

*An exploration of the suitability of design education approaches in enabling enterprise and entrepreneurship educators to enhance undergraduate students' opportunity recognition attributes, behaviours and skills in Higher Education in Ireland.*

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This PhD Thesis is dedicated to my Dad.

A man who loved an opportunity.



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## **Abstract**

Enterprise and entrepreneurship (EE) education aims to equip students with the attributes, behaviours and skills to recognise and respond to opportunities. However, evidence suggests that this does not happen in practice.

Opportunity recognition (OR) is frequently cited as a competence from EE education, yet studies suggest it is rarely developed as such. This has resulted in calls for practical guidelines and frameworks on OR to be made available to EE educators.

While OR is recognised as a creative process, there is a distinct lack of creativity driven approaches available to educators. Similarly, a growing awareness of the potential value of 'design' in EE has resulted in calls to consider education and assessment methodologies used in Design Education (DE) for the creative aspects of EE education. This study responds to those calls.

The research explores the potential suitability of DE approaches to OR education (ORedu), within the context of Higher Education (HE) in Ireland. A qualitative approach was taken, involving both semi-structured interviews and observation of educators in practice.

This research is the first of its kind to reveal the existence of an ORedu process, which was found to lack prominence in existing EE education. The current ORedu process was considered sub-optimal, with students rushing into the process or selecting unsuitable or convenient opportunities.

DE was found to develop 'designerly ways of thinking' in students, facilitating the generation and development of new ideas, thereby making it relevant from an OR perspective. This was enabled by its delivery, the requirement for students to explore, continuous educator challenge and exposure to managed risk in safe learning environments.

Key theoretical contributions include a refined ORedu process and an ORedu framework to enable the progressive development of student OR competence. Practical implications of this research include recommendations for EE educator training.





## List of Abbreviations

Critique (crit)

Computer Aided Qualitative Data Analysis Systems (CAQDAS)

Design Education (DE)

Enterprise and Entrepreneurship (EE)

Entrepreneurial Intention (EI)

Global Entrepreneurship Monitor (GEM)

Higher Education (HE)

Higher Education Authority (HEA)

Higher Education Institutions (HEIs)

Higher Education and Training Awards Council (HETAC)

Quality Assurance Agency (QAA)

Quality and Qualifications Ireland (QQI)

Opportunity Recognition (OR)

OR education (ORedu)

Problem Based Learning (PBL)

Problem Oriented Project Learning (PPL)

Self-directed learning (SDL)



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# Chapter 1 Introduction

## 1.1 Introduction

This research is concerned with exploring how enterprise and entrepreneurship educators can enhance undergraduate students' opportunity recognition attributes, behaviours and skills, in HE in Ireland. A creativity driven perspective towards opportunity recognition informs this study. While the research is firmly situated in enterprise and entrepreneurship education, this research journey delves into the field of design education (DE) to explore its potential suitability to enhance current opportunity recognition education. Chapter one provides an introduction to the current research and an overview of the structure of the document, beginning with an explanation of the practitioner based origins of this study.

## 1.2 Origins of the study

As an experienced enterprise and entrepreneurship (EE) educator, in a business school at a Higher Education Institution (HEI) in Ireland, this researcher became sensitive to students' initial reticence with regard to opportunity recognition (OR) when presented with the requirement to engage in it as part of their studies. However, it never failed to impress both the students, and this researcher, that following engagement with creativity exercises, students rose to the challenge and were successful in their attempts to recognise opportunities, which enabled them to progress with their module.

This pattern repeated itself year after year and caused the educator to wonder what was happening and how the students' experience of what was happening as part of the module, enabled them to engage in OR. Initially the researcher sought to understand how student group interaction influenced OR but engagement with the literature revealed that there was more to OR than simply engaging students in creative exercises. The researcher began to realise that if educators understood how and why creativity influenced OR, perhaps they could enable student competence in OR further. Thus, a research study born out of interest in the students' experience of OR education shifted to one which sought to understand the educators' experience, in the hope of possibly enhancing it. This research brought the researcher on an interesting journey, which led to her to open the door to the world of design education in an attempt to understand alternative education approaches which enable the development of students' creative competence.

In light of this, the overall objective of this study is to explore the suitability of DE approaches to OR education at undergraduate level in the Higher Education (HE) sector. OR education (ORedu), in the context of this research, is defined by the researcher as being the variety of ways in which educators actively seek to develop OR attributes, behaviours and skills in students.

### 1.3 Justification of the current study

Enterprise is at the heart of both economic recovery and growth across Europe as it leads to the creation of new businesses, new jobs, new skills and new markets (European Commission, 2013). Research suggests that future graduates will need to be increasingly entrepreneurial, due to the uncertainty of work environments caused by globalization and the pace of change (Testa and Frascheri, 2015; Gibb, 2007). Therefore, entrepreneurial competences, behaviours and skills, such as the ability to recognise opportunities and generate fresh entrepreneurial ideas, are growing in importance (Higher Education and Training Awards Council, 2013; Gibb, 2007).

As a key pillar in European entrepreneurship policy, EE is seen to promote the necessary knowledge, skills and attitudes necessary for students to 'see themselves' as being entrepreneurial (World Economic Forum, 2014; European Commission, 2014; European Commission, 2013; Higher Education and Training Awards Council, 2013). EE education aims to encourage the development of entrepreneurial mind-sets in students and equip them with skills, such as creativity and innovation, which enables them to act on their entrepreneurial ideas (European Commission, 2014; European Commission, 2009; Cooney and Murray, 2009).

OR is considered central to entrepreneurship (Shepherd, 2015), as it is frequently recognised as the first stage of the entrepreneurship process (Baron, 2006; Scott and Venkataraman, 2000). OR is recognised at European policy level as being an important feature of EE education, yet the evidence suggests this is not the case in practice (Bacigalupo, Kampylis, Punie and Van den Brande, 2016; The European Commission, 2014; All-Party Parliamentary Group for Micro Businesses, 2014; Higher Education and Training Awards Council, 2013; QAA, 2012).

OR and opportunity development are not the same. OR, which leads people to conclude they have identified an opportunity, is distinct to opportunity development (Baron, 2006; Ardichvili *et al.*, 2003) where the latter is concerned with opportunity evaluation in the context of economic value and resource acquisition to realise the opportunity (Vaghely and Julien, 2008; Pretorius, Millard and Kruger, 2006; Ardichvili *et al.*, 2003). This research is firmly focused on the OR process, leaving opportunity development outside the remit of this thesis. The view of OR taken in this study is informed by Baron (2006:107) who defines it as the "cognitive process (or processes) through which individuals conclude that they have identified an opportunity". An opportunity, in this context, is defined by the researcher as: A chance to add value by doing something novel in response to a problem.

OR has been associated with creativity due to the importance of idea generation in the OR process and the processes required to effectively develop opportunities (Dimov, 2011; Ardichvili, Cardozo and Ray, 2003). Research indicates that creativity and OR are the two most commonly mentioned competences in EE education yet, evidence suggests that there is little effort to teach them as competences as in practice it is claimed that OR tends to be overlooked in EE

delivery (Nixdorff and Solomon, 2007; Kellet, 2006; Hills and Lumpkin, 1997). This is compounded by the recognised lack of structured guidance available to educators on selecting appropriate teaching methods and on the skills needed to turn ideas into opportunities (Goldsby and Nelson, 2012; Balan and Metcalfe, 2012). As a result, there are calls to make practical guidelines or frameworks on OR available to EE educators (Goldsby and Nelson, 2012; Balan and Metcalfe, 2012).

The literature suggests little agreement in the use of the term competency itself (Hoffman, 1999). Due to complex nature of OR, this thesis uses the term 'competencies' to refer to the attributes and skills underpinning OR competence (Bacigalupo *et al.*, 2016; Hoffman, 1999).

Education and training, studies suggest, can enhance OR (Krueger, 2009; Nixdorff and Solomon, 2007; DeTienne and Chandler, 2004; Hills and Lumpkin, 1997). As OR is a creative process (Hills, Shrader and Lumpkin, 1999), it is argued that many of the associated skills can be developed from a creativity perspective (Breslin and Jones, 2014; Gundry, Ofstein and Kickul, 2014; Puhakka, 2011; Ko and Butler, 2007; Baron, 2006). However, existing EE education appears to rely on analytically focused pedagogies (Penaluna, Penaluna and Jones, 2012; Krueger, 2009; Kellet, 2006) which raises questions whether the creativity required for entrepreneurship can be both developed and assessed in this way (Penaluna, Coates and Penaluna, 2011).

Opportunity validation appears to take precedence over OR in current EE, resulting in questions being asked about EE educators' ability to enable the cognitive skill development of students to creatively engage in OR (Penaluna, Penaluna, Matlay and Jones, 2013; Matlay and Carey, 2010; Penaluna and Penaluna, 2009). Whilst dedicated OR approaches are hard to come by, the literature does offer a menu of creative tools and techniques educators can use in ORedu (Heinonen, Hytti and Stenholm, 2011; Heinonen and Poikkijoki, 2007; Rae, 2007; Rae, 2004; DeTienne and Chandler, 2004; Jones and English, 2004). However, the problem with such lists is that they do not provide clarity to the educator as to when it is appropriate to use such methods (Lackeus, 2013), nor do such lists suggest what can be achieved in terms of developing OR relevant attributes, behaviours and skills. This puts the EE educator in a challenging situation where they must determine for themselves the most suitable method.

Coupled with this is the absence of OR assessment from EE education research, suggesting that it is 'ignored' in current assessment practices (Jones and Penaluna, 2013). This in itself is revealing, as assessment is considered as the link between learning outcomes and student performance.

A recognised challenge for EE educators, lies in identifying EE education approaches that develop and assess OR competencies in students (Clydesdale, 2012; Penaluna and Penaluna, 2009). In response to calls for EE educators to consider adopting methodologies used in both education and assessment of art

and design (Penaluna *et al.*, 2013; Carey and Matlay, 2010; Penaluna and Penaluna, 2009), some EE educators have embraced design thinking methodologies. Design thinking is believed to enable students of EE to explore creative ways to turn such problems into opportunities (Nielsen and Storvang, 2014; Fixon and Read, 2012; Neck and Greene, 2011). Indeed, the literature clearly indicates a strong support for 'design thinking' in EE (Nielsen and Storvang, 2014; Laviolette *et al.*, 2014; Razzouk and Shute, 2012; Neck and Greene, 2011) over any broader concept of design (Penaluna *et al.*, 2013; Penaluna, 2011; Carey and Matlay, 2010).

Such is the growing popularity of design thinking that it is leading to increasing criticism from the design community (Johansson-Skoldberg, Woodilla and Cetinkaya, 2013; Dorst, 2011; Stewart, 2011; Badke-Schaub, Roozenburg and Cardoso, 2010) who are concerned that the liberal application of design principles, coupled with a lack of understanding, leads to an oversimplification of design concepts (Dorst, 2011; Stewart, 2011). This has resulted in calls for researchers to take a pluralistic perspective in relation to design in order to make an academic contribution.

