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Interrogating the academic research process in UK design education from design and business management perspectives

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ABSTRACT

This paper explores the process of undertaking a PhD within the framework of the UK design education system, by examining it from two different perspectives. The authors come from different educational backgrounds, representing emic and etic perspectives respectively. Their viewpoints are triangulated and used as a basis for discussion around the following question: How well does design education prepare students for research-based activity? In addition, the historically dominant model in design education, which focuses mainly on vocational skills, is interrogated. On the one hand, the authors observe that this model is ill-equipped to provide designers with the critical skills and knowledge required for research-based projects. On the other hand, the authors recognize that traditional research-led education can result in a procedural and cognitive straitjacket. Discussion surrounding these issues will be presented in a case study format and used to inform further discussions on the role and wider influences of research in design education.

I. INTRODUCTION

Over the last ten years, the United Kingdom has seen an increased interest in Design PhDs. For example, over the past two decades, the number of Design PhDs awarded in the UK has more than doubled[1] (Christer 2006; HEFCE 2006:36). In addition, the emergence of a number of major international conferences such as the Doctoral Education in Design (Buchanan *et al.* 1998), Doctoral Education in Design: Foundations for the Future (Durling and Friedman 2000) and Doctoral Education in Design: Practice of Research (Durling and Sugiyama 2003) which discussed issues specific to doctoral education in design also reflects the growing interest 'over the nature of research and practice' in the field of design (Durling 2000). These seminal conferences provided a platform for educators to share their diverse experiences and insights on challenges arising from the development of Design doctoral programmes. Most of their early discussions centred on the purpose of Design PhDs and how doctoral education will benefit the discipline, which then naturally progressed to discussions that focused on exploring methodologies, structures and processes particular to Design PhDs.

Despite this growing interest in academic research in Design, a brief review of current UK undergraduate design programmes reveals that the dominant model in design education is still a vocational one, which focuses more on practical skills. We argue that this historically dominant model in design education does not sufficiently provide designers with critical thinking skills and knowledge required to undertake a research-based activity.[2] Designers, as Winkler suggests, understand research 'as information gathering, sometimes information synthesis and analysis, but rarely as the testing of conceptual models, or the testing and application of data from findings in sociology or psychology' (1997:133). There is also a lack of coherence on the format of Design doctorates. Not only are there different titles awarded (such as PhD and DDes), there are also different forms such as Practice-based PhD, PhD by Publication and Professional Doctorate. Anecdotal evidence suggests that design graduates are often ill-prepared for, and misinformed about, the requirements of a Design research degree (Archer 2004).

There is an ongoing need to discuss the role and influence of research in order to understand how it can better serve the future of design. This paper will attempt to contribute to this debate by presenting two case studies (Yin 2003) of two recent Design graduates whose disciplinary background is substantially different. It is this disciplinary difference which will be used to explore whether Design undergraduate and taught masters degrees provide adequate skills to pursue a PhD degree; and if so in what areas. Both candidates were enrolled and have successfully completed their PhDs in the School of Design at Northumbria University. However, one of the graduate's undergraduate degree was in Business (Michlewski) and the another was in Design (Yee).

II. PHD IN DESIGN

A. Why pursue a doctoral education in Design?

Yee's personal motivation to pursue a PhD centred on exploring practice-based issues and developing skills to enable her to interrogate her practice in a systematic and explicit manner. In comparison, Michlewski wanted to explore in depth an interesting issue with future rhetorical

[1] According to the Art and Design Index to Thesis, 180 Design PhDs were awarded during 1996 – 2005, compared to 82 PhDs awarded during 1986 – 1995. The HEFCE report also reported a 232% rise in PhDs completed in the Creative Arts and Design subjects from 1995 to 2005.

[2] For example see editorial to the International Journal of Design Sciences and Technology (2002) edited by David Durling, Ken Friedman and Paul Gutherson who argued against practise-based research, cited in Mäkelä, M. (2005) *In the making: Nordic Design Research Conference: The Role of the Artefact in Practise-Based Research.* Copenhagen, Denmark.

potential that would enable him to enhance his career and build professional bridges. Additionally, he wanted to hone and utilize methodological knowledge by taking on an advanced research programme. Both case studies reflect two common reasons for students to pursue a doctoral degree; personal intellectual development and professional advancement. These 'personal interest and challenge' reasons are comparable to reasons cited by other postgraduate students from other disciplines where, in a survey by the Office of Science and Technology (now known as OSI), 63% of the respondents cited the above reasons relating to this broad category (OST 2002).

