A mix of objectives, all of which can be classified into methods that mix intuitive and deliberate actions, often informs the design process. Brainstorming, a method quantified in the 1950s, was previously the norm for generating a variety of creative ideas around a theme (Lupton, 2011, p.4). 'Brainstorming remains a powerful tool,' wrote Lupton, 'but it is just the beginning in a designer's quest for useful and inspiring ideas.' Osborn (*Applied Imagination*, 1953) and deBono (*New Think*, 1967) have been the forerunners in the field of creative problem solving, generating methods for understanding the creative process. deBono's concept of "Lateral Thinking" provides a framework for innovative thinking. The Lateral Thinking paradigm relies on seven steps, which form a sequence for the production of innovative ideas. deBono classifies these steps as (Anon, 2012, *deBono Consultants*):

1. Alternatives / Concept Extraction: Use concepts to breed new ideas
2. Focus: Sharpen or change your focus to improve your creative efforts
3. Challenge: Break free from the limits of accepted ways of operating
4. Random Entry: Use unconnected input to open new lines of thinking
5. Provocation: Move from a provocative statement to useful ideas
6. Harvesting: Select the best of early ideas and shape them into useable approaches
7. Treatment of Ideas: Develop ideas and shape them to fit an organization or situation

Nigel Cross, author of 'Design Thinking: Understanding how designers think and work' (2011), explains that designers approach problems in a way that differs from standard practices: 'Designers appear to be "ill-behaved" problem solvers, in that they do not spend much time and attention on defining the problem.' 'Successful design behavior,' states Cross, 'is based not on extensive problem analysis, but on adequate "problem scoping" and on a focused or directed approach to gathering problem information and prioritizing criteria. Setting and changing goals are inherent elements of design activity' (Cross, 2011, p.16). Cross explains that designers are 'solution-focused' rather than 'problem-focused.' A 'solution-focused' approach often allows for more innovative and human based results rather than process-based results that rely on scientific factors. 'Creative thinking has tended to be regarded as mysterious, but new explanatory descriptions of creativity in design are beginning to emerge from empirical studies,' explains Cross (2011, p.17). 'In particular, it no

longer seems correct to promote the key feature of creative design as dependent upon an intuitive, heroic "creative leap" from problem to solution. Problem framing, co-evolution, and conceptual bridging between problem space and solution space seem to be better descriptors of what actually happens in creative design.'

Design Thinking, a more recent take on dissecting the design process, draws on deBono's Lateral Thinking and Cross's concept of 'solution-based design' by offering a more comprehensive set of objectives and steps that help to quantify the creative process. According to Tim Brown (2009, p.4), director of IDEO, 'Design Thinking can be classified as discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity.' Moreover, design thinking converts need into demand. IDEO, a leader in Design Thinking techniques, breaks the design process into five steps: Discovery, Interpretation, Ideation, Experimentation, and Evolution. Each step, defined in more depth below, leads to a creative solution that solves a known or otherwise unknown problem.

1. Discovery: Discovery builds a solid foundation for ideas. Creating meaningful solutions for people begins with a deep understanding of their needs. Discovery means opening up to new opportunities, and getting inspired for new ideas.
2. Interpretation: Interpretation transforms stories to meaningful insights. Observations, field visits, or just a simple conversation can be great inspiration — but finding meaning in that and turning it into actionable opportunities for design is not an easy task. It involves storytelling, sorting and condensing thoughts, until a compelling point of view and clear direction for ideation emerge.
3. Ideation: Ideation means generating lots of ideas. Brainstorming encourages expansive thinking without constraints. Often it's the wild ideas that spark the thought for something visionary. With careful preparation and a set of rules to follow, a brainstorm session can yield hundreds of fresh ideas.
4. Experimentation: Experimentation brings ideas to life. Building prototypes means making ideas tangible, learning while building them, and sharing them with other people. Even early and rough prototypes can evoke a direct response and help learn how to further improve and refine an idea.

