Northumbria Research Link

SAFE ENVIRONMENTS FOR INNOVATION - DEVELOPING A NEW MULTIDISCIPLINARY MASTERS PROGRAMME

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ABSTRACT
This paper outlines the research and resulting curriculum design activities conducted as a collaborative venture between Northumbria University's School of Design, School of Computing, Engineering and Information Sciences and Newcastle Business School undertaken in the creation of a new post-graduate programme in Multidisciplinary Design Innovation.
With the area of multidisciplinary innovation education practice being comparatively new, the research conducted in support of the programme development was undertaken through a series of industry-linked pilot-study projects conducted with Philips, Hasbro, Lego and Unilever. The key finding from this research was an understanding of the importance of freeing students from different disciplines of the inhibitions that limit creativity in collaborative settings.
This paper gives an account of the pilot studies and the associated learning derived from them, the collaborative development of the programme and approaches in curriculum and assessment design adopted in order to create what we call 'safe environments for innovation'; environments designed to free students of these evident inhibitions.

Keywords: Multidisciplinary, innovation, design-thinking, collaboration, team-work

1 INTRODUCTION

In September 2007, three schools at Northumbria University came together in collaboration to create a Masters Programme in Multidisciplinary Design Innovation. The lead school was the School of Design (SoD) working together with the School of Computing, Engineering and Information Sciences (CEIS) along with Newcastle Business School (NBS). This innovation was both in response to an emerging understanding within the School of Design of the value of 'Design-Thinking' as a multi-disciplinary activity, developed and reinforced through a series of under-graduate pilot projects, and the Cox Review of Creativity in Business: building on the UK's strengths, which was commissioned by the, then, Chancellor of the Exchequer, Gordon Brown at the time of the 2005 Budget. (Design-Thinking is an approach to viewing business and organisational situations from a more interpretative perspective than that of traditional business analysis (Lester, Piore and Malek, 1998)). The programme was launched in September 2008.
Design-Thinking has been shown, most visibly through the work of commercial agencies such as IDEO, to lead to more creative and effective solutions both in organisational structure and strategy as well as new product and service development. To be truly effective, it relies on collaboration between activists with specialist knowledge of, typically, but not exclusively, design, engineering technology and business who are comfortable working with, and have an understanding of, complimentary disciplines. Such individuals have been described as 'T-shaped' (Leonard-Barton,1995) - they have deep knowledge of one subject (the down-stroke of the 'T') and broad experience and understanding of other disciplines (the cross-stroke). Tim Brown, CEO of IDEO and Visiting Professor at Northumbria University states that T-shaped individuals are *'not to be confused with a 'Jack of all trades' T-shaped people have a core competency, but can easily branch out. And they possess curiosity, empathy and aren't afraid to ask why'* (Brown, 2007)

Creating a successful learning environment in which students feel safe to ask 'why?' and to 'branch out' required an understanding of the potential impediments to engagement and the supporting curriculum necessary to develop the characteristics of learners as T-shaped individuals. The Pilot Projects were designed to allow staff from each discipline to observe and identify these impediments. Advocacy for this creative approach isn't restricted to designers however. In his lecture 'Real Engineering', Prof Fred Maillerdet, Visiting Professor of Engineering Pedagogy, explained the need to return to creativity and innovation as fundamentals in undergraduate engineering programmes (Maillerdet, 2009). Similarly, Roger Martin, Dean of the Rotman School of Management in Toronto proclaims the value of Design-Thinking as an essential leadership approach, "*The designers who can solve the most wicked problems do it through collaborative, integrative thinking, using* abductive *logic, which means the logic of what might be.[]I saw that this was what great business leaders do*"(Dunne; Martin. 2006)

