**The 2nd International Conference on Design Creativity (ICDC2012)**
Glasgow, UK, 18th-20th September 2012

# COURSES IN CREATIVE TOOLS AND MODELS OF DESIGN THINKING

E. Robertson

School of Design Studies, COFA, University of New South Wales, Sydney, Australia

**Abstract:** This paper is based on the outcomes of writing, refining and teaching online courses in creative and design thinking to staff in several countries who work for Arup; and, over a seven year period to undergraduate and postgraduate university students. It uses an original **Four Cs** model in presenting the context, concept, content and constraints of teaching creativity tools effectively and successfully in online environments. The paper also presents **Combined Divergence**, a model and methodology of creative thinking. Our mindsets and methodologies of work and study can inhibit or enhance our creative abilities, and this was one focus of the three *Tools for Creative Thinking*, *Creative Thinking Processes*, and *Creative Thinking Case Studies* online courses. The empirical research analysed and discussed in this paper uses statistics which prove that courses of longer duration with more time for incubation of new curriculum content and ideas are viewed as more successful by participants.

***Keywords:*** *design processes, creative thinking, creativity tools, models of thinking, design thinking, creative case studies, divergent thinking, conceptual blending, reverse thinking.*

## 1. Contextual Premise

The three online courses being discussed and evaluated here *Tools for Creative Thinking*, *Creative Thinking Processes*, and *Creative Thinking Case Studies* developed from applying a model of thinking - *Gap Analysis* - to the existing courses on offer through Staff Development at Arup, and elective options available to students at the University of New South Wales. A cross-disciplinary course on this theme was seen to be missing from those different course lists. The Arup course attracted 37 applicants, of whom 20 were selected at Grade 3 and above. The participants were based in Madrid, London, New York, Hong Kong, Singapore, Brisbane, Sydney, Melbourne and Perth. There was a positive and enthusiastic response to the course in the feedback, with most participants expressing appreciation for the opportunity provided by Arup to take part:

*"The positive effect of the subject (was my key learning) - after weeks of struggling with 'negative' problems on the project I am working on, I found it inspiring to take a step back and look at a topic that is all about how to get solutions, how to look at things differently and how to empower yourself to do it."* From Question 3, Arup Survey Monkey summary of responses.

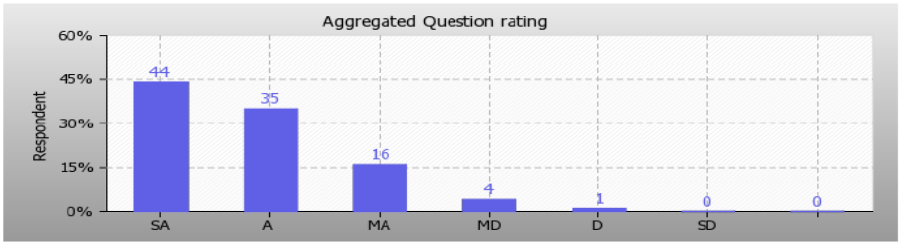
The fully online course ran for four weeks in September 2011, and the informal and formal evaluations have been reported back to the Arup Design Council. This indicated a measured increase of the positive response rate from a rating average of 4 to 7 in the "before and after" course question:

| 2. Upon completion of the training course, how would you rate your level of knowledge and skills regarding creative thinking? | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Rating Average | Response Count |
| (1= low level of knowledge and skills, 10= high degree of knowledge and skills) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 6.7% (1) | 0.0% (0) | **60.0% (9)** | 26.7% (4) | 6.7% (1) | 0.0% (0) | 7.27 | 15 |
| | | | | | | | | | | answered question | | 15 |

**Figure 1.** The Survey Monkey responses showed an increase from 4 to 7 as the average improvement

The twenty selected course participants came from a diverse range of disciplinary backgrounds in Arup, including architecture and engineering, and they indicated in the formal course evaluation that they were able to actively apply the creative course content in a wide range of ways in their design and other work. One particular aspect of the course – the use of **models of thinking** – proved very popular, and as a result of positive participant evaluations and feedback, more visual-and-verbal models were developed and designed as a "hook" to enhance recall. This built on one course premise: *What we understand and remember, we can creatively and actively apply.* Models of Thinking can assist that process, and they can be used to more clearly explain and embed creative terms such as bisociation and conceptual blending, particularly in design course contexts, in more memorable ways.