5. Evolution: Evolution is the development of a concept over time. It involves planning next steps, communicating the idea to people who can help realize it, and documenting the process. Change often happens over time, and reminders of even subtle signs of progress are important. (Anon, 2012, *IDEO Education*)

IDEO works on the premise that they are the forerunners of concepts that will ultimately serve and support people in new ways. Their work aims to identify problems before they exist 'by uncovering latent needs, behaviors, and desires.' (Anon, 2012 *IDEO*). Satisfying human needs, both in a local and global sense, underpins IDEOs rhetoric. 'Design Thinking taps into capacities we all have but that are overlooked by more conventional problem-solving practices. It is not only human centered; it is deeply human in and of itself,' explains Brown (2009, p.4). For a solution to be successful, however, it must be both feasible (what is functionally possible within the foreseeable future) and viable (what is likely to become part of a sustainable business model) (Brown, 2009, p.18). Moreover, as a commercial product or social idea, the solution must be desirable (what makes sense to people and for people) (Brown, 2009, p.18).

Notes Brown, 'perhaps the most important opportunity for long-term impact is through education,' (Brown, 2009, p.212). Educational institutions across the world are developing programs that utilize the IDEO methods of design thinking to progress creative innovation in the classroom. IDEO provides a tool-kit for educators that explain the use of its methods in primary, secondary, technical and tertiary institutions. The University of Canberra, in the development of a new curriculum for its Graphic Design discipline, utilized techniques set out by IDEO in the creation of projects and processes for design thinking in the classroom. Using the classroom as a 'laboratory,' UC lecturers foster an environment conducive of critical thinking and problem solving. In keeping with IDEO's mission, the mission of the program at UC is to generate design solutions that have value to the community, both locally and globally. Case studies of these projects are provided below as a means to show how IDEO design-thinking techniques can be successfully integrated into a design curriculum.

Design Thinking In The Classroom: Case Studies

When approaching the use of design thinking techniques in the classroom, UC lecturers prepared a curriculum that would build the students thinking skills over a three-year period. In the first year of studies, students enroll in the subject, 'Graphic Design Thinking and Research.' Thinking and Research is a foundation level course that enables students to critically analyze graphic works; identify fundamental graphic principles in existing works and apply them in new design works; and demonstrate an understanding of the significance of cultural context in design. In this unit students are given one large project and a series of exercises that introduce them to key concept and techniques.

When planning the primary assessment within the unit Graphic Design Thinking and Research, we took into account the students' relatively low exposure to design process and Design Thinking and with this in mind the assessment was developed to act as an introduction to concepts and processes which will play a fundamental part in all problem solving and design thinking projects throughout the three-year course. In this project students were given a pre-developed design problem to solve that consisted of a commercial request to produce design deliverables that were backed by a needs case. This minimized engagement in the discovery stage and meant that students could concentrate on interpretation and ideation stages that were deemed more relevant at this early stage in the course. The primary deliverable was a concept proposal for an interactive kiosk design that displayed information to patrons of a fictional eco-centre located in Canberra. Students looked to the provided brief for keywords that would inform their visual design research and collected a diverse range of design elements and existing inspiration that pertained to the keywords. Critical inquiry into the topics contained within the brief allowed students to observe the project from different perspectives.

Over three weeks the students created a folio of research that served to back their justification during the ideation stage where students produced multiple responses in consultation with their teacher and peers. The use of 'pin-up' critiques and question-and-answer sessions helped students focus their response. This process of brainstorming and reflective adjustment and feedback yielded fantastic results amongst the cohort.

In the second year of the Bachelor of Graphic Design, UC students take a unit in information graphics. The core assessment of this unit is a project called 'Design with Value.' This project draws on the thinking skills students have attained in their first year and builds their skill sets in social awareness and design for human need. 'Design with Value' is a project in which students define and propose a graphic design problem to solve locally. By identifying a range of local visual communication problems students then analyze which problem has the most valuable outcome. Once students have identified a problem, IDEO methods are employed to tackle the issue and generate a solution.

In the unit Information Graphics we asked the students to engage with empathy as a key driver for identifying an information design problem that they could solve locally that would have high value to those who would interface with it. Students set out to discover information issues they had personally experienced that could be enhanced with information graphics to alleviate the issues. Each student put forward a case that identified criteria that needed to be addressed on route to solving the problem. Because each project was different, the students had to engage with an inclusive brainstorming, ideation, and experimentation process. The students recorded their process and took notes throughout all steps of their design process, which meant they had a clear record of each pathway considered from start to finish. Over the course of eight weeks the students were tasked with solving an information design problem with clear process milestones that helped motivate and drive students to submit clear deliverables throughout the project. All final outcomes had to be justified against initial discovery and research into the topic. The unit outcomes resulted in a great range of valuable design solutions to local information problems, which could positively affect those who would benefit from them.

