ACHIEVING HIGHER EDUCATION GRADUATE ATRIBUTES IN THE AREA OF CREATIVITY, INNOVATION AND PROBLEM SOLVING THROUGH THE USE OF DESIGN THINKING

Abstract

The paper examines issues related to achieving generic graduate attributes at the discipline subject level in the areas of innovation, creativity and problem solving through the application of design thinking frameworks. The paper explores the literature in the field of graduate attributes and then outlines important aspects of design thinking theory and finally provides a glimpse of how elite universities are implementing design thinking strategies. This approach does not involve the application of a specific design thinking framework – instead it advocates the selection of design thinking frameworks to suit particular contexts.

Neil Anderson, James Cook University, Queensland, Australia.

neil.anderson@jcu.edu.au

A major focus of presentations in the QSAPPLE conference stream of 'Internationalising the Curriculum' has concerned generic graduate attributes that universities or employers value in relation to graduates' ability to enter the workforce equipped with skills that enable them to work globally and effectively. Graduate attributes have been defined by Barrie (2007) as the "skills, knowledge and abilities of university graduates, beyond disciplinary content knowledge, which are applicable in a range of contexts and are acquired as a result of completing any undergraduate degree" (p.440). Bath, Smith, Stein and Swann (2004) pointed out that these attributes or qualities include critical thinking, intellectual curiosity, problem-solving, logical and independent thought, communication and information management skills, intellectual rigour, creativity and imagination, ethical practice, integrity and tolerance" (pp. 313-314). This paper will examine some important aspects of the push to embed graduate qualities in the higher education curriculum and how design thinking frameworks may provide an effective means of achieving skills in areas where a creative and innovative mindset are required. While it is a relatively easy matter for universities to include explicit graduate qualities as an intended outcome of their courses, it may be a lot more difficult to achieve anything substantial beyond a surface acknowledgement of their importance and a presence in policy documents. To achieve the development of such attributes, learning tasks that strongly contribute to the desired skill and mindset development must be embedded in discipline specific subjects.

Undoubtedly, some pressure has emanated from international employers keen to recruit graduates who possess more than subject knowledge and professional skills. They also require employees who possess the kind of attributes outlined by Bath et al (2004). Harvey (2000) argues that graduate qualities are linked to the 'employability agenda'. Hesketh (2000, p.246) argues "while not all of the problems can be placed at the door of higher education, employer dissatisfaction with the attributes of the individuals they recruit from our universities cannot be ignored". A consistent theme in the literature concerning graduate attributes has been the emphasis placed on fostering innovative and creative mindsets in students and providing them with strategies that enable them to achieve outcomes that involve different paths and solutions to new problems. Barrie (2007, p.440) claims that innovation and creativity "lie at the heart of all scholarly learning and knowledge, with the potential to transform the knowledge they are part of and to support the creation of new knowledge and transform the individual". Bath et al (2004, p.314) determined that four main factors have contributed to the growing importance of generic attributes in higher education and concluded that "this emerging importance of generic skills, or graduate attributes, in higher education has been influenced by at least the following three factors: the popular perspective that education is a lifelong process; a greater focus

on the relationship between education and the employment of graduates; and the development of outcome measures as a part of the quality movement".

Policy makers and higher education researchers have agreed about the importance of graduate qualities and these aspirations have been accepted and implemented on the surface but confusion occurs about the concept and how to embed graduate qualities in courses – and therefore the reality is not as it seems on the surface. Green, W., Hammer, S. & Star (2009) maintain that governments, business and universities have all underestimated the profound changes that would be necessary within universities to really make this happen. Policies can exist at the university wide level but ensuring that these policies are enacted at the discipline subject level is another matter. Practical means of achieving student development in these graduate attributes such as innovation and creativity include the design of learning experiences that directly impact on student learning in particular areas. One learning framework for solving problems or designing products in creative and innovative ways is design thinking. The following section will define and provide information on design thinking and then outline examples where design thinking has been embedded successfully in the curricula of world leading universities.

Nigel Cross (2011, p.3) contends that design thinking is an integral part of the human condition and expands on this in his book by pointing out that "everyone can – and does – design. We all design when we plan for something new to happen, whether that might be a new version of a recipe, a new arrangement of living room furniture, or a new layout of a personal web page. The evidence from different cultures around the world … suggests that everyone is capable of designing. So design thinking is something inherent within human cognition; it is a key part of what makes us human." Dunn and Martin (2006, p.517) define design thinking "as the way designers think: the mental processes they use to design objects, services or systems, as distinct from the end result of elegant and useful products. Design thinking results from the nature of design work: a project based work flow around 'wicked' problems." This takes design thinking out of the realm of merely creating a product to using the process as a means to solve complex problems such as climate change or social problems. Dunn and Martin present a cycle of stages of design thinking including: Abduction, Deduction, Testing and Induction.

