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Directions for an innovation climate have been evident since 1996 when the Federal Government endorsed the Australian Science Technology and Engineering Council for its first comprehensive foresight review identifying essential priorities as a national interest in innovation capacity building Australia’s future generations. As the Australian economy continues to transition away from the mining boom and shifts focus to the agriculture sector in regional communities, the country’s future growth is dependent on fostering and promoting innovative ideas as a National Innovation & Science Agenda (Australian Government, 2016). Sustainable and effective learning of technological practice has important implications for innovation capacity building in primary and secondary Technology Education students and opens up the possibility for framing new models of assessment in school curriculum concerned with the choice and use of cross disciplinary tools and materials. However, literature suggests innovation has no single typical set of descriptors but rather many overlapping attributes, thus the capacity to assess innovation in a teaching and learning context lacks an underlining theorem. This research offers a guiding structure to promote teaching and learning assessment methods aligned with identifying appropriate qualities of design-led innovation in food education.

Key words: Design-led innovation, food education assessment, Technacy Genre Theory

Introduction

We are at a point in history unlike any other time where rapid population growth, increased food demand, energy sources used in the production of food, loss of ecosystems and reducing bio-diversity are colliding (Parnell, 2011; Stern, 2007). Consequently, policy drivers have identified food as a basic necessity that deserves immediate attention at local, national and global levels (Australian Government AusAID, 2010; Carberry, 2010; Organisation for Economic Co-operation and Development, 2015). These aspects are compounded by the growing consumer appetites of developed countries for new food products, particularly for the supply side of food products into retail outlets and the many institutions such as schools that further raise the demand for unlimited and cheap food product supply in the delivery of traditional food curriculum (Turner & Seemann, 2010).

Unquestionably, school students in tomorrow’s world will need to have the ability to make informed decisions about a range of matters quickly and effectively which includes maintaining currency of knowledge in related technological sciences and the global social, cultural and ecological environment upon which food production relies. Accordingly, sustainable food production systems are crucial to the economic wellbeing and viability of rural communities in terms of employment, yet the
Australian food industry operates in a very challenging environment that involves erratic weather conditions relating to rainfall patterns which affects the security of nutrient rich soil (Qureshi, Hanjra, & Ward, 2013). Furthermore, the local food industry supports richly diverse social and cultural lifestyles. The New South Wales Government (2014, p.18) emphasises “education in local food production is an important priority at all ages and stages of education” to attract ‘next generation’ farmers, and to have the capacity for making sustainable long term decisions concerning food supply. This will require increasing knowledge and application of design led innovation, applied technology and science and the global environments that these occupy.

Correspondingly, design-led innovation offers empowerment for students, whether primary or secondary, to be entrepreneurs in food supply issues through the exploitation of new ideas and opportunities involving social entrepreneurial ventures with local communities (Ballantine-Brodie, Wrigley, Ramsey, & Meroni, 2013). This could involve community gardens inside or outside of the school grounds and physical or virtual food hubs as a communication tool where school and community members connect, learn and share and thus build community capital in addressing local food security and food sovereignty. Central to this involves design where exploration undertaken in collaboration between teachers, students and community stakeholders fosters innovation capacity building. Ballantine-Brodie phrase this by way of “economics of localisation” (p. 323) as people continue to question the monopoly corporate businesses have over food supply systems. Literature suggests local communities seek to control their own food economies with the view to forge social equity through sustainable and environmental practices. To this end food curriculum needs to take the student to a new level of understanding on food issues and now demands an environmental conscience embedded in curriculum and assessment (Turner & Wilks, 2016). This paper discusses the nuances between innovation and design led innovation, puts forward a guiding framework for cross disciplinary assessment planning and suggests some ideas for lesson activities.

Innovation

Admittedly, innovation is a broad, complex and multifaceted term that is used freely throughout individual countries and associates with different meanings for an individual’s frame of reference or as an economic purpose in government policy, reports and curriculum reform (Rogers, 2003; Sundbo, 1998). Yet it is the definition from the Organisation for Economic Co-operation and Development (2012) which encapsulates innovation most succinctly and where much literature refers to as human capital for innovation from a business perspective and innovation in education and training systems. For both contexts, innovation is expressed as 1) product innovation, 2) process, 3) marketing innovation and 4) organisation innovation.

Fundamentally, innovation is often linked between research (and innovation) and science (and innovation) and pertaining more specifically to the innovative use of technologies and materials (Moyle, 2010). According to the National Science and
Innovation Agenda, there are five overarching agenda that provide a framework for Australian innovation policy: 1) Culture and capital (be confident, embrace risk, pursue ideas, learn from mistakes, commercialise ideas 2) Collaboration (Australia is the lowest in the OECD in research and industry 3) Talent and skills (Australia has the lowest study in science, mathematics, & computer coding in schools 4) Government exemplar: (new ways of doing business) and 5) Primary school teachers graduate with a new subject specialisation in STEM.

While school education policies have rarely reviewed the economic concepts of innovation in the past, the economic language of innovation now permeates these documents. Moyle (2010) asserts creativity and imagination underpin innovation, thus from a teaching and learning perspective, nurturing students to learn constructively through trial and error processes will foster capacity building in students. However, Moyle suggests there is a tension between language and expectations in the policies regarding capacity building as a guiding process by teachers, which also involves the expectation to teach a “didactic concept of delivering content skills and knowledge” (2010, p. 16). This is compounded by two core aspects: 1) a focus on ‘teaching to test’ rather than developing a broader suite of skills that are more transferrable across different contexts, and 2) teaching innovation and creativity as ‘core content’ rather than as an integrated approach.