To compare with the approach taken over four weeks with the Arup participants, two other courses have been evaluated and considered, both of which were delivered over twelve weeks. Empirical primary research and evaluation suggests that the longer course duration is more advantageous to developing creative thinking and problem solving, with the majority of the Arup respondents assessing that they needed more time to *incubate* the tools and ideas being taught. In contrast, in the twelve week courses, the most recent 2012 postgraduate students formal evaluation (aggregated across ten questions) indicated satisfaction with the duration, and a very high approval rate of 95% in regards to course content, design, implementation, interface, group work and other measured indicators:




| | |
|---|---|
| Session | : 2012 Teaching Period - T1 |
| Enrolled | : 18 |
| Repondents | : 15 |
| Survey Type | : ONLINE (07 May 2012 - 12 Jun 2012) |
| Administration Date | : 13 Jun 2012 |

| Gender: | | | Residency Group: | | |
|---|---|---|---|---|---|
| Male | 4 | 27% | Local | 12 | 80% |
| Female | 10 | 67% | International | 3 | 20% |

**Figure 2.** Ten course evaluation questions aggregated a 95% positive response in the CATEI Survey

## 2. Concepts Introduced to the Students

All three courses used a number of models of thinking, and they included the **Four C's** shown in Appendix 2 on Page 7, and **Combined Divergence**, seen below in Figure 3:

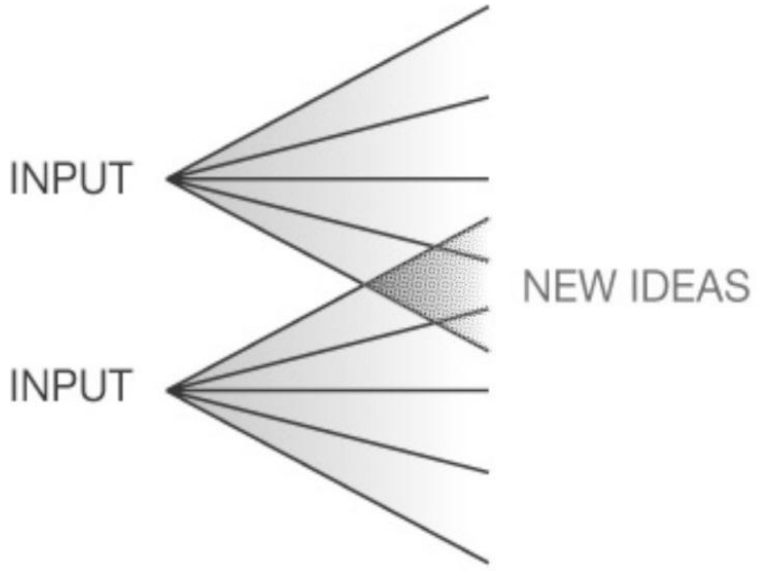



**Figure 3.** The Combined Divergence Model by A/Prof Emma Robertson

Students applied this model, and watched and analysed a TED Talk – they then *Compared, Contrasted, Combined and Communicated* to generate a new creative idea from the overlaps and synthesis of what they had observed and considered. The balance between visual and verbal modes of communication was carefully considered, and this also relates to the course content, which explores people's predispositions to learn and recall information in different ways – visual, verbal, aural, with movement - and so on.

