Across these units, cultural competence/IKs are evident in the assessment and evaluation. SSVS also aims to develop skills such as effective cross-cultural communication throughout units of study and placements; and provides opportunities for students to have placements in Indigenous communities as part of the service learning model. Advice and toolkits on cultural competence to inform extramural rotations, and international and community placements and research, are provided to all students.

5. Developing and introducing a cross-faculty unit of study: AGEN3008—Indigenous Land and Food Knowledge

To increase the cultural competence of staff and students across Science, the development and implementation of a new unit of study in what was the Faculty of Agriculture and Environment was pursued. AGEN3008: Indigenous Land and Food Knowledge is a unit of study that aims to develop staff and student knowledge and understanding of the specific opportunities and challenges facing Indigenous people living on, and caring for, Country. The unit also contributes to the development of community enterprises centred on land and food knowledge. The course is structured with a pre-enrolment activity, a pre-field study two-day preparation, a 13-day field study to Darwin, Katherine and Kununurra, and a post-field study day to consolidate learnings. Students and staff complete formal cultural competence and awareness training programs throughout the course.

Up to 30% of Australia is under some form of Indigenous land management with much of this land located in the northern part of the continent (Altman & Markham, 2015). With the onset of climate change, food production in Australia has the potential to shift the production emphasis northwards and with this will come changes in land management issues. Students graduating with a degree in agriculture, veterinary science, food production or environmental management should have the opportunity to gain an understanding of past, present and future Indigenous land management. Understanding Country from an Indigenous point of view is essential for graduates who will influence sustainable land management policies and practices.

The purpose of AGEN3008 is for staff and students to engage with key Indigenous organisations and communities to aid in the development of sustainable land-use, to provide local economic return. Students engage with communities to listen to what communities need and the vision they have for the use of their land, whether that be conservation or production-oriented. In collaboration with key community members and organisations, students then develop feasibility studies for enterprise development. These studies consider the cultural needs and capacity of the community, new and innovative management strategies, niche products, local environmental conditions, local markets and start-up costs. This helps students to gain professional experience working with Indigenous communities, and at the same time, giving back to the community a body of research and a potential grant application. The long-term aim for this course is to have students and staff to develop grant applications in collaboration with communities, thus transforming the course from a field study into a true immersion experience (see Fig. 14.1).

The rationale for introducing this course was determined by the evident lack of cultural competence in the former Faculty of Agriculture and Environment. A first-hand immersive experience to develop cultural competence skills in the field is a direct and effective way to bridge the gap between theory and reality (Ranzijn et al., 2008; Abrams & Moio, 2009), positions IKs holders as experts, and respects the *in situ* nature of Indigenous wisdom. The importance of this last point was echoed by Hill and Mills (2013, p. 70) in reflection on their immersion course at Charles Sturt University: “for once we were inside the landscape rather than standing outside

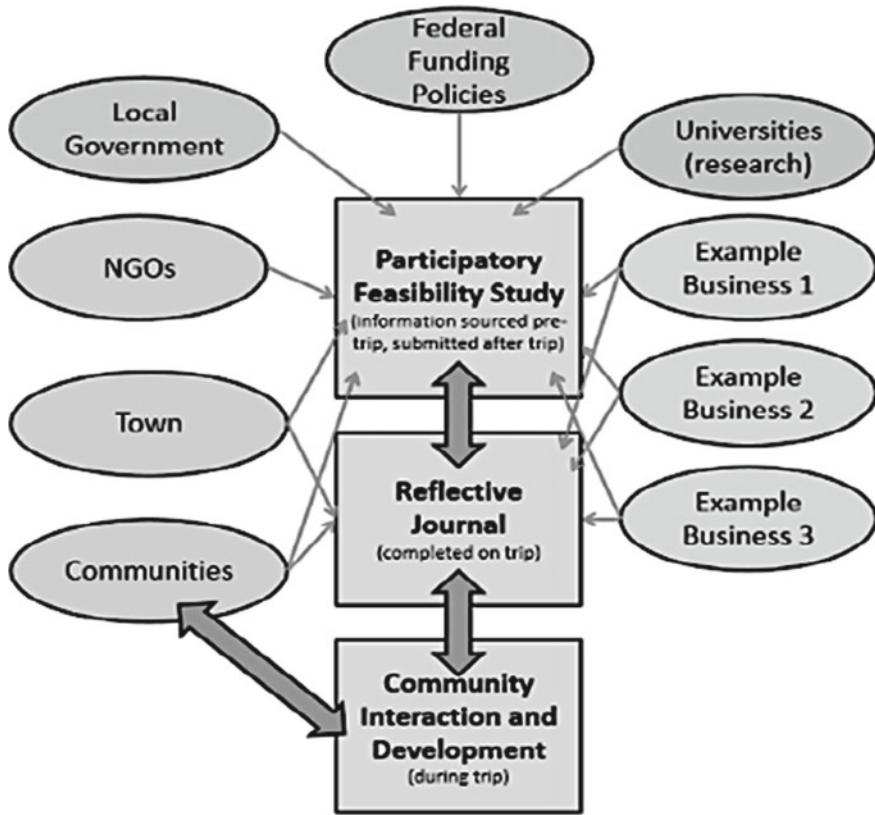


Fig. 14.1 Model of engagement and assessment for AGEN3008 Indigenous Land and Food Knowledge