While the innovation process can be identified in terms of a linear ‘funnel’ model (Rogers, 2003), the nature of innovating is non-linear, iterative, and uncertain, somewhat like a meandering river leading you through unknown territory at times, but it does require disciplined thinking to navigate the river. Moyle (2010) and Gruenewald (2004) suggest the capacity to innovate is determined through a suite of skills that require a deeper level of learning that encourages initiative and enterprise. In order to develop attributes that foster student’s social, cultural, and environmental sustainability awareness, this paper puts forward that curriculum requires a standard classification scheme to describe innovation attributes in universal terms. In addition, the Melbourne declaration on education goals for young Australians (Ministerial Council Education Employment Training Youth Affairs, 2008) outline a range of general employability skills students need to learn as planning and organising, the ability to think flexibly, to communicate well and work in teams, the capacity to think creatively, innovate, solve problems and engage with new disciplines.

**Design-led innovation**

In a similar manner, design-led innovation is a design thinking approach that embraces a sensitivity for another person’s world through observation and direct interactions with people rather than for people and where a designer requires a deep understanding of target users’ needs in order to achieve a positive outcome for the user. Design not only encompasses form and function but more importantly should have ‘meaning’ for the user, so in that context the designer needs to be able to understand the behaviour of the end user. That is, design-led innovation employs empathic approaches that can be used to gain insight and shared understanding of the
systems the end user will interact with. Additionally, as an end user’s situation changes or where cultural cues evolve, an expectation of design-led innovation involves a significant amount of design flexibility and interdisciplinary adaptability. It is also a learning approach that mitigates cognitive bias (Anderson, 2012; McDonagh & Thomas, 2010; Olsen, 2015). While design thinking is not a new concept with regard to product design, emerging literature indicates design-led innovation is used broadly across different disciplines and industries. Furthermore, Ballantyne-Brodie, et al (2013) describe design-led innovation in a food context as a practice-led approach that can not only frame the scalability challenges of food sustainability projects, but also help frame community connectedness and develop social capital in local food projects. Olsen (2015) refers to this as an ‘ethnographic deep dive’ with regard to finding solutions to food needs — agency in empathy and understanding of the community voice, use and suitability of technology through scientific processes to achieve sustainable eco friendly food choices and cultural usage.

Guiding framework for cross disciplinary teaching and learning

A limitation of many design-oriented frames for the study of food education is that the design process approach is often formulaic and “considered a downstream activity in the innovation process; an afterthought applied to an idea to make it attractive, usable and marketable” (Ballantyne-Brodie, 2013, p. 326). A risk with such approaches is that while design studies may aspire to higher order thinking in the process of designing, very little reference is given to the technological form of the knowledge and practice being studied, particularly in cross disciplinary applications. In a technological context this includes subtle but significant variations from the way things are laid out, the materials used, to more abstract transformations such as new ideas – all of which are often tested for their innovation value in the market (Turner, 2013). Furthermore, in terms of formal technology education, the diverse ways society seeks to conceptualise technology practice suggests that while we may all see intuitively some aspects of technical knowledge linking together, we equally struggle to clearly articulate it all into one whole universal model (Figure 1).

Figure 1: Framework for assessment

Discussion

Food education in the twenty first century needs to have a clear position for the ecological landscape and demonstrate the capacity to nurture the socialisation of people who are inclined to be innovative toward the design of food as a sustainable enterprise. In order to develop attributes that foster student’s social, cultural, and environmental sustainability awareness, curriculum requires a standard classification scheme to describe innovation attributes in universal terms, and in stages of development. In the context of design-led innovation, Technacy Theory (TGT) offers a way to value a proper place for both a cogent examination of technological understanding as well as the role that design plays in the educational process. One of the key ideas underpinning of TGT is that the form it takes as an explanation of technological knowledge also links to other disciplines in a ‘fractal’ relationship. This proposition makes TGT scalable and offers a way to see how complexity may arise out of simple relationships between people, tools and ecology when they are combined to meet a purpose in an applied context setting. The standard approach in education draws on the design process, but what the design process does not consider
is how to conceptualise materials, tools and agency to work coherently together towards a purpose and for an intended context of application and sustainable outcome. From a technological perspective, it is argued that TGT can articulate a core place for the study of values and practice for emerging knowledge with particular regard to design-led innovation. The ability to map the entire field of technological knowledge into a networked association of genres poses new and exciting epistemological as well as pedagogical possibilities.

Conclusions and implications

Sustained food innovation is key to the future growth and prosperity across local, national and global economies. Innovation and food innovation capacity building call for multifaceted talents and cultural capital in scientific, technological, engineering and mathematical capabilities, learning through risk taking and pursuing ideas confidently. Equally important is that students acquire a breadth and depth of knowledge and understanding that is universal. For this reason, this paper identified the need for a robust assessment framework that could clearly articulate the relationship between technology education pedagogy for change and ecological sustainability, and human development. Attention is drawn to the need for food curriculum to align more toward a common interest for sustainable food production as a life sustaining enterprise between schools and communities in food based research projects. This would open up opportunities to engage in new approaches through design-led innovation and to link eco-footprint more deeply into teaching and learning.

References