#### **1.4 The research gap**

This research responds to the growing recognition of the importance of OR as an outcome from European enterprise education policy (Bacigalupo *et al.*, 2016; European Commission, 2014; QAA, 2012) and addresses its relative oversight in EE education in practice (Krueger, 2009; Nixdorff and Solomon, 2007; Kellet, 2006; Hills and Lumpkin, 1997). The research responds to calls to make practical OR education guidelines and frameworks available to EE educators (Goldsby and Nelson, 2012; Balan and Metcalfe, 2012) by considering creative education strategies employed in design education (Carey and Matlay, 2010; Penaluna and Penaluna, 2009). In doing so, this researcher addresses the following research gaps:

- The literature indicates that OR is considered an important feature of EE education, yet there are claims that it is not currently delivered as a competence (section 3.2.2). However, few studies provide empirical evidence to support such claims.
- There are growing expectations that EE education can enable student competence in OR. OR is recognised in the literature as a creative process (Hills *et al.*, 1999) and it is argued that many of the associated skills can be developed from a creativity perspective. The literature indicates that there is a gap in knowledge within EE education regarding suitable creativity driven approaches that can specifically enable OR competence development in students (section 3.8.4).
- While assessment is recognised as a means by which educators can equate student achievement with educational outcomes, the literature

reveals a dearth of research on OR assessment (section 3.9), indicating a significant knowledge gap in this area.

- The literature suggests that design approaches can offer EE educators education and assessment approaches that could enable the development of creativity related attributes, behaviours and skills in students. However, while interest is growing in this area, it is concentrated on design thinking and little research exists which considers the suitability of broader design education approaches to ORedu in particular (section 4.6).

## 1.5 Research objective and questions

This research seeks to achieve the following research objective:

*Explore the suitability of design education approaches in enabling enterprise and entrepreneurship educators to enhance undergraduate students' opportunity recognition attributes, behaviours and skills in Higher Education in Ireland.*

To achieve this objective the researcher seeks to answer the following research questions, in the context of HE in Ireland:

- How is opportunity recognition currently addressed in practice within enterprise and entrepreneurship education?
- How does current enterprise and entrepreneurship education develop opportunity recognition attributes, behaviours and skills in students?
- How is opportunity recognition education currently assessed in practice within enterprise and entrepreneurship education?
- How does design education enable the development of creativity related attributes, behaviours and skills in design students?
- How suitable are design education approaches to opportunity recognition education?

## 1.6 Contextual setting of this research study

HE in Ireland is provided by fourteen Institutes of Technology, seven Colleges of Education and seven Universities in addition to colleges which offer specialist education such as art and design. HEIs are state funded and self-governing but the Higher Education Authority (HEA) has overall statutory authority for advising on and developing higher education and research activities, in addition to acting as the funding authority for the HEI sector. Under the Institutes of Technology Act (2006) the HEA assumes responsibility for overseeing that plans and processes are in place for the delivery and evaluation of teaching and research. HEIs can award qualifications according to the National Qualification Framework (based on the Bologna Framework), from certificate level right up to doctorate level across all academic disciplines. Institutes of Technology offer ordinary level degrees, of on average three years duration, and higher level degrees, of on average four years duration. Degrees are awarded by the Quality and Qualifications Ireland (QQI), formerly the Higher Education and Training Awards Council (HETAC). Many of the programmes offered by specialist colleges are also validated by the QQI. The third level sector in Ireland is proposed to change with the publication of the Technological Universities Bill 2014 which paves the way for Institutes of Technology to merge, with a view of becoming Technological Universities (Department of Education and Skills, 2016).

A report by the Entrepreneurship Forum (2014) suggests that due to the difficult economic environment (between 2009 and 2011) and corresponding high unemployment rates, encouraging greater levels of entrepreneurship has become a particular priority in Ireland. While the report takes a narrow view of

entrepreneurship, it does identify six pillars towards supporting Entrepreneurship in Ireland, amongst them creating an innovative 'can-do' culture. The report suggests that in this culture, entrepreneurship should be considered the norm rather than the exception and that EE education plays a role in this. Curth (2015) argues that at EE education at HE is most likely to have an immediate impact on students, due to their maturity and ability to realise entrepreneurial ambitions. This research study is therefore situated in the context of HE in Ireland.

### **1.7 Justification of the methodology adopted**

Being exploratory in nature, this research serves to gain insights into ORedu, an area about which little is known (Saunders, Lewis and Thornhill, 2014; Sekaran and Bougie, 2010; Bryman and Bell, 2007). To address the research objective and questions the researcher sought to understand the educators' experience of both ORedu and DE. A qualitative research methodology was adopted which allowed the researcher to secure a detailed understanding of the complex phenomenon of ORedu (Creswell, 2007). To achieve this level of understanding it was important to get close to the participants, to probe, examine and question them on their experiences. Qualitative research was considered suitable as it involved understanding motivation, emotions and influencers that shape individual educator behaviour (Creswell, 2007).

Qualitative interviews and observation were deemed the most suitable methods to secure the data required for this study, as they allowed the researcher to gain an in depth understanding of the phenomenon from the individual educators' perspective (Denscombe, 2010; Sekaran and Bougie, 2010; Bryman and Bell, 2007). Semi-structured interviews gave the researcher the flexibility to explore interesting issues more deeply, in addition to allowing the researcher the opportunity to adapt the flow and use of questioning according to the specific context (Saunders *et al.*, 2014; Qu and Dumay, 2011; Sekaran and Bougie, 2010; Bryman and Bell, 2007). In total, 20 semi-structured interviews were undertaken (ten EE educators and ten DE educators) in HEIs in Ireland. Observation was undertaken on six occasions, with three EE and three DE educators taken from the pool of interview participants. Observation was used for crystallisation purposes, adding rigor to the research (Ellingson, 2009; Richardson, 1994) as it allowed the researcher to gather information immediately at the time that it occurred (Cooper and Schindler, 2003).

A purposeful sampling approach was used in this research study, as the research warranted input from both experienced EE educators and DE educators in order to truly understand education approaches used by educators in both domains. To facilitate comparability the participants were all from HEIs in Ireland.

Following pilot testing, the research was operationalised over a six month period. The data gathering phase was conducted in two phases spanning a six month period which allowed for initial data analysis and the adaptation of questions, where necessary (Saunders *et al.*, 2014; Qu and Dumay, 2011; Bryman and Bell, 2007). Phase 1 ran from October to mid December 2015 and Phase 2 ran from

January to April 2016. Observations took place in their normal HE educational setting, lasting between 1 and 3 hours. Interviews were manually transcribed within a few days of the interview taking place. The transcriptions were anonymised, with all references to the participant, their colleagues, their location or other identifiable references removed from the transcript.

A descriptive phenomenological approach was taken in analysing the data as this approach was considered more appropriate for the study of groups of individuals and where the emphasis of the approach was on what was described, with nothing added or taken away (Giorgi, 2006). A qualitative data analysis software package QSR NVivo10 was used to analyse the research data for this research study in light of the need to demonstrate rigour (Leech and Onwuegbuzie, 2011; Sinkovics and Alfoldi, 2011; Carcary, 2011).

The researcher recognises the limitations of this study in terms of its small sample size, albeit small sample sizes, of around ten participants, are recommended for phenomenological studies (Creswell, 2007; Hycner, 1985). More importantly, data saturation was deemed to have been reached at ten participants in each cohort (EE and DE) as evidenced by the lack of new codes generated by additional interviews.

## **1.8 Proposed contribution of this study and dissemination of findings**

The proposed contributions of this study are discussed in detail in the conclusion chapter of this thesis (section 9.5). A number of contributions have been identified at both a theoretical and practical level:

### **1.8.1 Theoretical contributions**

In the course of this research the researcher discovered little existing research on ORedu from the creative perspective (Breslin and Jones, 2014; Rae, 2004; Sarasvathy, 2001). The literature suggests that enabling student creativity is an area where DE could potentially contribute to ORedu (Penaluna *et al.*, 2013). This research addresses this gap by contributing knowledge as to how DE approaches can potentially enhance ORedu.

The literature suggests that there is a lack of clarity around current OR education practice, although frequently it is claimed that more needs to be done to develop student competencies in this area (Neck and Greene, 2011; Krueger, 2009; Penaluna and Penaluna, 2008; Nixdorff and Solomon, 2007). At a theoretical level this research contributes much needed clarity as to what constitutes current OR education by identifying current OR education practices and revealing the existence of an ORedu process (section 6.3). However, this research suggests that the degree to which current ORedu enables students' creativity appears limited due to students' over-reliance on existing knowledge and experience, their resistance to engage in creative processes, their tendency to rush into the process and selecting convenient or unsuitable problems. By proposing a refined ORedu



process (Figure 8.4), which seeks to address the recognised weaknesses in the current ORedu process, this research makes a strong contribution to theory.

This research responds to calls for frameworks (Goldsby and Nelson, 2012; Balan and Metcalfe, 2012) by proposing an ORedu framework (Figure 8.5) which aligns the refined ORedu process with key enablers for ORedu and considers competence progression as students progress through their studies at HE. This ORedu framework compliments recent work by Bacigalupo *et al.* (2016) and is therefore a valuable contribution to EE education theory.

### **1.8.2 Practical contributions**

This research contributes to EE education in a number of ways. Firstly, it serves to draw attention to the continuing lack of prominence of OR in current EE education (Nixdorff and Solomon, 2007; Kellet, 2006; Saks and Gaglio, 2002; Hills and Lumpkin, 1997). The research also contributes to practice as the framework for ORedu provides educators with a structured approach to OR education which facilitates the development of OR relevant attributes, behaviours and skills. Therefore, the research helps to build overall OR competence (Goldsby and Nelson, 2012; Balan and Metcalfe, 2012; Clydesdale, 2012).

The lack of assessment of OR, as highlighted by the empirical findings in this research, clearly indicates that no link currently exists between OR competence development and student achievement in OR, at HE in Ireland. This research contributes to practice by enabling educators to consider process based assessment around the ORedu process itself, such as that used in the DE domain (Penaluna *et al.*, 2013).

The findings from this research suggest that perceived student competence in OR was frequently attributed to the individual, suggesting that educators can distance themselves from student performance in this area. This research contributes to practice as the framework offers educators an opportunity to reflect on the importance of their role in student OR competence development over time.

## **1.9 Thesis structure**

This thesis explores the suitability of DE approaches to OR education at undergraduate level in the Higher Education (HE) sector. In so doing the thesis is built around nine chapters, of which this is the first.

**Chapter two** presents the first of three literature review chapters. It begins by providing an overview of the literature on EE education. The chapter explains the context in which EE education sits and the role of EE education in developing entrepreneurial attributes, behaviours and skills in students. The chapter takes a critical look at the way in which both EE education and assessment are currently delivered in HE.