2   PILOT PROJECTS

Four pilot projects were conducted during 2006 and 2007 with a mixed-discipline cohort of undergraduate students and in collaboration with Lego, Hasbro, Philips and Unilever. They were run outside curricular time as un-graded placement projects. The projects ranged from fairly straightforward incremental development of products within a defined range to more radical and disruptive innovation; seeking to influence the way that scientists approach problems through the production of media designed to inspire creativity. The students worked as a team on each project with academic support and direct client contact. The projects were observed by academics from each of the three disciplines and whilst design praxis may be the obvious home for innovation practices, staff were keen to expose and explore other, equally valid approaches adopted in other disciplines. The projects revealed three key insights. The most significant, relating to the confidence levels of the individuals, involved expressing themselves and their disciplinary expertise on an equal footing to others or to question that of their colleagues. Also significant was the potential for misunderstanding to arise resulting from the specificity of meaning attributed to key terminology as it related to the different disciplines. The third observation was the challenge of dealing with the inherent ambiguity in projects with a more disruptive intention; these projects, where the scope of exploration is less clearly defined were more readily embraced by the designers who had greater experience of venturing into the unknown in their work. Students commented that their confidence grew as their clients offered critical support to the work and they were 'given permission' to adopt a more explorative approach without fear of failure; the work was not assessed.

3   DESIGNING THE PROGRAMME

Based upon three guiding principles derived from the Pilot Projects, a group of senior academics from the three separate schools started meeting to discuss the potential to develop a new Masters programme in the field of Design-Thinking. These principles were:
- To create a physical and mental environment in which creativity would be nurtured
- To develop a community of practice in which a 'common language' would be learned
- To promote shared values through developing self-awareness in pursuit of collaborative learning

Several meetings were conducted before any clear direction or structure was identified. In hindsight, perhaps what was happening was an orientation and alignment process through which each individual was making sense of the overall programme objectives and once they had contextualised it from the point of view of their own discipline, attempting to find a language of expression which was congruent within the group. This, in itself, was an indication of the likely behaviour that could be expected within a multidisciplinary cohort, and coincided with observations made during the pilot projects.

In order to move the programme forward, the activists in the development team had to behave as 'T-shaped' individuals themselves. This involved acknowledging the value that each discipline would bring to the programme and separating this from the differentness in the pedagogic, structural and administrative approach of each school. It was clear that teachers would be learning alongside students!

4 THE DESIGNED STRUCTURE

The programme is designed to have three semesters delivered on–campus over one year. It involves a multi-disciplinary cohort of students working under the guidance and teaching of a multi-disciplinary team of academic staff, each with expertise in their own field. It is a truly collegiate venture planned around unique ways of working in which the staff teams collaborate to debate and discuss students' emerging ideas in cross-disciplinary plenary sessions.

Much as the development team needs to understand the contextual relevance of each discipline relative to the others, so do the students of the MDI programme. To this end, students take contextual modules in the complementary subjects; 'Understanding the Business Context, Understanding the Technology Context' etc. (see Figure 1). These run through the first two semesters and make the connection between theory and practice, increasingly exposing students to the language and practices of the host discipline.
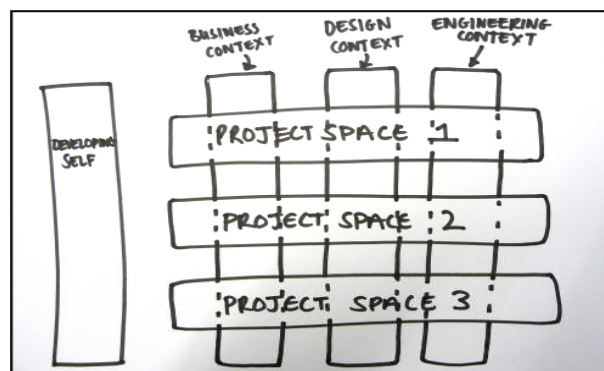

Figure 1. An original concept sketch for the programme structure

Problem based learning is fostered through three, semester-long modules, involving Familiarisation Projects (Semester 1), Experimentation Projects (Semester 2) and Integration Projects (Semester 3), through which students working in multidisciplinary teams explore problem and solution spaces. These are large modules allowing staff and students freedom to explore collaboratively. As they progress through the semesters, the client-voice in their projects increases in volume; in the first semester as they learn to work together, projects tend to be internal, in the second they work as teams but with one external client to the whole cohort whilst in the third, each team of three or four students has a client to manage themselves. This approach addresses key observations from the pilot studies; students are initially given a 'safe environment' in which to orientate themselves to the demands of multidisciplinary working and to develop the self-awareness necessary to separate self from team. As their awareness develops, so does the role of the client in their work until, in the final semester, they are able to focus much more on the project than team-behaviour.