The application of the model of **Combined Divergence** in Figure 3 recognises that creative ideas are often generated through discussions with others, and it builds on the writings and research of J.P. Guilford, who defined convergent and divergent thinking in individuals. When two or more people combine their divergent creative thinking, new outcomes can arise – sometimes subconsciously. One empirical case study example of this, relating to design occurred in the pre-production of Episodes 1, 2 and 3 of the Star Wars movies. On a visit to Skywalker Ranch and Industrial Light and Magic, Iain McCaig, the concept artist who designed Darth Maul was interviewed, and he said that in his drawing he imagined feathers coming out of the head of the character, but when the costume designer made up the pieces, she misread his drawing as small horns. McCaig said that when he saw it, he was about to tell her it was a mistake, when he decided it looked better – *combined* - that way. This is one observed design example, which was discussed with participants in all three courses. Iain McCaig conversed with the online students during the creativity courses as a featured special guest, and he discussed such design techniques as conceptual blending and reverse thinking – both also formally recognised as tools for teaching creative problem solving and design ideas generation. McCaig's participation in the courses was also evaluated and the empirical research and outcomes from this was published in Issue 7, 2012 of Incubate Magazine as the Feature Article, an excerpt of which is shown below in Figure 4:


**Figure 4.** The article on the postgraduate online course work and McCaig's contribution to it, showing a visual outcome of the creativity technique *conceptual blending,* written by A/Prof Emma Robertson

Many of the twenty participants in the shorter four week Tools for Creative Thinking course articulated the usefulness of the material, and as one Arup participant formally commented in his qualitative written evaluation:

*"I think the most important advantage I gained from the course was the realisation that creative thinking is a skill that can be nurtured and honed. I was always under the impression that creative thinking was a result of 'a bolt from the blue' and not something that can be improved through models of thinking. The information I learnt in the constraints model will be the most useful for me in the future, as there are a few behaviours I have constructed and indulge in that obstruct me from being more productive. I'm really looking forward to producing results from what I have learnt in my working life and in my personal life. There are a lot of ideas and projects that I have put off or shelved that are worthy of exploring further, I now feel I have the tools to progress these."*

## 3. Content Tools

Understanding and actively applying models of thinking more creatively (such as those shown in Figure 3 and Appendix 2) were important in all three courses as a whole, as were **Current Creativity Concepts**. This aspect is being constantly updated due to the changing web resources available. Two of note in addition to the TED website, are Michael Michalko's Creative Thinking Net and also Mycoted. Others included 99%, RSA Animate, and Change This. The course participants were asked to select and apply at least one creative thinking tool to an aspect of their life and to *refer, reflect and reconstruct* its impact by way of a diary format Research Report.

Participants were also asked to select and apply a specific Creativity Tool, which is also a model, from the eight provided in the courses. As well as the **Four C's** (Figure 4) and **Combined Divergence** (Figure 3) **The Synectic Pinball Machine** (see Figure 5) proved popular in the three course cohorts. The theme or problem is the "ball" and as it bounces off different creative "pins" in the game, perceptions are challenged and changed until a new creative outcome is arrived at. Nicholas Roukes, who developed the game in the book Design Synectics wrote that:

*"The more information that is brought to the problem the better. A common block to a creative solution is the overly narrow concentration on a single idea or frame of reference."*


**Figure 4.** The four C's model

## 4. Constraints to Creativity

One key aspect of the course, which resonated with the participants, was the theme of **The Top Ten Inhibiters of Creative Thinking**. Arup employees were asked to nominate which of the ten inhibiters listed they most recognised in themselves. A fear of failure was frequently nominated, and the online discussions leading from this course content provided a fascinating insight into how previous teaching has trained and preconditioned many employees in creative and design industries to stay safe and not take risks in trying new creative processes. In the twelve week undergraduate course Creative Thinking Case Studies a week was spent exploring failure and resilience, and their impact on creative output. Another identified constraint amongst the Arup staff was multi-tasking and its related impact on sleep. Applying certain Models of Thinking allowed for a greater realisation of the negative impact that poorly planned work-life balances can have on the creative process. Consciously reversing constraints to our thinking and creativity, sometimes called limiting beliefs, can help to create an applicable learning approach, with relevance and resonance for everyday life.