**Chapter three** is the second literature review chapter which considers OR as a subset of EE education. The chapter examines key theoretical perspectives on the

nature of OR and the role of creativity therein. Literature on enabling creativity in an education context is explored, leading to a critical review of the way in which popular approaches adopted in EE education facilitate OR competence development, from the creative perspective. The chapter ends by acknowledging calls in EE education to look to art and design education for proven approaches in enabling student creativity.

**Chapter four** is the third literature review chapter which looks to the field of design. It considers literature on the nature of design and critically reviews the recent interest in 'design thinking'. This leads to a consideration of design at broader level, to encompass practices used in design education. Potential for synergy between DE, EE education and in particular, OR education are considered in light of recent theoretical contributions in this area. The chapter draws to a conclusion by presenting a conceptual framework illustrating research gaps in the literature.

**Chapter five** explains and justifies the research methodology adopted in this thesis. The chapter begins with a discussion of the philosophical assumptions underpinning the researchers' position. The research objective and questions are presented and the corresponding explorative, qualitative research design is explained. A detailed explanation of how this design was operationalised is provided to enhance the legitimacy of this research. The sampling approach, primary data collection protocols, coding and analysis conventions applied in this research are described in detail. The chapter concludes by describing the standards of validation used by illustrating its credibility, dependability and transferability.

**Chapter six** presents the empirical findings related specifically to OR education. The findings are presented along key themes which emerged from analysis of the semi-structured interviews and observation data. These findings illustrate the prominence of OR in EE education, reveal the existence of an ORedu process, illuminate current ORedu practices and explore the role of creativity therein. In an attempt to set aside the researcher's preconceptions and stay close to the meaning intended by the participants, the researcher was careful to allow themes to emerge independently. This chapter is liberally illustrated with participant quotes to demonstrate the closeness of the findings to the data obtained.

**Chapter seven** presents the empirical findings related specifically to DE and is structured in a similar way to chapter six. It addresses the fourth research question, revealing the nature of DE as found by this research study. In particular the roles of explore, challenge and risk in DE emerge as interesting themes and the chapter concludes with a consideration of DE perceptions of the broader application of design to other domains.

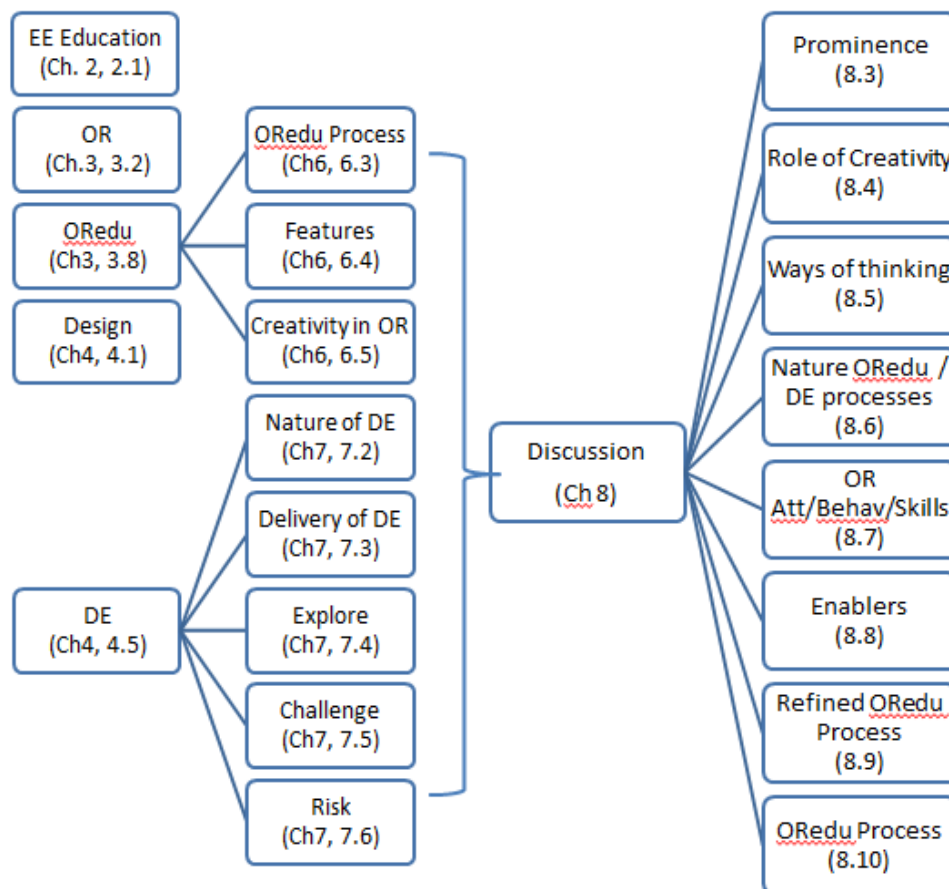
**Chapter eight** provides a synthesised analysis of the overall research findings (from both EE education and DE) in the context of extant literature. The chapter is built upon the insights revealed in chapters six and seven, but integrated in a way which informs the overall research objective. The chapter systematically moves

from a discussion of current provision of ORedu to a consideration of the suitability of aspects of DE in enhancing EE students OR attributes, behaviours and skills in this regard. This culminates with a refined ORedu process which extends into a proposed ORedu Framework.

**Chapter nine** outlines the main conclusions drawn from this research study, cognisant of the limitations associated with pursuing research of this nature. The chapter begins by addressing, in turn, each of the research questions and conclusions reached in relation to the overall research objective. The chapter considers contributions from this research to both theory and practice and recommends avenues for future research. This final chapter of the thesis concludes with a reflexive analysis of the impact of this research on the researcher.

Figure 1.1 traces the development of themes as they occur within this thesis structure. It illustrates the relative focus in the literature review on ORedu and DE. These areas inform, and are developed further through the empirical findings of this research, in chapters six and seven. In chapter eight, the findings are synthesised and the chapter is broken into a number of sub-themes to facilitate this discussion.

**Figure 1.1: Development of themes**



## **1.10 Chapter summary**

This chapter positions the study in the context of its background and justifies the research in terms of the identified research gap. The research objective and questions have been introduced and the contextual setting of the study explained. An outline of the methodology adopted in operationalising the research has been presented, leading to the resulting contributions of this research study. The chapter concluded with an overview of the structure of this thesis. A review of relevant literature in EE education now follows.

## **Chapter 2 Enterprise and Entrepreneurship Education**

### **2.1 Introduction**

This chapter is the first of three literature review chapters. It provides an overview of enterprise and entrepreneurship (EE) education, which is the context in which OR education (ORedu) exists. In doing so, it explores the role of EE education in developing student competencies to compete in a global and rapidly changing environment. Entrepreneurial attributes, behaviours and skills are identified from the literature leading to a discussion of entrepreneurial competence development. The chapter then considers popular education practices that have emerged in this field and draws to a close by critically considering assessment practices in EE education.

### **2.2 Context**

Entrepreneurship is recognised as being an important driver of job creation and economic growth across Europe as it leads to the creation of new businesses, new jobs, new skills and new markets (European Commission, 2013; Matlay and Carey, 2007; Matlay, 2005). Indeed, the need to foster entrepreneurial citizens and innovation-driven entrepreneurs is seen as important for the development of European competitiveness (Curth, 2015; Thematic Working Group on Entrepreneurship Education, 2014; World Economic Forum, 2014). In response to the economic turmoil of recent years, encouraging greater levels of entrepreneurship in organisations of all kinds has become a particular priority for countries, such as Ireland for example (Entrepreneurship Forum, 2014). The Thematic Working Group on Entrepreneurship Education (2014:7) echoes this need:

Europe needs citizens who are creative, socially responsible, can spot opportunities, understand and take risks, and can work in teams and solve problems. This can not only boost the number of start-ups and increase the number of people working as entrepreneurs; entrepreneurial employees within an established business or entrepreneurial start-up can help enhance productivity, increase adaptability, and ensure that opportunities are fully realised.

EE education is seen as an important pillar in European entrepreneurship policy (Curth, 2015; World Economic Forum, 2014; European Commission, 2014; European Commission, 2013; Higher Education and Training Awards Council, 2013). This is reflected by the European Commission (2013:5) who consider that “investing in entrepreneurship education is one of the highest return investments Europe can make”. Indeed, it is this recognition of the value of enterprise to economies (Entrepreneurship Forum, 2014; European Commission, 2008b; Garvan and O’Cinneide, 1994a; 1994b) and acknowledgement of the need for people to be more entrepreneurial in a globalised world that has seen EE education grow in popularity (Gibb, 2007; Hannon, 2006; Henry, Hill and Leitch,

2005a; 2005b). Rae, Martin, Antcliff and Hannon (2012) contend that HE institutions have a critical role to play in fostering entrepreneurial mindsets and behaviours.

Worryingly however, the European Commission (2008a) found that over half of students at HE in Europe do not have access to EE throughout their studies, suggesting that Europe still has a long way to go in this regard. Similarly, Rae *et al.* (2012) express concern that engagement in EE education in English universities may be lower than the European average. The Thematic Working Group on Entrepreneurship Education (2014:7) recognise that while progress has been made in recent times, there is still concern regarding “large gaps in provision and severely fragmented approaches inside Member States”.

European EE education policy recognises the need for educators to equip students with the knowledge, skills and behaviours necessary to create their own futures in a rapidly changing world (Curth, 2015; Hoidn and Kärkkäinen, 2014; European Commission, 2014; Entrepreneurship Forum, 2014; Higher Education and Training Awards Council, 2013; QAA, 2012; Rae *et al.*, 2012; Higher Education Authority, 2011; Cooney and Murray, 2008; Gibb, 2007). For example, Boyles (2012) reflects a view from the Kaufmann Foundation, who consider that those who demonstrate twenty-first century skills (such as analytical problem solving, innovation and creativity) in addition to the confidence to put those skills into practice, will be in demand in organisations. Similarly, there are calls in the literature for EE education to increase awareness of, and student competence in, creativity to enable students to interact with their environment and create opportunities in their personal lives, their work or social surroundings (Sorensen and Davidsen, 2016; Cooney and Murray, 2008; Hamedi, Wennberg and Berglund, 2008). Analytic reasoning, critical thinking, idea generation and OR are recognised as skills which can provide the foundation upon which students can contribute at a personal, social or commercial level in the future (European Commission, 2014; World Economic Forum, 2014; Thematic Working Group on Entrepreneurship Education, 2014; European Commission, 2013; Higher Education and Training Awards Council, 2013; Hamedi *et al.*, 2008; Kirby, 2006b).