B. What is a PhD?

According to Green and Powell (2005:55), a PhD is 'generally accepted as a research-based qualification centred on an extended piece of research' that will lead to an original contribution to knowledge. This is demonstrated through a mastery of research skills that will allow the candidate to contribute in an independent way to the advancement of knowledge within their field. Additionally, UK doctoral candidates are required to participate in an oral thesis defence examination at the end of their degree.

C. What are the unique differences pertaining to Design PhDs?

Langrish (2000:302) describes these differences in three areas: (i) the questions asked, (ii) the methods used to answer them and (iii) the type of evidence that is acceptable to a design peer group of academics. Firstly, the questions that Design PhDs ask are concerned with things visual. Secondly, a review of Design PhDs seem to suggest a mix of methods used, ranging from quantitative, empirical methods to more qualitative, social science methods. Thirdly, the evidence produced in response to the research questions can vary from a traditional big-book thesis to a portfolio containing design pieces that are accompanied by a shorter thesis.

III. Learning Experience

In this section, the learning experiences from Design and Business perspectives will be discussed and compared in four areas: mode, format, knowledge and cognition. Additionally, these two experiences will be juxtaposed against the authors' learning experiences during their PhD programmes. Table 1 provides a summary of this analysis.

A. Mode

Yee's undergraduate design education experience was based on an iterative and constructive mode of learning, which was discursive in nature and often diverse in the subjects covered. She felt that her PhD programme was much more constrained in its structure and assessment requirements than her undergraduate degree, and was heavily reliant on self-directed learning. In comparison, Michlewski's educational experience in a Business programme was based on a stage-gate model, which is linear and relies upon cumulative knowledge acquisition through layering. In contrast to Yee, he found his PhD experience to be unstructured and discontinuous due to its novel and open-ended nature. As a result, he was forced to adopt a non-linear model that followed a discontinuous pattern with uncertain outcomes.

Both Yee's Design and Michlewski's Business undergraduate degrees were based on a micro to macro model, where the focus is on details and analysis, and only partially arrives at an overall representation. Specifically, minute details and subsystems play a very important role in Business. This is a far cry from the experiences of Yee and Michlewski's PhD programmes, where the requirement was to broaden and then narrow down options in an iterative manner. A holistic view served as a yardstick and informed the overall completion levels, while a micro perspective was essential in order to progress the details of the degree. It was a sinusoid-like behaviour whereby one has to oscillate between the two viewpoints constantly in order to progress through the PhD.

Table 1. Comparisons between Design and Business perspectives.

Learning Experience	**Case study 1: Design**		**Case study 2: Business**	
	Pre-PhD	PhD	Pre-PhD	PhD
1. Mode	• Iterative • Diverse • Constructive • Discusive	• Iterative • Structured • Theory-based	• Linear • Stage-gate • Cumulative • Details important	• Iterative • Dis-continuous • Holistic
2. Format 2a. Learning Environment	• Studio-based • Atelier model • Guided • Group learning	• Self-directed • Proactive • Desk research • Field work	• Lecture-based • Passive • Asynchronous • Group learning	• Self-directed • Proactive • Desk research • Field work
2b. Assessment	• Formative • Portfolio	• Summative • Thesis • Viva	• Formative (Presentations) • Summative (Written exams, tests)	• Summative • Thesis • Viva
2c. Relationship	*Tutor as:* • Academic guide • Mentor • Counsellor	*Tutor as:* • Academic guide • Strategist • Assessor • Motivator	*Tutor as:* • Detached supervisor • Motivator	*Tutor as:* • Mentor
3. Knowledge	*Emphasis:* • Procedural	*Emphasis:* • Meta-cognitive • Conceptual	*Emphasis:* • Factual • Conceptual	*Emphasis:* • Meta-cognitive • Conceptual
4. Cognition	*Primary* • Analyse • Evaluate • Create • Apply *Secondary* • Remember • Understand	*Primary* • Understand • Analyse • Evaluate • Create • Apply *Secondary* • Remember	*Primary* • Analyse • Evaluate • Understand • Remember *Secondary* • Apply • Create	*Primary* • Understand • Analyse • Evaluate • Create *Secondary* • Remember • Apply