From the outset, it was the expectation that students would work outside their comfort-zone and in support of this, the programme has adopted a strong self-reflexive approach (Schon, 1987) where students engage in a two semester module 'Understanding the Interdisciplinary Self' that allows them to relate their project-based experiences to a theoretical framework so that they may understand where they fit in and how they can contribute to the multidisciplinary team. This strand feeds into their final semester Design-Thinking Thesis in which they explore and define this position.

In a session addressing the question "What are the barriers to multidisciplinary teams achieving success?" Prof Steven Kyffin supports the argument for self-awareness. He identifies three issues; Personal – those personal agenda items that individuals bring to any team situation, Institutional – the agenda defined by the organisation, and Disciplinary – the collective confidence derived from familiar methods adopted within a given disciplinary group (Kyffin, 2009). In the MDI students' experience, the 'Personal' and 'Disciplinary' are addressed by the Interdisciplinary Self and Project modules respectively. In this academic context, the 'Institutional' is represented by the curricular and assessment structures needed to measure and support academic attainment. In the industrial setting these would be measured in commercial terms.

5 SAFE ENVIRONMENT

In order for true creativity to flourish, participants need to operate free from inhibition and confident that their contribution will be valued. Through committed engagement in creative, explorative and reflexive activities deep learning is achieved and new opportunities can be discovered. Essential to ensuring this is the establishment of a community where understanding is nurtured and freedom to create is celebrated. The programme is built upon recognition that it must support the potential for what Toni Matti Karajleinen refers to as "creative abrasion" through which a deeper understanding is achieved. (Karajleinen, Salimäki 2008)

Both the physical, mental and curricular environments have been considered in ensuring that the programme nurtures this fundamental pursuit of collaborative creativity.

The programme is delivered in a unique space tailored to support learning in a collaborative community based on flexible 'project spaces' and formal and informal exchange environments. (Bailey, 2000). Through the project and informal exchange spaces students are actively encouraged to expose and share their ideas through use of image, text, photography and so forth. A more formal 'boardroom' is employed to bring professionalism to client presentations and project meetings. The design of this physical environment is key to supporting the community of practice essential in encouraging the confidence to participate and share. Equally important in this respect is the confidence that industrial partners feel in engaging in this space. This is achieved by providing a secure environment where projects can be openly displayed as works-in-progress and the space is used to mediate the activity between client and students. An example of this is a recent project undertaken with the BBC where students created 'Radio Stations' (genre-based listening environments) in which to expose and explore aspects of listener experience in a way that made this explicit to the client.

Mentally liberating the students to explore the new approaches and methods of complimentary disciplines requires re-thinking the way in which students are assessed in order that they are encouraged to strive for more than simply safe solutions. In this pursuit, assessment for learning needs to take a supportive role. The development of self-awareness and confidence that the first two semesters promote is supported by these projects being un-graded. Using the self-reflexive approach students become aware of the strength of their contributions and where they can afford to take risks in pursuit of the project objective and how to take best advantage of collaboration. This approach is supported across many disciplines, for example in mathematics where Winkel states *"the formative assessment takes place in the interaction among students and between students and teacher. Basically, the students "expose" their unshaped ideas and strategies, get feedback from classmates on their ideas, hone their articulation, and reject false notions. In so doing they clarify and move to a higher level of development. Observing and interacting with students who are going through this problem-solving process is an excellent way for the teacher to assess what students really understand."* (Winkel, Brian, 2006).