### **2.3 Enterprise and entrepreneurship education**

Following years of debate, there is growing acceptance in the EE literature that entrepreneurship can be taught (Levie, Hart and Anyadike-Danes, 2009; Fayolle and Gailly, 2008; Matlay and Carey, 2007; Heinonen and Poikkijoki, 2006; Henry *et al.*, 2005a; 2005b). Indeed, there is evidence that EE education has a positive impact on the attitudes, behaviours and entrepreneurial intentions of participants and that it has benefits for individuals, organisations and society in general (Curth, 2015; European Commission, 2014; All-Party Parliamentary Group for Micro Businesses, 2014; Higher Education and Training Awards Council, 2013; QAA, 2012; European Commission, 2012; Kloveried and Moen, 1997). Similarly, researchers claim that entrepreneurial awareness and entrepreneurial skills are

positively influenced by EE education (European Commission, 2014; Matlay and Carey, 2007), although Matlay (2005) questions claims linking the impact of EE education to actual entrepreneurial activity, due to the lack of clarity surrounding methodological methods applied in studies.

However, the literature recognises that not all EE education is the same (Pittaway and Edwards, 2012; Henry *et al.*, 2005a; 2005b; Gibb, 2002). Henry *et al.* (2005) cites Jamieson (1984) who developed a three-category framework of EE education which distinguishes between education ‘about’, ‘for’ and ‘through’ enterprise. Alternative categorisations consider ‘about’, ‘for’, ‘through’ and ‘embedded’ forms of EE education (Pittaway and Edwards, 2012). They explain that ‘about’ is considered didactic in nature and tends to be theory and knowledge based. ‘For’ approaches focus on the development of students’ skill and competence development through projects while ‘through’ approaches allow students to acquire and practice their skills of entrepreneurship by learning through doing in a safe environment. ‘Embedded’ forms of EE education are typically embedded within courses which are discipline specific (Pittaway and Edwards, 2012).

As positive experiences of EE education are perceived to impact peoples’ entrepreneurial intentions (Hannon, 2006), there are calls for all students to be exposed to EE education during their studies (European Commission, 2012). This is reflected by the Thematic Working Group on Entrepreneurship Education (2014:8) which cites the Rethinking Education policy (2012) “calling for it to be embedded at a systemic level and for all learners to receive at least one practical entrepreneurial experience during their compulsory education.” Embeddedness is frequently achieved through formal modules or ‘by stealth’ where entrepreneurial terminology is introduced to students in a seamless way across modules (Penaluna *et al.*, 2012).

### **2.3.1 Constraints in EE education**

Recent research suggests that many educators experience difficulty or even resistance integrating EE education into the core curriculum. Reasons include: the lack of room for additional content, a narrow understanding of EE education, a lack of respect for the field and lack of support from senior leaders (Thomassen, 2016; All-Party Parliamentary Group for Micro Businesses, 2014). In some contexts lack of available resources such as time, personnel and funding, rigid curricula and lack of advice and support are recognised as impediments to the development of EE education (All-Party Parliamentary Group for Micro Business, 2014; Rae *et al.*, 2012; Cooney and Murray, 2008; European Commission, 2008a; European Commission, 2008b). Matlay and Carey (2007) posit that the lack of educators as practitioners exists as a limitation, although more recent studies by Penaluna *et al.* (2012) suggest that up to 76% of EE educators in their study had personal start-up experience. EE education is frequently offered as an extra-curricular activity but over-reliance on this form of education has been criticised by Wilson (2012), who argues that such approaches de-contextualise entrepreneurial learning and may

signal to students that a low value is being placed on entrepreneurial skill development. Similarly, Rae *et al.* (2012) contend that this 'voluntary' approach could be failing students who miss out on EE education as a formal part of their undergraduate education.

It is widely recognised that another constraining factor in the development of the field lies in the inconsistencies in definitions of enterprise and entrepreneurship education (Henry *et al.*, 2005a; 2005b). These inconsistencies result in terms being used interchangeably and considered in their broadest sense. An attempt to inject clarity into the debate is attempted by the QAA (2012:8) who define enterprise education and entrepreneurship as:

**Enterprise Education** is that which “focuses on the development and application of an enterprising mindset and skills in the specific contexts of setting up a new venture, developing and growing an existing business, or designing an entrepreneurial organisation”. As such, entrepreneurial education aims to produce graduates “who are capable of identifying opportunities”.

**Entrepreneurship Education** is defined as “the application of enterprise skills specifically to creating and growing organisations in order to identify and build on opportunities”

The European Commission (2012:8) present a slightly wider perspective of entrepreneurship education by suggesting it “seeks to prepare people to be responsible, enterprising individuals who have the attitudes, skills and knowledge necessary to achieve the goals set for themselves to live a fulfilled life”. The breadth of this view allows for the expression of entrepreneurial skills and competencies in a wide variety of contexts, including self-enterprise, which extends the definition of enterprise education as proposed by the QAA (2012). As such, the researcher proposes a modified version of the QAA (2012) definition, as follows:

**Enterprise Education** is that which “focuses on the development and application of an enterprising mindset and skills in the contexts of setting up a new venture, developing and growing an existing business, designing an entrepreneurial organisation” *or actively pursuing opportunities to achieve life goals*. This definition of enterprise education aims to produce graduates who are capable of *identifying opportunities in a wide variety of contexts*.

For the purpose of this study the term EE education refers to both enterprise and entrepreneurship education.

### **2.3.2 Entrepreneurial attributes, behaviours and skills**

The focus of EE education has shifted in recent years towards the development of the entrepreneurial mind-set and developing entrepreneurial attributes, behaviours and skills in students (Boyles, 2012; Gibb, 2007; Gibb, 2002). The literature suggests that this could be problematic as educator conceptualisations of attributes differ and that the term 'attribute' does not have a consistent meaning (Barrie, 2006). In addition, a review of the literature demonstrates that the terms



attribute and attitude are used interchangeably. The Collins English dictionary (2001:43) defines attributes and attitudes as follows:

- Attribute – a quality or characteristic representative of somebody or something.
- Attitude – the way a person thinks

The above definitions show that the definition of attitude is limited to ‘thinking’, whereas their definition of attribute is broader in nature. Therefore, in keeping with the terminology used by Gibb (2002) and the QAA (2012), the term attribute is adopted in this research.

Behaviours are commonly associated with an entrepreneur yet Bird, Schjoedt and Baum (2012) draw attention to inconsistencies in the way behaviours are conceptualised in EE research. Representing a narrow view of entrepreneurship, they define an entrepreneurs’ behaviour “as the concrete enactment by individuals (or teams) of tasks or activities ... which are required in some combination to start and grow most new organizations” (Bird *et al.*, 2012:890). In their opinion, behaviours include actions, activities and responses which are audible or observable and therefore can be captured by recording equipment (audio or video). In a review of research over a six year period to 2010, Bird *et al.* (2012) conclude that very little is still known about entrepreneurial behaviour resulting from definitional and methodological inconsistencies.

Gibb (2002) argues that the skills associated with EE can be developed. Bacigalupo *et al.* (2016:21) define skills as “the ability to apply knowledge and use know-how to complete tasks and solve problems”. It is argued that EE students require a wide portfolio of skills necessary to support entrepreneurial endeavour (Matlay and Carey, 2007; Matlay, 2005). Interestingly, Chell (2013) suggests that skills, once acquired, are frequently taken for granted.

Informed by the categorisation of attributes, behaviours and skills by the QAA (2012), the researcher has attempted to integrate information gained from this literature review (Appendix 1) to provide more clarity in this area (Table 2.1).

**Table 2.1: Summary of attributes, behaviours and skills associated with entrepreneurial behaviour**

	<b>Description</b>	<b>Source</b>
Attributes	<ul style="list-style-type: none"> <li>• Action orientation</li> <li>• Alertness</li> <li>• Ambiguity tolerance</li> <li>• Awareness</li> <li>• Creativity and innovation</li> <li>• Curiosity</li> <li>• Empathy</li> <li>• Intention</li>   <li>• Internal locus of control</li>   <li>• Openness to learn</li> <li>• Passion</li> <li>• Perseverance</li>   <li>• Resilience</li> <li>• Risk taking propensity</li>   <li>• Self belief /self efficacy</li>   <li>• Self-actualisation/ achievement</li> </ul>	<ul style="list-style-type: none"> <li>• Lakeus, 2013; Mitchelmore and Rowley, 2010; Gibb, 2002; Welsch and Young, 1982</li> <li>• Kirzner, 2009; NCGE, 2008; Ko and Butler, 2007; Kirzner, 1997</li> <li>• Walter and Heinrichs, 2015; Lakeus, 2013 citing Sanchez, 2011; McMullan and Shephard, 2008</li> <li>• Chell, 2013; Lackeus, 2013</li> <li>• Lackeus, 2013; QAA, 2012; Gibb, 2002; Schumpeter, 1934</li> <li>• Jeraj and Marič, 2013; Kashdan <i>et al.</i>, 2004</li> <li>• Neck <i>et al.</i>, 2014</li> <li>• do Paço, Ferreira, Raposo, Gouveia, and Dinis, 2015; Boddington and Berg, 2014; Kirby 2006; Ajzen, 1991; Bird, 1988</li> <li>• QAA, 2012; Kroeck, Bullough and Reynolds, 2010; NCGE, 2008; Gibb, 2002; Welsch and Young, 1982</li> <li>• Chell, 2013; QAA, 2012; Litman, 2006; Gibb, 2002; Welsch and Young, 1982</li> <li>• Lackeus, 2013</li> <li>• Lakeus, 2013, QAA, 2012; Kirby, 2004; Gibb, 2002</li> <li>• Chell, 2013; QAA, 2012; Windle, 2010</li> <li>• Zheng, 2012; Carland, Carland, Carland, Pearce and Pearce, 1995; Schwer and Yucelt, 1984; Welsh and Young, 1982; Brockhaus, 1980.</li> <li>• Boddington and Berg, 2014; Lackeus, 2013 citing Fisher <i>et al</i>, 2008; Chell, 2013; Lackeus, 2013; QAA, 2012; Gibb, 2002; Kruger, 1994; Welsch and Young, 1982.</li> <li>• Chell, 2013; Lackeus, 2013; QAA, 2012; NCGE, 2008; Steward and Roth, 2007 citing McClelland, 1961; Kirby, 2006; Gibb, 2002.</li> </ul>
Behaviours	<ul style="list-style-type: none"> <li>• Communication and networking</li> <li>• Creativity</li> <li>• Management skills</li>   <li>• Opportunity recognition and development</li> <li>• Ownership development</li> <li>• Problem solving</li> <li>• Perseverance</li> <li>• Risk taking</li>   <li>• Take Action</li> </ul>	<ul style="list-style-type: none"> <li>• QAA, 2012; Bird, 1988</li>   <li>• Chell, 2013; Gibb, 2002</li> <li>• Chell, 2013; QAA, 2012; Gibb, 2002; Cunningham and Lischeron, 1991; Bird, 1988; Drucker, 1985a; 1985b</li> <li>• QAA, 2012; Gibb, 2002; Kirzner, 1987; Schumpeter, 1934</li> <li>• Chell, 2013; Gibb, 2002</li> <li>• QAA, 2012; Gibb, 2002</li> <li>• Chell, 2013; QAA, 2012; Gibb, 2002</li> <li>• Chell, 2013; QAA, 2012; Zheng, 2012; Gibb, 2002; Brockhaus, 1980 citing McClelland, 1961</li> <li>• QAA, 2012; Gibb, 2002</li> </ul>