gazing at it ... place rather than time emerged as the crucial element in developing our understanding of Indigenous cultural competence.” The course was developed in consultation with Indigenous academics and knowledge holders and is based on a series of visits to Indigenous enterprises and cultural awareness workshops delivered by local Indigenous elders. Critical reflection, collaboration and engagement, and staff and students co-learning in the cultural interface together are key aspects of this course, and foster experiential and transformational learning (Ranzijn et al., 2008)—or what Hill and Mills (2013) refer to as “adventure-learning.” The unit explores IKs, language, history, culture and science, as well as western agricultural science, history and culture, and the interactions between these knowledge in various contexts.

The success of this course has been in the building of new relationships and developing understandings collectively via multiple knowledge. This transformative learning experience enables students to build relationships with each other and staff (both academic and professional) via a co-learning model, and with Indigenous land managers, communities and enterprises. Students have different disciplinary

backgrounds—as well as science degrees, the course is open to arts, education and business students—which encourages diverse discussion. As this course has run for three years, the relationships with IKs holders and land managers has developed and strengthened, and each year the students are privy to new invitations and insights.

The reflective journal and essay illustrate the impact of AGEN3008 on student learning, with profound insights evident on entitlement to knowledge, history and culture (e.g. as one student commented, “Why did I think I could come in as a total stranger and just be given people’s stories and knowledge?”), on-ground realities (e.g. as one student commented on funding for communities, “Why doesn’t the rain ever seem to hit the ground?”), and the complexity and invisibility of white privilege (e.g. “I did not realise how much pain was caused by the construction of Lake Argyle and how current this pain is”). Further to this, a previous student has now undertaken an internship with one of the enterprises she engaged with during this unit. We hope that in future years, engagement in this unit of study inspires new student and staff research projects, and to maintain engagement, we run a Facebook group to continue sharing knowledge between students, staff and the enterprises/communities with which we engage. However, the ability to enable meaningful engagement in a two-week period is a severe limitation. Students have a very short time in each place and undertake stakeholder consultation for their projects via distance communication. Other drawbacks include the limited number of students that the course can accommodate, and the cost to students for flights, accommodation and food.

6. Embarking on new research initiatives

To engage in cultural competence with students, staff in the Science Faculty have had to engage in their own journeys of cultural competence. For some, this has included a blend of involvement in professional development courses on cultural competence and completion of online modules (both provided by the NCCC), self-guided learning, and evolving research projects to encompass and draw attention to IKs.

One such initiative has been instigated by academics engaged in plant science. The Australian flora is unique. Connecting science undergraduates to our Australian flora is critical if we are to have botanically literate graduates to enable our agricultural and ecological systems to be managed and sustained. The standard biology texts used in teaching botany and learning across the country inadequately represent Australian flora, which our students see all around them. “Campus Flora” is an m-learning app co-created with students (using the “students as partners” model, see Healey, Flint, & Harrington, 2016). The Campus Flora app offers an innovative interactive botanical map, able to be accessed through mobile devices, which highlights the extraordinary biodiversity of plants on our campuses (Pettit, Pye, Wang, & Quinnell, 2014). The Campus Flora iOS app was launched in The University of Sydney AppStore in 2014, with the WebApp and Android versions following in 2015. Inherent in the app design was the capacity to offer the traditional names of plants, as used by local communities. In 2016, Campus Flora was showcased at the University for its capacity to (a) offer ethnobotanical and cultural narratives to support cultural competence

in the curriculum, and (b) inspire new ways of offering student engagement with the botanical resources growing on our campuses. In 2017, the Patyegarang trail was offered to the University community (Quinnell et al., 2018). This trail presents the plant names in the Sydney Language (Troy, 1994). In connecting the Sydney Language back to our University campus, we honour the Gadigal Elders past, present and future.