B. Format

Yee's undergraduate design classes were based on the atelier model of practice-based training where a tutor works

closely with a small number of students to progressively train them. Large group lectures were rare and learning was mostly based on one-to-one tutoring. It is also quite a common feature in design to employ active practitioners, due to the discipline's belief that design education should be grounded in practice rather than theory. In comparison, the Business model is predominantly lecture-based, based on group-work, passive and asynchronous, with full-time academics employed to lecture.

Occasionally, well-known design practitioners were invited to guest lecture to students. These sessions were akin to 'show and tell' rather than the 'show, explain and discuss' model of the Business programme. The 'show and tell' mode of teaching reinforces the model of learning where the development of a student's value judgment is based on exemplars shown by tutors. This is quite a contrast to the PhD learning model, where learning is self-directed with less constant support from peers and supervisors.

Due to the atelier model, Yee was more exposed to the format of one-to-one tutoring than Michlewski. Yee experienced a personal and nurturing relationship with her tutors. In contrast, Michlewski's relationship with his tutors was more detached and one-to-one contact was rare. Design's tutoring model is quite similar to a PhD supervision team, where the student is assigned a principle and subject supervisor. The main difference is that the supervisor's role is less focused on being an academic guide, and also has responsibilities as an assessor, counselor, motivator and supporter. The relationship is also long-term, maintained over the whole PhD programme, rather than for a specific project. The 'personal' dimension is much more intense in a student-supervisor relationship, which is why poor supervision is often cited as one of the reasons for unsuccessful PhDs (Rudd 1985; Burgess, Pole and Hockey 1994).

Undergraduate assessments in Yee's case were based on practical rather than written submissions. It was a formative assessment of her final year projects culminating in a public degree show. In contrast, Michlewski's assessments were summative in the form of written assignments, tests and exams. A PhD degree draws more on the written model of assessment, although it differs in the work assessed as the final thesis is the only basis for summative assessment, and for UK degrees, includes an oral thesis defence. Although Yee had to present and 'defend' her work in classes, a PhD viva requires different types of communication abilities, for example an ability to verbally structure a logical argument, and to think and respond quickly in a coherent manner. Michlewski had a distinct advantage in this form of assessment as he was used to presenting and defending his ideas verbally throughout his undergraduate degree.

Peer assessment does not seem to be as a common occurrence for Business classes as it is for Design. There were instances in Yee's experience where informal peer assessments would occur, usually during design critique sessions, however there were no formal assessments by peers. In contrast, peer assessment in the form of conference and journal articles is an established assessment format for PhD level. Apart from peer assessment, self-assessment is also considered by the authors to be a crucial part of the PhD process. The nature of the degree relies on the assumption that the PhD candidate should be the specialist in his/her subject and therefore self-assessment is a useful tool to question and verify the quality of his/her own work.

C. Types of Knowledge

Bloom's revised taxonomy of educational objectives[3] (Anderson, Krathwohl and Airasian 2001) describes four major types of knowledge. They are (i) *factual knowledge*, (ii) *conceptual knowledge*, (iii) *procedural knowledge* and (iv) *metacognitive knowledge*. *Factual knowledge* is the basic elements that students must know when communicating about their academic discipline. *Conceptual knowledge* is knowledge of interrelationships among these basic elements within a larger structure that enables them to function together. *Procedural knowledge* is the knowledge of how to do something. *Metacognitive knowledge* is knowledge about cognition in general, and an awareness of one's own cognition. Both *factual* and *conceptual* knowledge can be described as 'know-that' while procedural and metacognitive knowledge can be considered the 'know-how'.