Skills	<ul style="list-style-type: none"> <li>• Analytical and conceptual thinking</li> <li>• Communication and negotiation</li> <li>• Creativity and innovation</li>   <li>• Decision making</li> <li>• Information acquisition</li>   <li>• Networking</li>   <li>• Opportunity recognition</li>   <li>• Planning</li>   <li>• Problem solving</li> </ul>	<ul style="list-style-type: none"> <li>• Lackeus, 2013 citing Kraiger <i>et al.</i>, 1993; Chell, 2013; QAA, 2012; Drucker, 1985b.</li> <li>• Lackeus, 2013 citing Fisher, 2008; QAA, 2012; Chell, 2013; NCGE, 2008; Gibb, 2002</li> <li>• Chell, 2013; Lackeus, 2013; QAA, 2012; Welsch and Young, 1982; Schumpeter, 1934</li> <li>• QAA, 2012; NCGE, 2008; Gibb, 2002</li> <li>• Chell, 2013; Kirzner, 1997; Drucker, 1985b; Welsch and Young, 1982</li> <li>• Chell, 2013; QAA, 2012; NCGE, 2008; Gibb, 2002; Bird, 1988</li> <li>• Chell, 2013; Lackeus, 2013 citing Fisher, 2008; QAA, 2012; NCGE, 2008</li> <li>• Chell, 2013; Lackeus, 2013; QAA, 2012; NCGE, 2008; Gibb, 2002; Drucker, 1985a; 1985b.</li> <li>• Gibb, 2002; Guest, 1988</li> </ul>
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Source: Researcher's own work

While it is outside the scope of this thesis to discuss in detail all the attributes, behaviours and skills listed in Table 2.1, it is interesting to note the range listed in each category. This supports Gibb (2002), who suggests that there is little agreement as to what is included in these categories in the context of EE education.

Similarly it is noticeable that some attributes, behaviours and skills are mentioned in more than one category. For example, creativity and innovation are identified in Table 2.1 as both attributes and skills. The literature confirms that creativity in particular is frequently viewed as an individual attribute (Cunningham and Lischeron, 1991), a process (Puhakka, 2011) and a skill (Krueger, 2009). Similarly, OR is identified as both a skill and a behaviour yet, as will be illustrated in section 3.6, the literature suggests that OR itself is influenced by specific attributes, behaviours and skills.

### 2.3.3 Entrepreneurial competencies

The literature reveals ambiguity with regard to definitions of competency, competence and competencies which could refer to demonstrable attributes, behaviours, skills or minimum standards of achievement (Mitchelmore and Rowley, 2010; Moore, Cheng and Dainty, 2002; Hoffman, 1999). Hoffman (1999) suggests that the perspective taken towards competency depends on whether an output-based or an input-based approach is taken. An output-based approach views competency as what an individual can do while an input-based approach considers the inputs needed to perform competently. Hoffman (1999) argues that input-based approaches are used when specific outputs are difficult to describe and to determine content of learning that can lead to competency.

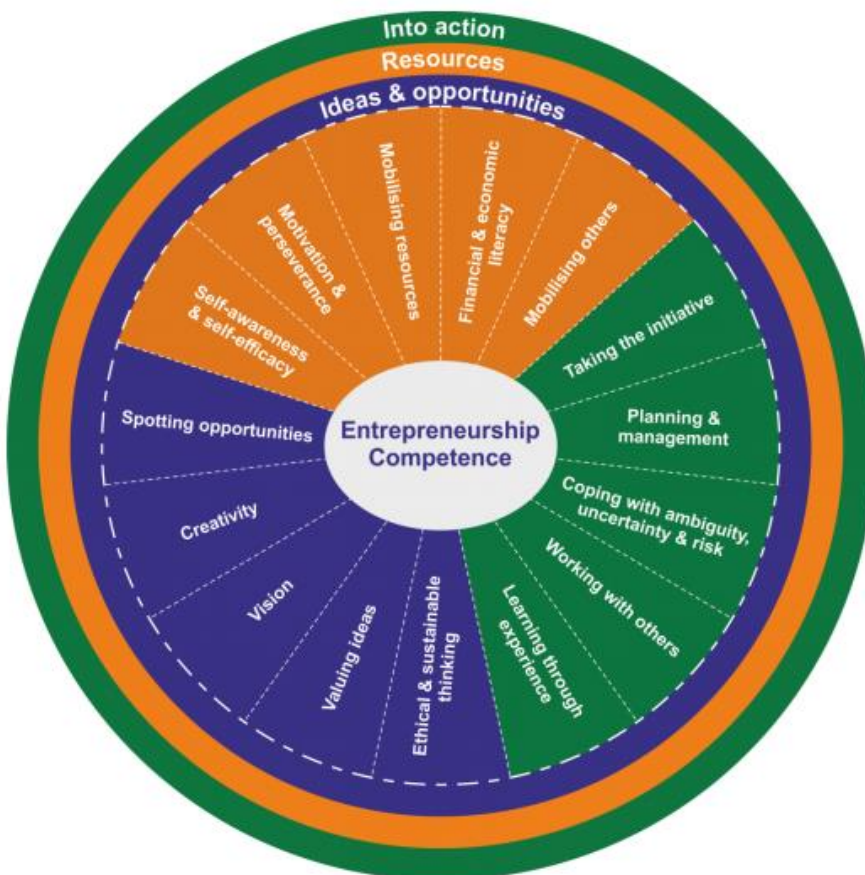
However, Mitchelmore and Rowley (2010:95) make the distinction between 'competence' and 'competency' where they describe competence as "the evaluation of performance in a specific domain of activity, whereas competency is a class of things that can be used to characterise individuals and their behaviours". Competencies are considered to relate to attributes and skills underpinning

behaviour (Moore *et al.*, 2002). Entrepreneurial competencies are considered a specific group of competencies which are associated with the exercise of successful entrepreneurship (Mitchelmore and Rowley, 2010). They suggest that the main focus of research on entrepreneurial competencies has been on 'competency' and how it is enabled by a persons' knowledge and skills.

Due to complex nature of OR, this thesis takes an input view of the term 'competency' where the term 'competencies' is used to refer to the attributes and skills underpinning OR competence (Bacigalupo *et al.*, 2016; Hoffman, 1999). Competence in this regard is considered to relate to evaluation of performance in relation to OR, which is typically observed in the form of behaviour (Hoffman, 1999).

Bacigalupo *et al.* (2016) propose 'Entrecomp', a framework of entrepreneurial competences which identifies 'Ideas and Opportunities', 'Resources' and 'Into Action' as the three core competence areas of their conceptual model along with 15 corresponding competences (Figure 2.1). Bacigalupo *et al.* (2016) emphasise that entrepreneurship as a competence is made up of a combination of these.

**Figure 2.1: Areas and competences of the EntreComp conceptual model**



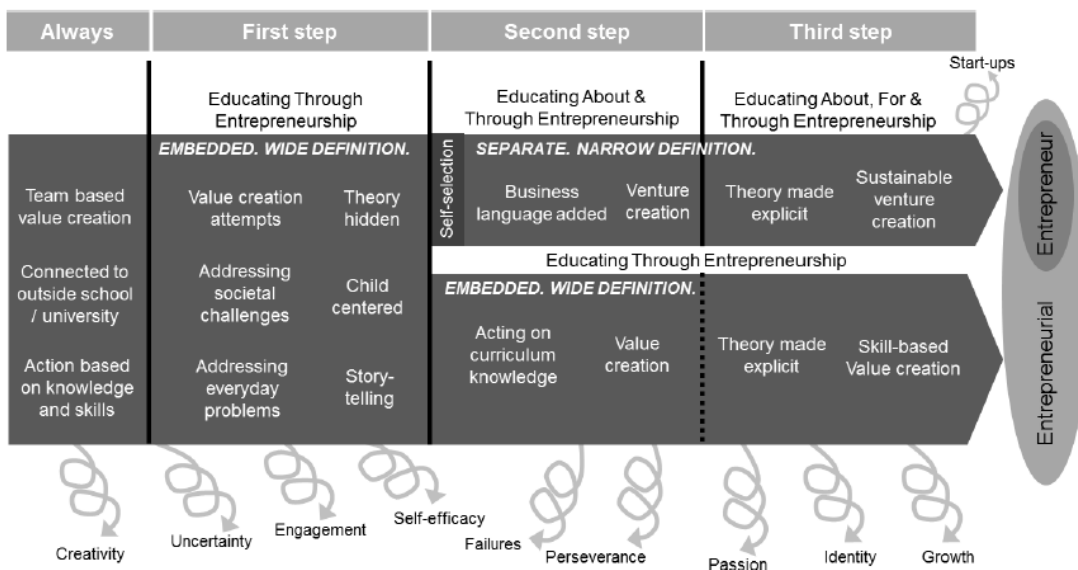
Source: Bacigalupo *et al.* (2016:11)

### **2.3.4 Competence progression**

Rae *et al.* (2012) recognise the need for progression, rather than repetition in EE education. A progression model, as defined by Lackeus (2015:22) “allows for gradual change of definitions applied and learning outcomes stipulated as learners progress in the educational system”. There is a dearth of such models in EE education, yet Lackeus contends that there are calls for progression models to provide clarity on learning outcomes and appropriate pedagogical approaches. Based on a review of EE education literature Lackeus cites four progression models: Gibb (2008) who developed a progression model based on the education system (primary through to university), Blenker, Korsgaard, Neergaard and Thrane (2011) who propose four basic building blocks for developing entrepreneurial attitudes in learners and Rasmussen and Nybye (2013) who highlight four basic dimensions that educators always need to be aware of, at each educational level (Lackeus, 2015). Lackeus (2013) developed the fourth, an action based progression model informed by four different types of action-based pedagogy which increase in complexity as students progress through the education system.

In an attempt to reconcile the four models, Lackeus (2015) developed a unified progression model for entrepreneurial education (Figure 2.2). In doing so he identified common features such as having a team approach, value creation, exposure to the external environment and acting on knowledge and skills. The first stage (primary level) sees EE education embedded in core subjects and embraces communication and peer to peer learning. The second stage (frequently secondary level) sees EE education potentially being delivered as a separate subject, introducing relevant knowledge and terminology. The third stage sees the underpinning theory made explicit and student reflection leading to deeper learning. This stage emphasises the application of skills which could potentially lead to significant value creation.