In another case, agricultural researchers embarked on a project evaluating the effectiveness of an Indigenous engagement program delivered by a regional governance body, Central Tablelands Local Land Services, in New South Wales (NSW). In this research, regional land management challenges, successes and aspirations of local Aboriginal land councils were shared, discussed and documented. This has now resulted in new connections with Indigenous landholders and knowledge holders in the Central Tablelands, and has provided insight into contemporary ways people are integrating Indigenous and western land management practices via fire, weed and pest management, biodiversity protection, and cultural heritage maintenance (see Ampt, Cross, Berry, & Bell, 2018), consequently enriching teaching and bringing diverse perspectives into lecture material.

A “Grasses for Grains and Native Food Park” initiative is also being developed by researchers with local IKs holders in Narrabri, northern NSW. This project aims to recreate an Indigenous foodscape by bringing back a diversity of native grasses and other associated plants, both on a University of Sydney site and on two local Aboriginal land councils’ properties, to research management practices as well as the edibility and food processing of native plants (Pattison, 2018). While this initiative is still evolving, it has already resulted in two student projects that have brought together western science and IKs.

Reflections on the National Centre for Cultural Competence 2018 Conference

The NCCC 2018 conference offered a plethora of experiences and strategies for integrating cultural competence into tertiary education. The most poignant discussions were on the importance of taking time and being patient with community engagement; the importance of personal connections in establishing trust for collaboration; and the intersectionality that can evolve when implementing and reflecting on teaching and research initiatives. In addition, there was discussion of cultural competence going beyond Indigeneity to focus on gender, sexuality, age and interpersonal approaches. One keynote speaker echoed some of the constraints found in our review and highlighted the lack of an agreed-upon definition of cultural competence; the lack of knowledge, skills and comfort about including cultural competence in academic endeavours; and the lack of leadership and organisational capacity to realise stated policy in practice (Goode, 2018). Overall, the forum lacked a clear focus on how cultural competence can be specifically achieved in the natural sciences.

Insights from the Conference Workshop

At the NCCC 2018 conference, a workshop was held to showcase what we had achieved so far in the Faculty of Science in regard to embedding cultural competence in the curricula. However, we are acutely aware that our efforts only “scratch the surface.” We intended to use this workshop to brainstorm with our participants and learn from them to inspire new strategies in science. Academics shared their experiences in trying to implement cultural competence, and the resistance they faced from colleagues who perceived IKs to be incompatible with their teaching or feared that IKs would “take over” their courses. We discussed ways to overcome those barriers, such as making cultural competence training compulsory for staff, and giving staff time and space to reflect on new ways of teaching and embedding cultural competence. It was also suggested that academics be encouraged to find like-minded colleagues to build interdisciplinary collaborations and share learning activities and assessments, across the Faculty. Most workshop participants perceived that the most successful way to integrate cultural competence would be by recruiting Indigenous academics to build Indigenous pedagogy, support the development of learning and teaching resources, engage in teaching and research, and build networks across the faculty and with external organisations and local communities. We also received advice on creating culturally safe spaces, as determined by Indigenous staff and students. Participants explained that the strategy of the culturally safe space aims to help people feel safe to engage in the critical self-reflection encouraged across the faculty and facilitates the safe expression of feelings of comfort and discomfort.

One takeaway regarding cultural competence in the curricula was the current lack of an accreditation requirement in the generalist sciences (broadly), which therefore restricts the effective incorporation of cultural competence as a solid graduate outcome in the sciences. In veterinarian sciences, as in the health sciences, cultural competence is a required graduate capability. Most universities have commenced cultural competence work in the curriculum in those degrees where cultural competence is required and so have parked the (arguably) more difficult discussions of cultural competence in the generalist sciences. This is not to say that those in the generalist disciplines are not including cultural competence in their curricula.

Going Forward with Cultural Competence in Science Curricula

Underlying the effort to embed cultural competence in science curricula is a goal to evolve all staff and students, and ultimately the university system, to a point where science incorporates many ways of doing and works with IKs to improve and address social and environmental justice issues. This chapter has focused only on the cultural competence initiatives in SOLES and SSVS, yet this journey has only just started

and our progress with cultural competence is still in the outer margins of what is possible.

Recognising divergent ontologies and epistemologies may require methodological pluralism in science (Cobern & Loving, 2000; Hauser et al., 2009; Kirmayer, 2012; McKinley & Stewart, 2012) and will require new thinking, where judgements, prejudices and assumptions are laid aside to “allow our consciousness to flow along new lines” (Peat, 1994, in Aikenhead, 1997, p. 225). Accepting that science can be developed through multiple evidence-based knowledge systems, and therefore that western science provides just one way of discerning “truth,” is key. This reflects respect for the ethnic, racial and cultural diversity of staff and students. Aikenhead (2001, p. 350) concluded that cultural competence is most successful “when cross-cultural science instruction creates a change in the relationships of social power and privilege in the science classroom.”

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