## 5. Conclusion and Evaluation

The experience of researching, writing, teaching, formally evaluating, and comparing these three courses in creativity over the period of 2005-2012 was an education in itself. Through paying careful attention to the responses of the first cohort of students in each of the courses, changes to content were identified and refined in subsequent iterations. Associate Professor Emma Robertson was presented with the Dean's Award for Innovative Teaching by a peer review panel, in recognition for the sustained high levels of student feedback received from enrolled students in these creativity courses in all nine University of New South Wales faculties. Developing the courses has also allowed insights into the increasing importance and possible applications of content-driven design teaching in creative thinking, beyond a university framework into commercial business environments such as Arup. Where possible, longer time periods for the teaching are desirable, and seem to allow for more incubation and direct use of the ideas presented in the course content. Creativity and innovation are applicable and necessary to all disciplines and industries, and consciously designing the best approach to using these tools, changes and improves in a measurable and evidence based way, work and broader life practices.

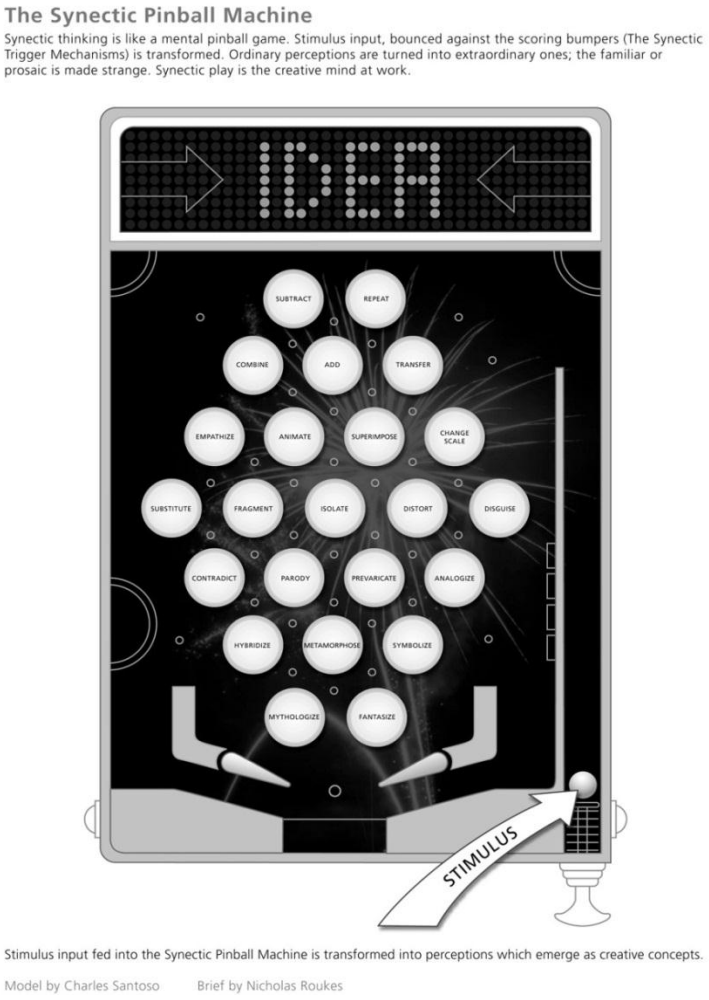



**Figure 5.** The synectic piball machine redesigned from Roukes, Nicholas


## Acknowledgements

Charles Santoso from Alpha Creative for his design of models in Figure 3; and Appendices 1 and 2.


## References


Fry, E. Richard, (2007). *Common Ground for Discussing Creativity in Multidisciplinary Settings*. Sydney: ConnectED Conference Paper, Page 2.

Hough, Richard, (2007). *Practice-Based Design Education: The Arup Design School Programme.* Sydney: ConnectED Conference Paper, Pages 2 to 5.

Michalko, Michalko. (2001). *Cracking Creativity* NY: Ten Speed Press.

Robertson, Emma. (2010). *Creative Thinking Processes: The Top Ten Inhibiters and Models of Learning.* Sydney: ConnectED Conference Paper, Pages 1 to 5.

Robertson, Emma. (2012). *Feature Article: Stories from the Shadowline.* Sydney: UNSW in Incubate Magazine Pages 4-11

Robinson, Ken, (2001). *Out of Our Minds.* Sussex, UK: Wiley Pub.

Roukes, Nicholas, (1988). *Design Synectics.* Mass, USW: Davis Pub.