**Figure 2.2: A unified model of entrepreneurial education**



Source: Lackeus (2015:25)

Very recently, Bacigalupo *et al.* (2016) proposed an alternative progression model which envisages four stages and eight levels of progression: Foundation, Intermediate, Advanced and Expert. At foundation stage (levels 1 & 2), Bacigalupo *et al.* (2016) see students developing competencies with the help of support, moving students towards more independent learning and assuming greater responsibility for learning over time. The expert stage (levels 7 & 8) is considered to refer to expertise beyond the average, leading to radical or breakthrough innovations (Table 2.2).

Bacigalupo *et al.* (2016) consider that entrepreneurial competence is progressed by:

1. Developing increasing autonomy and responsibility in acting upon ideas and opportunities to create value;
2. Developing the capacity to generate value from simple and predictable contexts up to complex, constantly changing environments (Bacigalupo *et al.*, 2016:14).

In their report to the European Commission, Bacigalupo *et al.* (2016) break this model down into levels of proficiency by competency, providing a welcome level of clarity in this area. However, Bacigalupo *et al.* (2016) note the limitation of their conceptual model due to the lack of supporting empirical evidence of its effectiveness at the time of writing. This very recent model of progression resonates strongly with latter stages of this thesis.

**Table 2.2: Entrecomp progression model**

Foundation		Intermediate		Advanced		Expert	
Relying on support <sup>6</sup> from others		Building independence		Taking responsibility		Driving transformation, innovation and growth	
Under direct supervision.	With reduced support from others, some autonomy and together with my peers.	On my own and together with my peers.	Taking and sharing some responsibilities.	With some guidance and together with others.	Taking responsibility for making decisions and working with others.	Taking responsibility for contributing to complex developments in a specific field.	Contributing substantially to the development of a specific field.
Discover	Explore	Experiment	Dare	Improve	Reinforce	Expand	Transform
Level 1 focuses mainly on discovering your qualities, potential, interests and wishes. It also focuses on recognising different types of problems and needs that can be solved creatively, and on developing individual skills and attitudes.	Level 2 focuses on exploring different approaches to problems, concentrating on diversity and developing social skills and attitudes.	Level 3 focuses on critical thinking and on experimenting with creating value, for instance through practical entrepreneurial experiences.	Level 4 focuses on turning ideas into action in 'real life' and on taking responsibility for this.	Level 5 focuses on improving your skills for turning ideas into action, taking increasing responsibility for creating value, and developing knowledge about entrepreneurship.	Level 6 focuses on working with others, using the knowledge you have to generate value, dealing with increasingly complex challenges.	Level 7 focuses on the competences needed to deal with complex challenges, handling a constantly changing environment where the degree of uncertainty is high.	Level 8 focuses on emerging challenges by developing new knowledge, through research and development and innovation capabilities to achieve excellence and transform the ways things are done.

Source: Bacigalupo *et al.* (2016:16).

## **2.4 Education approaches**

EE education at HE occurs within the broader context of HE teaching and learning. New education approaches have emerged in HE that have relevance for EE education. This section will briefly consider some of these developments before examining approaches used in EE education in more detail.

### **2.4.1 Pedagogy, Andragogy and Heutagogy**

Current education approaches in HE embrace pedagogical, andragogical and, to a more limited degree, heutagogical methods. The following section will provide a brief explanation of each. Traditional pedagogy, andragogy and heutagogy open up the educator to different models, approaches and methods of learning and teaching.

#### **2.4.1.1 Pedagogy**

Pedagogy, the art and science of educating children (Ashton and Newman, 2006; Knowles, 1984), is the most popular approach. However, the term Pedagogy is used quite liberally and has grown to mean the practice, method or study of teaching (Fry, Ketteridge and Marshall, 2003) and the word is often used as a synonym of for teaching itself (Ashton and Newman, 2006). Pedagogic approaches see the learner as dependant upon the teacher who determines what, when and how learning will occur (Knowles, 1984). Learning needs at a particular stage are considered uniform and what is learned now will be applied in the future (Knowles, 1984). The experience that the learner has is of little use to them and the role of the teacher is to transmit the wisdom of others (Ashton and Newman, 2006; Knowles, 1984). Responsibility for learning resides firmly with the teacher.

#### **2.4.1.2 Andragogy**

Adult learners have different ways of learning (Hase and Kenyon, 2001) and during the nineteen seventies Knowles introduced the concept of Andragogy (Blaschke, 2012; Fry *et al.*, 2003; Hase and Kenyon, 2001). Andragogy is defined by Knowles (1984:40) as “the art and science of teaching adults to learn”. Knowles (1984) firmly sees the adult learner as being self-directed where experience is considered core to allowing learners to identify learning needs and understand the meaning of their learning. Andragogy has therefore been positioned as “doing in the present rather than preparing for the future” (Ashton and Newman, 2006:828). Adult learners have different learning needs and they learn at different paces. The role of the teacher is one of coach and facilitator, where they provide tools for helping learners assess their specific learning needs and then assist the learner to learn. Responsibility for learning is therefore shared between the teacher and the student and Knowles (1984) suggests that the student should be actively involved in planning how learning should be achieved and in assessing learning outcomes.

Knowles (1984) considers that in their purest forms pedagogy and andragogy represent either end of a spectrum, with teaching experience frequently occurring in the middle. Therefore, assumptions from both models can be used alongside each other. However while andragogy has achieved widespread acceptance, it is not without its critics. Rachal (2002) argues that the effectiveness of the



andragogical approach has been difficult to test empirically, that the definition of andragogy is limiting and that it should move more towards an operational, criteria based definition. Meanwhile, Hannon (2006) argues that andragogical philosophies provide a good foundation for linking entrepreneurship and education yet more recent thinking on teaching and learning considers that andragogy is no longer sufficient to prepare learners for the challenges of the modern world (Blaschke, 2012).

#### **2.4.1.3 Heutagogy**

Heutagogy, learner determined learning (Ashton and Newman, 2006; Hase and Kenyon, 2001) is now considered a more suitable approach to develop students who are capable of dealing with the 21<sup>st</sup> Century challenges of globalisation, knowledge intensity and market complexity (Blaschke, 2012; Ashton and Newman, 2006; Hase and Kenyon, 2001). Heutagogy is considered an extension of andragogy as it equips students for lifelong learning by developing the skills, experience and beliefs needed to learn 'how' to learn (Blaschke, 2012; Ashton and Newman, 2006; Hase and Kenyon, 2001). The focus is on both competency and capability development (Blaschke, 2012). In line with andragogy, the learner identifies their own learning needs (Hase and Kenyon, 2001) but complete control for learning is given over to the student in terms of the path, content and method of assessment (Blaschke, 2012).

Heutagogy is considered an holistic approach where learners make choices based on what is important or interesting to them (Blaschke, 2012). Double loop learning, which is neither planned nor linear (Hase and Kenyon, 2001) is considered core to the process, along with reflection, where the learner converts the experience into learning (Hase and Kenyon, 2001). Blaschke (2012) sees this as a growth process that can lead to transformative learning enabling people to become proactive in their thinking (Hase and Kenyon, 2001). Heutagogy is considered to embrace collaborative learning, openly sharing, discussing and reflecting on knowledge and learning experiences (Blaschke, 2012). The role of the educator in this instance is described as a guide (Ashton and Newman, 2006) who provides materials (Hase and Kenyon, 2001) which can be used by the learners if they so need. Features of this approach include learning contracts, flexible curriculum, learner-directed questions, flexible and negotiated assessments, collaborative learning, learning journals, action research and formative and summative assessment (Blaschke, 2012).

Heutagogy appears to assume a level of maturity on the side of the learner as they must take full responsibility for their own learning. Indeed, it is argued that relinquishing power to the learner poses the greatest challenge to educators (Blaschke, 2012). Jones, Matlay, Penaluna and Penaluna (2014) contend that in an ideal world we are assumed to move from pedagogy to andragogy to heutagogy, but that in reality this may prove unrealistic due to the dominance of pedagogy assertions in higher education. Table 2.3 contrasts the three approaches.

**Table 2.3: Contrasting models of education**

	Pedagogy	Andragogy	Heutagogy
• <b>Learner Maturity</b>	• Less mature	• Youth / Adult	• Mature Learner
• <b>Ownership</b>	• Dependent	• Self-directed	• Self-directed
• <b>Experience</b>	• Inexperienced	• Life experience	• Valuable life and learning experience
• <b>Application</b>	• Delayed	• Immediate	• Immediate and future focused
• <b>Focus</b>	• Subject	• Performance	• Process
• <b>Responsibility for Learning</b>	• Teacher Responsible for Learning	• Joint Responsibility for Learning	• Learner Responsibility for Learning
• <b>Assessment</b>	• Teacher assessed	• Self Assessment	• Self Assessment
• <b>Teacher Role</b>	• Teacher: transmitter of wisdom	• Mentor / facilitator	• Guide

Source: Researcher's own work

#### 2.4.2 Teaching and learning in HE

Teaching and learning are inter-related as Prosser and Trigwell (1999:11) explain “good teaching is about helping students to learn”. In recognition of this, teaching has moved to embrace student focused approaches, which recognise that students experience learning in different ways and to enable learners to experience it in the same way as intended by educators (Prosser and Trigwell, 1999).

To enhance the student learning experience educators have embraced innovative teaching practices such as the flipped classroom, where the focus is on applying concepts previously introduced in the students' own time, through interaction and reflection (Zuber, 2016). Similarly, there has been a resurgence in the popularity of peer-to-peer learning, where students engage in reciprocal learning relationships and networks (Hilsdon, 2014). A review of international teaching and learning practices by O'Mahony (2015) reflects this emphasis on the student learning experience with the prevalence of practices such as:

- Experiential learning (individual and group)
- Blended learning
- Enquiry-based learning
- Community-based research
- Project based learning
- Team teaching

Prosser and Trigwell (1999) suggest that educators experience teaching in different ways as “their perceptions of their teaching context, the way they approach their teaching, and the outcomes of those approaches vary between

individuals in the same context, as well as between contexts” (Prosser and Trigwell, 1999:7). Indeed, it is recognised that the specific application of these practices also varies due to the diverse needs, priorities and objectives of different disciplinary groups (O’Mahony, 2015). As a complete review of teaching practices is outside the scope of this thesis, the chapter will therefore focus on those commonly adopted by EE educators in the EE education domain.

### **2.4.3 Approaches used in EE education**

The European Commission (2013) identify the need for the development of a range of effective teaching methodologies for all EE educators. However, criticisms are levelled at traditional approaches for delivering EE which are considered to be typically lecture based and pedagogic in nature (Penaluna *et al.*, 2013; Neck and Greene, 2011; Penaluna *et al.*, 2011; Krueger, 2009; Matlay, 2008; Matlay and Carey, 2007; Jones and English, 2004). Krueger (2009:37) suggests that the pedagogic approach can be summed up as “learning the answers” versus “finding the questions” and such didactical teaching approaches are now considered as inadequate and unsuitable for EE education (Krueger, 2009; Fayolle and Gailly, 2008; Heinonen and Poikkijoki, 2006). Interestingly, Kirby (2002, as cited by Heinonen and Poikkijoki, 2006) suggests that such approaches may in fact impede the development of entrepreneurial skills and behaviours (Penaluna *et al.*, 2013). Interestingly, Penaluna *et al.* (2011) extend the criticism towards assessment by challenging the assumption that creativity required for entrepreneurship can be both developed and assessed using analytically focused pedagogies.