Students undertaking their third and final year of study in the Bachelor of Graphic Design undertake more advanced projects that draw on Design Thinking skills learned in their first and second years. In the unit Professional Practice 1, students are given a current social issue and are tasked with creating a solution for this issue using Design Thinking techniques. Initially students form working teams to incubate concepts, which are then tested for viability and feasibility against stated criteria. The final solution informs a new approach that is socially desirable.

For this unit, students were tasked with generating a design solution to solve the problems posed in the 2011 Book Industry Strategy Group Report (Barry, 2011). The report outlined that the Australian Book Industry is undergoing enormous change due to the rising Australian dollar; the high price of imported books in shops compared to offshore online prices, which are GST-free; small production runs; evidence of over-servicing and surplus capacity; threats to local printers from low-cost, high-quality printing in China and other Asian nations; the growing take-up of electronic books (ebooks) available online at low cost; and the increasing online purchase by readers of books through overseas suppliers such as Amazon and the Book Depository. The viability of book stores and, to some degree, the availability of paper books in Australia is in danger. As a graphic designer, the demise of the book industry in Australia is a worrying prospect. The book industry provides an un-paralleled link to knowledge and creative thinking and is vital to Australia's cultural identity and our capacity for self-discovery. Students were posed the question: "How do we save the Australian Book Industry?' and worked in teams, utilizing the design thinking techniques of discovery, interpretation, ideation, experimentation and evolution to solve this problem. After collecting extensive research to form an understanding of the issue, students created a design strategy that provided a viable visual solution and creative strategy for this problem. Students generated a brief, selected a target audience for the solution and generated a campaign (based on research findings) that promoted (and ultimately aided in revitalizing) the Australian Book Industry.

In the final semester of study at UC, students are tasked with a large globally relevant brief that utilizes the full range of their Design Thinking skill sets. The unit Global Design Strategy engages students to design with empathy. Using human centered design as a foundation, students must research certain cultural groups as a basis for understanding cross-cultural design strategy. This final project is a culmination of the Design Thinking skills explored throughout the program and provides a solid platform for the students to either work in industry or continue higher-level studies in this area.

In this unit, students were posed the problem of generating a set of culturally relevant information pieces for recently arrived refugees in Australia. According to the United Nations High Commission for Refugees (UNHCR), a refugee is someone who is outside their own country and cannot return due to a well-founded fear of persecution

because of their, race, religion, nationality, membership of a particular social group and/or political opinion. Worldwide, there are an estimated 11.4 million refugees that are under the responsibility of UNHCR. Australia is obliged to submit to the United Nation's Refugee Convention and allocates 13,500 visas per year for refugees (http://unhcr.org.au/unhcr/). The brief for this unit was to create an information pack for refugees who have recently arrived to Australia. Arriving in Australia for the first time from a war torn country is a daunting undertaking. Often refugees have little or no English language skills and limited education due to interruptions in their education system as a result of the unsettled state of their nation of origin. Many refugees come to Australia after living for long periods of time in volatile camps and have been subject to violence, starvation, and terrible atrocities. It is therefore essential that the Australian Government provide suitable information and support for these individuals on arrival so that they can find solace in a new life in Australia. For this project, students were provided with lectures by representatives from the Department of Immigration and Citizenship and local Canberra refugee support groups. They then researched a specific refugee group currently given access to Australia to understand their unique informational needs. Students then designed a culturally specific information pack, which is meant to be given to refugees on their first day in the Australian Cultural Orientation Program (ACOP) offered by the Department of Immigration and Citizenship. The information pack, tailored to a specific cultural group, included important information on life in Australia and was constructed in a way which allowed the refugee to easily access information and utilized icon design and info-graphics to visualise important information to cultural groups who have limited understanding of English.

Overall, Design Thinking offers a 'solution-focused' approach and allows for more innovative and human based results rather than process-based results that rely on scientific factors. The IDEO model of Design Thinking draws on previous creative process techniques of lateral thinking and brainstorming and attempts to provide designers and businesses with a solid process-based approach to tackling social and institutional problems. By introducing techniques and building skill sets in Design Thinking in the undergraduate graphic design program at UC, student are given the tools to generate highly valuable solutions to current social problems. Students learn to research, interpret and discover solutions in team-based situations in a way that informs rather than submits to the client. In this sense, students learn to design with

empathy and to look beyond the traditional client-led design, forming the skills to interpret current social issues and prescribe new design-based solutions. In an ever-changing global village, these skills are essential to the designers of the 21st century.

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