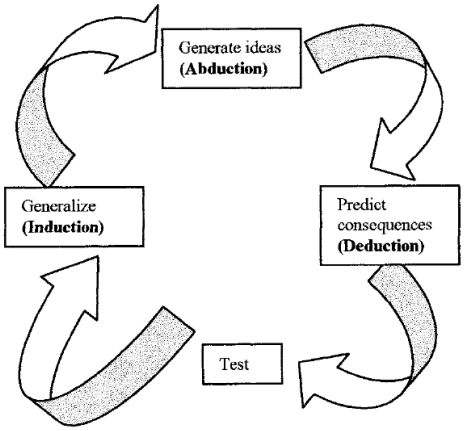

FIGURE 1
The Cycle of Design Thinking

From Dunn and Martin (2006, p.518)
Explicit steps are typically used as guides in design thinking frameworks, such as: understand (the user and the system); observe, point of view; ideate; prototype and test (Carroll, et al., 2010). More complex and nuanced explicit steps such as those developed by Beckman and Barry (2007) have been designed for specific industry applications but the simpler steps used by Carroll and colleagues in school-based education and Bell (2008) in library and library services design are more appropriate as a way of introducing design thinking to tertiary students. Design thinking differs from previous approaches to developing innovative mindsets due to its emphasis on focusing the learner on empathy

and understanding the systems and users at the beginning of the process. Although explicit steps such as those outlined by Bell (2008) and Carroll et al (2010) have great potential as a means of introducing design thinking to undergraduate students at the subject level, it must be kept in mind that such steps are useful in early phases and that as designers they will go beyond such simplistic steps. Rowe (p.4) warned of this back in 1987 when he argued that "there is no such thing as the *design* process in the restricted sense of an ideal step-by-step technique. Rather, there are many different styles of decision making, each with individual quirks as well as manifestations of common characteristics." Although explicit steps may not be the ideal design process, they do provide a scaffold for students to start applying a designerly way of thinking in order to solve complex problems – often referred to in the design thinking literature as 'wicked problems'.

In recent design thinking models, the design approach is applied more broadly than producing a product, leading proponents to claim that the approach is useful in solving a wide range of problems (Brown, 2008). Design thinking has been used in expected areas such as art, engineering and business but also in climate change, medicine, library services and sustainability (Dunne & Martin, 2006; Dym, Agogino, Eris, Frey & Leifer, 2005; Senturer & Istek, 2000; Uehira & Kay, 2009). To illustrate this use of design thinking, some examples will be now briefly presented to illustrate examples where design thinking has been implemented in the higher education environment.

Dym, C., Agogino, A., Eris, O., Frey, D. & Leifer, L. (2005, p.103) from University of California at Berkeley, Stanford University and Massachusetts Institute of Technology in the area of engineering believe that that "the purpose of engineering education is to graduate engineers who can design, and that design thinking is complex." They outline how design thinking is integrated in their engineering programs in ways that scaffold students undertaking complex processes of inquiry, including working collaboratively in teams using a PBL (problem-based learning) approach. Martin and Dunn (2006) discuss the use of design thinking in business management courses at the University of Toronto. Martin (p.513) claims that "today's business people don't need to understand designers better, they need to become designers". Roger Martin, who was dean of the Joseph Rotman School of Management at the time of writing, maintained that business education needed to become more like design education and implemented curriculum reform in the MBA program to ensure that students used facets of design thinking such as 'abductive' reasoning to solve complex problems.

Oxman (2004, p.63) outlined a design framework he termed 'think maps' as a means of scaffolding students' design processes in undergraduate architecture. He described this as a "pedagogical framework for design learning and design teaching." Beckman and Barry (2007) use what they call 'second generation' design theory to enhance learning in the business school at the University of California, Berkeley. Second generation design theories emphasise the social nature of the design process. They contend that "this social process accommodated a less top-down view of the design process and relied less on experts to provide the solutions, instead engaging a broader range of players. Design then shifted from a clear-cut problem-solving process to a problem-formulating process in which getting to a collectively acceptable starting point (so that appropriate resources could be committed to solving the problem) was the core of the effort (p.26)." This 'starting point' in design theory involves gaining a comprehensive understanding of the user or potential user and the systems that they work/live in.

The subject 'Design Thinking and Innovation' is part of the Harvard Business School, MBA program. Harvard is consistently ranked 1st in various university ranking schemes and their MBA ranks as one of the world's premier MBA programs. Datar (2012, n.p.) writes that "the core objective of the course is to help students develop design thinking skills including problem finding and problem framing, gaining customer insights, design thinking and innovative problem solving methods and approaches, identifying innovative individuals, forming innovative teams and building innovative cultures." A follow-up subject is available where students undertake a project and use design thinking approaches in order to scaffold their completion of planning and conducting the project. Datar explains that "the key is to develop an actionable point of view that addresses the following questions: Who should be the target users? What do they need? How do you know? The module will then explore various techniques of brainstorming and idea generation such as mind mapping, nominal group techniques, reversal techniques, rotating attention, lateral thinking, forced relationships, use of analogies, and attribute analysis, used by design firms such as IDEO, Design Continuum, and Systematic Inventive

Thinking." Many other examples of embedding design thinking in graduate and undergraduate subjects can be found, albeit in world leading, innovative universities, however this small sample serves as an illustration.