Gibb (2007) developed a new model of EE education which is built around the entrepreneurial mind-set, that uses a wide set of carefully focused teaching approaches, embraces emotion and relationship building and the need to cope with uncertainties. This ‘entrepreneurial mind-set’ is recognised as being learnable and as it seeks to develop entrepreneurial “behaviours, attributes and skills” (Boyles, 2012; Gibb, 2007:112). Nielsen and Storvang (2014) support this approach as they argue that we should equip students to navigate in and create their own future by teaching them the necessary entrepreneurial processes, methods and tools. Similarly the European Commission (2013) believe that it is this mind-set which enables entrepreneurs to act on their ideas and also increase their employability, should they so choose. This perspective is increasingly informing EE education. As this thesis is looking at EE education from the educators’ perspective, a consideration of more popular approaches currently used in the delivery of EE education will now follow.

#### **2.4.3.1 Student-centred learning**

In light of developments such as the entrepreneurial mind-set, and in response to the aforementioned criticisms, there has been an increase in interest in more student-centred approaches in EE education (Jones *et al.*, 2014; Lackeus, 2013; Krueger, 2009; Fayolle and Gailly, 2008; Jones and English, 2004). Fayolle and Gailly (2008) clearly argue that the learner position should be considered when teaching entrepreneurship, which Jones *et al.* (2014) respond to by attempting to

reconcile EE teaching approaches to student learning. They explain that students learn over time, moving the emphasis increasingly to learning through enterprise, building a disposition from curious to engaged and ultimately to confident learners. This, they suggest, can be achieved by EE educators shifting the emphasis from pedagogy through to andragogy and ultimately heutagogy over time. Curth (2015) provides evidence from a number of countries that supports the view that to develop entrepreneurial attitudes it is important to use varied yet suitable methods.

Krueger (2009) supports a student-centred approach where students are self-directed in that they identify their own problems and even have a say in the method of assessment, echoing heutagogic undertones. Self-directed learning (SDL) is described by Knowles (1975:18 as cited by Dynan, Cate and Rhee, 2008:96) as being a process where students “take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources, choosing and implementing appropriate learning strategies, and evaluating learning outcomes”. Such a skill, if delivered successfully, is considered to enable life-long learning.

In their study in Denmark, Sorensen and Davidsen (2016) revealed that students are far from self-directed and that teachers control their learning. Matching students’ readiness for SDL to the environment has been shown to impact the acquisition of SDL skills in students (Dynan *et al.*, 2008). For students who are unprepared for SDL, a more structured environment is considered more suitable, whereas those who are prepared for SDL perform better in an unstructured environment. Dynan *et al.* (2008) suggest therefore that SDL skills can be developed by designing early coursework that is more structured in nature and increasing opportunities for SDL as students move through the curriculum.

#### **2.4.3.2 Action approaches**

Lackeus (2013:13) refers to the work of Cope (2005) who considers that “there is only one way to learn to become entrepreneurial, and that is by learning through own experience”. Research shows that EE educators have an interest in action based learning (Hoidn and Kärkkäinen, 2014; Kirketerp, 2012; Krueger, 2009; Cooney and Murray, 2008; Corbett, 2005b; Jones and English, 2004) and it is claimed that such approaches “enhance entrepreneurial thinking to a remarkable degree” (Krueger, 2009:42). This is supported by Bell (2015) who showed that action based learning does enhance entrepreneurial skills, in particular self-efficacy and the opportunity to be creative, albeit the findings must be treated with caution as they were based on a single site study of undergraduate students. Lackeus (2013) also contends that action based learning impacts attitudinal learning outcomes over skill-based and knowledge outcomes, but again his study was limited by a small sample size. Reflection is considered an important feature of action based learning where students codify their learning, yet Neck, Greene and Brush (2014) contend that little information is available in EE education research as to how students reflect.

Researchers observe that while the learning by doing approach is popular, the question has now become 'learning by doing what?' and that research as to what students should learn is in the early stages (Lackeus, 2013; Kirketerp, 2012). Neck *et al.* (2014) contend that EE education should be method driven, where students are guided through a set of theory-based practices, what they term actionable theory, to enable students to act more entrepreneurially. Similarly, Kirketerp (2012, citing Kirketerp 2011) presents a push method of transforming thoughts into action. This method posits that it is important to push theory into thought provoking action which pushes a process of reflection, further visualisation and further action. In this context Kirketerp (2012) presents seven concurrent strategies she describes as entrepreneurship didactics and this she suggests leads to mastery experiences. However, Penaluna *et al.* (2012:169) found evidence which suggests that, in reality in the context of EE education, "HE tends to be inflexible in delivering experiential mechanisms".

#### **2.4.3.3 Problem oriented approaches**

Problem Based Learning (PBL) is a method which facilitates student learning through problem solving (Andersen and Heilesen, 2015). It is considered popular in EE education due to its experiential nature (Neck *et al.*, 2014) as it is recognised for allowing students to make sense of their learning in the light of prior knowledge and developing transferrable skills which can be applied to solving other problems (Hoidn and Kärkkäinen, 2014). PBL centres around solving problems that do not have 'one single solution' as they are ill structured, complex and open-ended. In PBL the educator tends to carefully craft the problem and signposts students with relevant references (Andersen and Heilesen, 2015). This requires students to explore multiple paths in dealing with and resolving the given problem.

However, PBL critics suggest that the widespread use of PBL has resulted in misapplications and misconceptions thereby resulting in practices that do not achieve their learning outcomes (Hoidn and Kärkkäinen, 2014). Indeed some researchers are critical of the approach due to the very fact that PBL starts with problems being presented to the students (Andersen and Heilesen, 2015; Penaluna *et al.*, 2013).

#### **2.4.3.4 Curiosity-based approaches**

Penaluna *et al.* (2013) suggest extending the PBL approach towards a curiosity-based learning approach where the students out of curiosity define the problem themselves, thus requiring creativity skills and tapping into their internal motivation. Curiosity may be defined as a desire to know, to see, or to experience that motivates exploratory behaviour directed towards the acquisition of new information and knowledge (Litman, 2006). A curiosity based learning approach encourages students to recognise new problems themselves, based on their own experience and encourages them to explore and dig deep around problems to truly understand them.

Kashdan, Rose and Fincham (2004) posit that curiosity is a pleasurable motivational component which enables people to link cues for novelty and change

with opportunities for growth. Curiosity is linked to openness to new ideas and new experiences and self-determined tendencies to engage in activities for mere pleasure and challenge (Kashdan *et al.*, 2004). This supports claims by Penaluna *et al.* (2013) that a curiosity based learning approach seeks to tap into students' internal motivation to learn as they seek to learn more in order to resolve the problem they have identified. However, Penaluna *et al.*'s recommendations in this regard are not evidence-based.

#### **2.4.3.5 Problem oriented project approaches**

The curiosity-based learning approach aligns with a problem oriented project learning approach (PPL). PPL is considered to share basic pedagogical ideas with PBL (Andersen and Heilesen, 2015) such as student responsibility for learning, intertwining theory and practice, focus on process of knowledge acquisition rather than product, educator as facilitator, student and peer self-assessment and interpersonal development. However Andersen and Heilesen (2015) contend that the crucial difference between them lies in who formulates the problem for students and the way work progresses. As PPL requires students to determine the problems from their own project work and find resources relevant to their study themselves.

## **2.5 Assessment**

While a full review of assessment practices employed in the HE sector is outside the remit of this current research, a brief description of the broader context in which assessment of EE sits is useful in this regard.

Assessment is considered to promote both effective teaching and learning and is seen as one of the most important functions of HE as it is recognised to have a huge impact on student learning behaviour and on their future career (QQI, 2015; Higher Education Academy, 2012). Assessment is considered to impact student learning by influencing what, when and how students study and the approach that they take to their learning (Higher Education Academy, 2012; Prosser and Trigwell, 1999). Prosser and Trigwell (1999) also argue that assessment should enable educators to determine the variation in student understanding and give students a guide as to the quality of their performance. Indeed, Pittaway, Hannon, Gibb and Thompson (2009) reflect the complexity and tensions that exist with regard to the role of assessment in HE and its significance for the student, the educator, academic institutions and external stakeholders alike.

Assessment is frequently categorised into two distinct forms:

**Formative assessment** has a developmental purpose and is designed to help learners learn more effectively by giving them feedback on their performance and on how it can be improved and/or maintained. Reflective practice by students sometimes contributes to this.

**Summative assessment** has a more formal purpose and is used to indicate the extent of a learner's success in meeting the criteria used to gauge the intended learning outcomes. The marks awarded count towards the final mark/classification of the programme or module. (QAA, 2015:81)

It is recognised that assessment standards cannot be prescriptive as assessment must fit the needs of individual learning institutions and academic disciplines (QQI, 2015; Higher Education Academy, 2012). The broader debate on assessment in the HE sector recognises the need for innovative assessment practice. It is argued that traditional assessment, with its emphasis on summative assessment, has not kept up pace with changes in the HE context, such as modularisation, the increasingly diverse nature of students and the relevance of assessment to the world of work (Higher Education Academy, 2012). In particular, traditional assessment is criticised for not meeting the needs of the 21<sup>st</sup> Century graduate, where skills and attributes such as creativity, risk taking, independent learning, flexibility and responsiveness are in demand. Therefore, Pittaway *et al.* (2009) argue that the challenge with assessment is to define what it is that educators want students to learn.

In response, changes in assessment practices have been encouraged. These include shifting the balance from summative to more formative forms of assessment such as peer assessment, self-assessment, embracing enquiry based learning and assessment practices, the use of technology, learning portfolios and group critique for example (QAA, 2015; Higher Education Academy, 2012).

### **2.5.1 Assessment of EE education**

Pittaway and Edwards (2012:779) define assessment as “the means through which educators can gauge the link between desired educational outcomes and actual student achievement” and its role in EE education is considered an important one. However, descriptions of EE assessment as being ‘underdeveloped’ (Thematic Working Group on Entrepreneurship Education, 2014), comments on the ‘paucity of work’ (Pittaway *et al.*, 2009) and observations of research on EE education assessment as being ‘embryonic’ (Carey and Matlay, 2010) reveal the relative neglect of assessment in EE in research to date. This is increasingly being acknowledged as a significant oversight in the field (Elmholdt, Warhuus and Blenker, 2016; Pittaway and Edwards, 2012; Pittaway *et al.*, 2009).