Factual knowledge is emphasized much more in Business teaching than it is in Design. A great deal of specialized Business terminology has to be memorized and applied appropriately. Factual knowledge in Design is generally used to provide context rather than to create a common language of the discipline.

Conceptual knowledge consists of classifications, categories, principles, theories, models and structures. The diverse and discursive nature of design education has resulted in fewer consensuses amongst practitioners in relation to processes, systems and terminologies. Professional design practice is notoriously resistant to incorporating any theoretical models, guidelines or frameworks into their design process. Designers learn design through project-based practice rather than theoretical discourse, 'learning by doing' (Schön 1987:93). As a result, designers tend to view the incorporation of models derived from theory as creativity suppressors and often see no value to them in their day-to-day design activity. In contrast, *conceptual* knowledge is valued in Business. For example, management theory specializes in proliferating frameworks, techniques and tools. As a result, students are expected to master a large amount of conceptual knowledge in the course of their studies.

As a professional discipline, it is not surprising that design education focuses more on *procedural* rather than *factual* knowledge. *Procedural* knowledge for Design includes techniques and methods relating to design software and hand-based skills. In contrast, *procedural* knowledge in the form of conceptual techniques and heuristic tools are often taught in Business to aid students in tackling analytical assignments. Students are familiarised with the entire research cycle including the whole path from identifying the problem, selecting appropriate methods, gathering data, analysing data using qualitative tools to formulating conclusions. Design

[3] Bloom's taxonomy was chosen as an evaluation format because it is an established model used to evaluate learning and is applicable to any discipline.

and Business also differ in the areas of transferable and specialist skills. In Design, *procedural* knowledge is generally focused on specialist design-related skills such as sketching, image manipulation, animation, CAD modeling and web-based programming. In contrast, Business education is mostly focused on transferable skills such as analysing fairly structured problems, working in groups, leading projects, formulating hypotheses, proposing and arguing solutions etc.

Metacognitive knowledge is considered to be a higher-order knowledge and is rarely addressed at undergraduate level. However, it is also one of the most important types of knowledge to possess in order to effectively deal with the challenges of a PhD. In Yee and Michlewski's experiences, this meant being critically reflexive, clear and logical in argument structures, explicit in assumptions and the identification of further research. In terms of cognitive tasks, contextual and conditional knowledge, undergraduate students acquire heuristics, which give them the flexibility to confront unusual or novel situations. There is, however, a tendency to rely heavily on frameworks for specific sets of problems. For Yee and Michlewski, cognitive flexibility was required in order to deal successfully with issues, due to a lack of a fixed framework in their PhD programmes.

The ability to be self-critical in an objective manner was never emphasized or taught explicitly in Yee's undergraduate education. Design students are expected to explore a problem in an empathetic and subjective manner. In comparison, Business students are encouraged to be objective and remain at a distance from any given problem. Although they are two different approaches, the ability to apply them successfully requires a high level of self-awareness.

Self-knowledge, which is the knowledge of one's strengths and weaknesses in relation to cognition and learning, is considered by Flavell (1979) to be an important component of metacognition. Similarly, the ability to accurately perceive and evaluate one's own knowledge base is considered by educational theorists (such as Mezirow 1985; Brookfield 1986), to be a pre-requisite for self-directed learning. Yee and Michlewski felt that the entirety of their PhDs were an extensive reflective practice exercise. Without the ability to self-assess, it would have been difficult for them to complete their PhDs as the nature of the process is very much focused on the capabilities of an individual. In the course of their PhDs, these capabilities were constantly questioned and confronted in order to get through the emotional, motivational and cognitive 'mill'.

D. Cognitive Processes

In addition to describing the four different types of knowledge, Bloom's taxonomy also identifies six different categories of cognitive process: (i) *remember*, (ii) *understand*, (iii) *apply*, (iv) *analyse*, (v) *evaluate* and (vi) *create*. The first category, *remember* is associated with the educational goal of retention, while the other five categories are associated with the educational goal of transfer. To *understand* involves the ability to construct meaning from instructional messages as well as build connections between new and prior knowledge. Students *apply* knowledge using procedures to perform tasks or solve problems hence it is linked to *procedural* knowledge. To *analyse* requires the ability to differentiate, organize and attribute, while to *evaluate* is to make judgments based on criteria and standards by checking and critiquing. *Create* involves assembling elements together to form a coherent or functional whole, and is associated with creative thinking that is based on constraints and the ability of the student to draw from different sources and combine them in a novel manner.