This paper has discussed the growing importance of graduate attributes in higher education, including the demands from employees that graduates should possess skills that transcend basic subject content. It has been established that developing innovative and creative mindsets is a graduate attribute that is particularly important for sustainable and productive future global development. A clear definition of design thinking has been presented along with several specific frameworks that can scaffold beginner's use of design thinking processes. These same frameworks have been successful in more complex situations such as designing new types of libraries and library services (Bell) or to foster innovation in companies such as IDEO and Apple. Although the paper has taken a positive view on the potential of design thinking it has not been entirely uncritical and has acknowledged the concern from some leading design theorists that complexity of design processes cannot be reduced to simple, explicit steps. Although this critique has obvious validity, the frameworks presented in this paper have been successfully used as an introduction in school-based education (Anderson & Courtney 2011, Anderson 2012, Carroll et al 2010), in tertiary education (Datar 2012), in business (Brown 2008) and library services (Bell 2008) and as a scaffold for solving complex industry based problems. This critique should remind us that many different frameworks are possible that have particular value in different contexts and that experienced designers may not need or use particular frameworks as they could regard such scaffolds as overly restrictive. In addition, explicit frameworks or steps may prove to be especially useful as a means of scaffolding students' creative processes in the earlier stages of courses. Another critique is that design thinking definitions are unclear, confusing and under-developed (Kimbell, 2009). The definitions provided earlier in this paper are quite suitable for the purposes of integrating design thinking in graduate and undergraduate programs but as the design thinking concept evolves through practical applications and academic research, no doubt, definitions and practice will improve and be supported by an expanding empirical body of evidence. If differences or lack of clarity in definitions was a serious impediment to implementing innovative concepts, then many areas would be subject to paralysis. Finally, the paper presents a short and non-exhaustive review of how design thinking has been embedded in the curricula of world leading universities. Future research should focus on determining if these relatively new programs are successful in producing outstanding student outcomes.

References

Anderson, N. (2012). Design thinking: Employing an effective multidisciplinary pedagogical framework to foster creativity and innovation in rural and remote education. *The Australian and International Journal of Rural Education,* 22(2).

Anderson, N. and Courtney, L. (2011). 'Students Using Indigenous Knowledge in Video Game Creation to Develop Design Thinking Skills' in *Handbook of Research on Improving Learning and Motivation through Educational Games: Multidisciplinary Approaches***.** Editor, Felicia, P., IGI Global, Hershey, PA.

Barrie, S. (2007). A conceptual framework for the teaching and learning of generic graduate attributes, *Studies in Higher Education*, 32:4, 439-458

Bath, D., Smith, C., Stein, S. & Swann, R. (2004). Beyond mapping and embedding graduate attributes: bringing together quality assurance and action learning to create a validated and living curriculum, *Higher Education Research & Development*,23:3, 313-328

Beckman, S. L., & Barry, M. (2007). Innovation as a learning process: Embedding design thinking. *California Management Review, 50*(1), 25-56.

Bell, S. (2008). Design Thinking. *American Libraries, 39*(1/2), 44-49.
Cross, N. (2011). *Design Thinking: Understanding how designers think and work*. Berg, Oxford, U.K.

Brown, T. (2008). Design thinking. *Harvard Business Review, June*, 84-92.

Carroll, M., Goldman, S., Britos, L., Koh, J., Royalty, A., & Hornstein, M. (2010). Destination, imagination and the fires within: Design thinking in a middle school classroom. *International Journal of Art & Design Education, 29*(1), 37-53.

Datar, S. (2012). *Design Thinking and Innovation*. Harvard MBA subject outline accessed from http://www.hbs.edu/mba/academics/coursecatalog/1345.html

Dunne, D., & Martin, R. (2006). Design thinking and how it will change management education: An interview and discussion. *Academy of Management Learning & Education, 5*(4), 512-523.

Dym, C. L., Agogino, A. M, Eris, O., Frey, D. D., & Leifer, L. J. (2005). Engineering design thinking, teaching, and learning. *Journal of Engineering Education, 94*(1), 103-120.

Harvey, L. (2001). Defining and Measuring Employability, *Quality in Higher Education*, 7:2, 97-109

Harvey, L. (2000). New realities: The relationship between higher education and employment. *Tertiary Education and Management* 6: 3–17.

Hesketh, A. (2000): Recruiting an Elite? Employers' perceptions of graduate education and training, *Journal of Education and Work*, 13:3, 245-271

Lockwood, T., Editor. (2009). Design Thinking: Integrating innovation, customer experience and brand value. Allworth Press, NY.

Martin, R. (2009). *The design of business: Why design thinking is the next competitive advantage*. Boston, MA: Harvard Business Press.

Green, W., Hammer, S., & Star, C. (2009). Facing up to the challenge: why is it so hard to develop graduate attributes? *Higher Education Research & Development*, 28:1, 17-29

Rowe, H. (1987). *Design Thinking*. MIT Press, Massachusetts.