Essential is that the academic structure is supportive enough to encourage this 'exposure', particularly in the early days of the cohort forming. Assessment is not, therefore, of project outcomes, but of the individuals' learning derived from the various project and team activities undertaken through the modules. This is presented in a 'Portfolio of Practice' as a factual account of what took place and a personal reflection of the consequent learning. Client organisations understand that projects undertaken in the second semester are likely to reveal as much about multidisciplinary innovation as they are about the topic of the brief and appreciate the value of this in relation to developing their own experience in this area.

A similar portfolio approach is adopted in the 3rd Semester Integration Projects at which stage students have largely overcome the team working challenges and are confident to focus on collaborative innovation practice in service of the project rather than themselves.

6 COMMON LANGUAGE

Establishing an equality of voice is essential to establishing equality of value (and confidence) within the group. From a disciplinary perspective, this necessitates the promotion of honesty in acknowledging what I don't know as much as what I do. Human nature dictates that in a group situation, we tend to avoid asking the 'dumb question'. To this end, we have established our 'Wall of

Words' upon which students (and staff) are encouraged to write-up the terms and phrases, acronyms and methods that are unfamiliar to them. Peers are required to explain these (see Figure 3). Seeking a common language as disciplines emerge is necessary to effective working (Kimbell, Siedel, 2008; Boland, Collopy, 2004) and as equality is established, students can start to identify true collaborative value. One student commented at the end of a recent project;

"The group provided another effective result by letting all of the disciplines have a say, we incorporated each other's criticisms and ultimately created three concepts that all originated from different group members. The innovation we each saw here was that no-matter what the idea; each member added something to it to turn out the concepts."

Figure 2. 'Wall of Words'

Gen Doy, explains that students and researchers who move from one discipline to another "*encounter languages and cultures which may seem alien, or perhaps welcoming. They feel uncertain and lacking in confidence sometimes, because they do not feel "at home" in the new discipline...".* (Doy, 2008) As we gain a greater understanding of each others' language and refine our prototype we will not only learn a common language, but will develop a common vernacular for multidisciplinary innovation practice that will become our 'at home'.

7   SHARED VALUES

We have shown how this new programme has been developed from sound principles and direct observation of multidisciplinary innovation practice in action. To date, students have worked successfully with such organisations as The MS Society, BBC, Mars, Unilever, Berghaus and Sonoco Alcore as well as a host of regional SMEs. Fundamental to sustaining this success is the honesty and commitment of stakeholders learning how to communicate and work together. We need to look to our students as partners in this research. We give them the last words as they explain through their Terms of Engagement (Fig. 4) the factors that they believe are essential to support their multidisciplinary innovation practice.

Figure 3. Terms of Engagement

These shared values are displayed within their project spaces as a point of reference at moments when tensions run high or project directions are lost. When this happens in a team, or "creative abrasion" ceases to be productive, students are encouraged to "give the problem to the wall".

8 CONCLUSION

The MDI programme's pilot projects and first year of operation demonstrate the fundamental importance of supporting the growth of the individual by providing an open and reflexive framework within which they are given permission (by a liberating assessment strategy) to behave in an experimental, explorative way. However, creating an open framework, without that supportive structure of the self-reflexive element and structured academic support, would have created a risky environment for students. The pilot studies clearly indicated the need to develop the confidence of the individual so that they may participate fully in the group.

Similarly, creating a framework without a place in which to participate would make it very difficult to establish a dynamic community of practice, developing a common language and in pursuit of shared learning. The creation of a neutral, non-territorial physical environment has been fundamental to the success of the venture in this respect.

In order to explore fully the potential of multidisciplinary innovation, students need to feel secure that they can be rewarded for 'brave failure' in pursuit of new understanding and that they can explore the boundaries supported by safe environments.

What we have learned here is applicable in any situation where group-based collaborative learning is appropriate. In understanding the dynamics of multidisciplinary working, there is clearly much to be done to unpick the complex interplay of personal, disciplinary and institutional dimensions that contribute to individuals' behaviour. Through the reflexive nature of our programme, we believe that we have a suitable vehicle for exploring this further enlisting our students as co-researchers.

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