Of these six categories, *analyse*, *evaluate* and *create* categories are generally emphasized in design education. Designers arrive at an appropriate design solution by creating and testing possible solutions. This trial and error method requires the ability to quickly *analyse* the problem, *create* several possible solutions, *evaluate* their effectiveness and decide on which solution to develop.

In comparison, the *analyse*, *understand* and *remember* categories are considered key skills for Business students. Most of what happens in Business education is based on the *analyse* processes such as organizing, differentiating and categorizing. The *understand* processes (such as interpreting, exemplifying, classifying, summarizing, inferring, comparing and explaining) are the basis of what Business students are expected to master. The ability to interpret a phenomenon, class it appropriately and explain it forms the basis of Business education. Unlike Design, most if not all Business-based problems are verbal and numerical – visual aspects are rudimentary and do not feature significantly. The *remember* processes, such as memorizing and recalling specific information or models, is highly valued in Business education. The ability to identify specific sets of circumstances is necessary in order to accurately assess a situation.

At undergraduate level, the focus is more on the aforementioned cognitive processes. However, at PhD level, all six processes become equally important. For example, in order to develop a research plan, a student may need to:

- Understand (to interpret the research question)
- Remember (to retrieve the relevant procedural knowledge relating to research methods)
- Analyse (to distinguish between different models of research methods)
- Evaluate (to determine the suitability of the methods in relation to the purpose of the research)
- Create (to prepare and produce the research plan)

The ability to *remember* specific details was not of great importance in Yee and Michlewski's PhD experiences. However, the ability to recall central facts and notions instantaneously when the need arose was important, particularly during the viva process where there was opportunity to relate what the candidates were describing to previous literature. It would also have been unthinkable to complete the degree without the application of processes derived from the *understand* category such as interpretation, classification and comparison. The research method itself required a constant comparison as a central feature enabling the research process to take place. Most of the *application* concerned the use of appropriate methods and research

techniques. The ability to *analyse* and dissect large amounts of information and data, reassemble it, categorize, and *evaluate* it was of real value in the process. Synthesizing and *creating* was in fact central to the success of Michlewski's PhD, which focused on creating concepts and theories on the basis of qualitative analysis.

IV. Discussion and Summary

Analysis of the two case studies has revealed the shortcomings of Design education in supporting students aiming to pursue a research degree. By comparing the two undergraduate experiences of the candidates, Design education can be described as based on an atelier model with a focus on procedural knowledge relating to visual interpretation and representation. This model has clear deficiency with regards to research frameworks and more analytical, verbal and structured approaches. However, design education does provide transferable skills that can be useful in research practice such as the ability to synthesize data, bringing lateral thinking to research problems and the ability to deal with uncertain outcomes.

Business education in comparison is strong in areas such as the analysis of structured problems, formulation of hypotheses, proposing and defending solutions. However, it is weaker on the front of creating solutions and synthesizing data into a coherent whole. It is framework driven, emphasizing factual and conceptual knowledge relating to verbal and numerical problems.

Design and Business undergraduate degrees have provided distinct and useful skills that Yee and Michlewski were able to apply in their PhDs. By comparing the two experiences, it is clear that design research would require a blend of design-based thinking complimented with research skills derived from more established fields. Balancing design-based skills with research-based skills is an interesting challenge for design educators.

Further analysis on other Design PhDs case studies using Bloom's taxonomy can be used to draw a more conclusive overview of the issues arising from the development of Design doctoral programmes. Additionally, we could learn from similar models of professional disciplines (for example Nursing) that are moving towards a research-led approach to their education. The decision to introduce a research-led approach into undergraduate design education will require careful consideration into the purpose of design education: Is its aim to train students to become specialist professional designers or to educate students that can also apply design thinking outside of the discipline? Will design research require a separate pedagogic model to cater to its objectives? Discussions and decisions surrounding these questions and issues will help determine the future role of research in design education.

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