The European Commission (2012) calls for EE education assessment to signal to educators the importance of competencies such as creativity and problem solving, echoing earlier competency requirements for the 21<sup>st</sup> Century student. However, Jones and Penaluna (2013) contend that these areas are relatively ignored in current assessment practices. Indeed, in their study of assessment practices in the USA and UK, Pittaway and Edwards (2012) found a range of assessment practices in use and a progression towards more formative forms of assessment as providers moved from knowledge based EE education to more experiential EE education provision. However, of concern to Pittaway and Edwards was evidence that the majority of assessment practices in EE education were found to be still quite traditional, with an emphasis on knowledge acquisition and objective, summative assessment. These traditional approaches (essays, exams and reports) are generally not considered appropriate for assessing outcomes such as attributes or behaviours associated with EE education (Pittaway *et al.*, 2009; Smith, Collins and Hannon, 2006). The Thematic Working Group on

Entrepreneurship Education (2014:12) also contend that much assessment in EE education is not aligned with learning outcomes which, they suggest, can result in non-assessed outcomes “not being taught nor valued”.

In response, there are calls for EE assessment to become more learning outcome based (Thematic Working Group on Entrepreneurship Education, 2014) and innovative in practice (Pittaway and Edwards, 2012; Pittaway *et al.*, 2009). Pittaway *et al.* (2009:89) contend that:

Enterprise Education, one could argue, should be one of the more innovative forms of learning in Higher Education. It consequently requires assessment practices that capture and assess learning effectively and by definition these practices may need to be innovative.

Krueger (2009) advocates the use of more constructivistic approaches to assessment such as the use of portfolios and process-olios. Pittaway *et al.* (2009) revealed an appetite by EE educators for innovative assessment methods by revealing a diverse list of innovative forms of potential assessment generated by educators themselves. However, such innovation is recognised to pose challenges for the way in which it is assessed (Smith *et al.*, 2006) as more recently Thomassen (2016) revealed that educators express difficulty in formally assessing the experiential nature of EE education. Indeed, Carey and Matlay (2010) contend that extending EE assessment methods to include assessment of behaviour presents a real challenge to academic institutions. Pittaway *et al.* (2009) recognise this complexity and suggest that innovative assessment must align learning outcomes, assessment tasks and learning opportunities. In this regard, Carey and Matlay (2010) contend that there is scope for EE educators to consider pedagogies and assessment approaches used in creative disciplines.

## **2.6 Summary of developments in EE education**

In summary, the literature demonstrates that changes are afoot in EE education. The discipline has seen a broadening of its scope to include the entrepreneurial mind-set and a concerted move away from traditional pedagogic approaches towards more student-centred, heutagogic ones. The emphasis has shifted towards more learner centred approaches such as experiential and action based learning which brings the development of student attributes, behaviours and skills into focus. As shown in the current chapter, this has created challenges for both the teaching and assessment of EE education.

This chapter sets the context for this research. The following chapter will explore and unpick OR as a feature of EE education and critically consider how the literature suggests OR education is currently delivered in HE.



## **Chapter 3 Opportunity Recognition**

### **3.1 Introduction**

This is the second of three literature review chapters. This chapter draws attention to the growing calls for EE education to develop student competencies in opportunity recognition (OR) and contrasts this against perceptions of OR education in practice. The chapter explores the nature of OR, from the creative perspective which leads to a consideration of creativity itself and a discussion of creativity based models of OR. The factors that the literature suggests influence OR are considered, from which a number of OR attributes, behaviours and skills are identified. This leads to a discussion of the way in which creativity based attributes, behaviours and skills associated with OR can be developed in a HE learning environment. The chapter then critically considers how the creative nature of OR is currently approached in EE education.

### **3.2 Opportunity recognition as a feature of EE education**

OR and the actions of entrepreneurs are described as being 'invariably central' in entrepreneurship research (Shepherd, 2015). OR is considered important for all citizens as Europe needs future generations who are "creative, socially responsible, can spot opportunities, understand and take risks, and can work in teams and solve problems", enabling them to be "entrepreneurial in society, in work and in business" (Thematic Working Group on Entrepreneurship Education, 2014:7). Indeed they go on to emphasise the importance of OR when they explain:

Entrepreneurship education is about learners developing the skills and mind-set to be able to turn creative ideas into entrepreneurial action. This is a key competence for all learners, supporting personal development, active citizenship, social inclusion and employability. It is relevant across the lifelong learning process, in all disciplines of learning and to all forms of education and training (formal, non-formal and informal) which contribute to an entrepreneurial spirit or behaviour, with or without a commercial objective (Thematic Working Group on Entrepreneurship Education, 2014:8).

In enterprise and business literature, OR is perceived as being unique to EE education and as such it is argued that it should play an important part in it (Fletcher, 2006; Hills and Lumpkin, 1997). DeTienne and Chandler (2004) conclude that education in OR enhances both the quantity and innovativeness of ideas, albeit their research was based on early stage studies. The literature supports the view that the OR process can be enhanced by developing students' creativeness through enhancing their cognitive abilities to identify market opportunities (Krueger, 2009; Saks and Gaglio, 2002; Hills and Lumpkin, 1997).

The potential of such education on OR competency development is emphasised by Nixdorff and Solomon (2007:7) in relation to the success of new ventures:

It would appear that entrepreneurs need certain competencies in order to enhance the probability of success of their new ventures, and one of those competencies is opportunity recognition. Opportunity recognition is primarily a cognitive process that most likely can be enhanced with training, and one of the purposes of education is to increase desired behaviours. If we look at the problem from that simplistic level, it would be possible that focused entrepreneurship education could increase the degree of opportunity recognition competency, and hence, behaviour.

The term OR education (ORedu) is used in this thesis. **ORedu** in the context of this research is defined by the researcher as being **the variety of ways in which educators actively seek to develop opportunity recognition attributes, behaviours and skills in students.**

### **3.2.1 Opportunity recognition competences**

EE education is perceived, at a policy level, as enabling student competences in creativity and OR (Bacigalupo *et al.*, 2016; European Commission, 2014; QAA, 2012) as reflected by the QAA (2012:8) statement that EE education aims to produce graduates “who are capable of identifying opportunities”. The recently published EntreComp framework proposed by Bacigalupo *et al.* (2016) (section 2.3.3) supports this belief by identifying ideas and opportunities as being central to EE education competence development. Their framework proposes that ideas and opportunities require competences in: spotting opportunities (which includes creating opportunities), creativity, vision (imagining the future), valuing ideas, ethical and sustainable thinking (consequences of ideas). In addition, other categories of ‘resource’ and ‘action’ competences are also considered to be relevant to the area of ideas and opportunities.

### **3.2.2 Opportunity recognition education in practice**

Whilst at policy level OR is increasingly being considered as important (Bacigalupo *et al.*, 2016; European Commission, 2014; QAA, 2012), in practice it appears to be an area that is frequently overlooked (Nixdorff and Solomon, 2007; Kellet, 2006; Hills and Lumpkin, 1997) with many entrepreneurship programmes assuming that the opportunity has been identified in advance (Neck and Greene, 2011). In a small study of EE educators, Saks and Gaglio (2002) found that many professors indicated an emerging interest in teaching OR but considered it ‘unteachable’. In particular, they criticised the inattention given to the area in text books, teaching approaches and available pedagogies. In the same study, opportunity evaluation skills were considered teachable, and Saks and Gaglio (2002) contend, that opportunity evaluation appeared more important to educators, in educational terms, than other parts of the OR process. More recently, Jones and Penaluna (2013:807) still question “whether we may be putting the cart before the horse when we start to teach enterprise with evaluation strategies, not idea generation strategies.”

A lack of momentum to make teaching OR a priority is recognised by Krueger (2009), while Neck and Greene (2011) contend that not enough is being done to enable students to creatively engage in OR. This view is supported by the All-Party Parliamentary Group for Micro Businesses (2014:76) which reflects conclusions from the 2010 UK GEM data that suggests that EE training appears “to be poor at enhancing opportunity recognition”. Coupled with this are observations by educators that students ‘lack ideas’ and that they often do not go beyond idea generation at a cognitive level, detaching it from reality (Thomassen, 2016).

Of note is that creativity and OR are the two most commonly mentioned competencies in EE education, yet researchers contend that there is little effort to teach them as competencies (Nixdorff and Solomon, 2007). Penaluna and Penaluna (2008) argue that how creative mindsets are developed is little understood in EE education albeit much discussion focuses on the creative aspects of entrepreneurship. In addition, the literature points to a lack of structured guidance available to educators on selecting appropriate teaching methods and on the skills needed to turn ideas into opportunities (Goldsby and Nelson, 2012; Balan and Metcalfe, 2012). This lack of clarity has resulted in calls to make practical guidelines or frameworks available (Goldsby and Nelson, 2012; Balan and Metcalfe, 2012; Krueger, 2009; Saks and Gaglio, 2002).

Based on the aforementioned arguments, the researcher recognises the paradox that exists in relation to OR in the context of EE education i.e. its centrality as an entrepreneurial concept versus its suggested oversight in practice. As OR competencies are considered necessary for students to create their own future (section 2.2), to evolve this debate it is necessary to define what is understood by the term OR. Taking an educators perspective in this thesis, it is also important to consider the factors that influence it in order to inform any attempt to enhance student OR competence. The following sections will address these areas.

### **3.3 Defining opportunity recognition**

The concept of OR is pivotal to entrepreneurship theory; as Scott and Venkataraman (2000:220) state, ‘to have entrepreneurship, you must first have entrepreneurial opportunities’. OR is seen as the first step in the entrepreneurship process (Baron, 2006), although it can also occur later in the process, depending on the type of entrepreneur (Chelly, 2011; Tegtmeier, 2011). For example, the literature suggests that for ‘push entrepreneurs’ OR can happen after the decision to set up an entrepreneurial venture; whereas ‘pull entrepreneurs’ tend to recognise the opportunity first and make the decision to act on it (Chelly, 2011 citing Bhawe, 1994; Tegtmeier, 2011). However, the literature reveals that OR is not a once off event and it is considered critically important for entrepreneurial ventures due to the ongoing nature of the process (Hills and Lumpkin, 1997).

Not all researchers subscribe to the OR view of entrepreneurship suggesting that an emphasis on OR overlooks an entrepreneur’s motivation to start a business

and it fails to distinguish between good and bad ideas in terms of potential value (Nightingale, 1998 as cited by Chell, 2013; Chalkley, 2011). Chell (2013) argues that the start point of the entrepreneurship process lies in understanding that there is a market or social need and recognising its relative value. However, the researcher of this thesis contends that this requires problem solving on the entrepreneurs part and the identification of an unsatisfied need results in an opportunity to provide something of value. Indeed, the more expanded view of EE education sees OR as being necessary beyond the new venture, where individuals can be enabled to identify opportunities across all aspects of their lives (Thematic Working group on Entrepreneurship Education, 2014). Regardless of when it occurs, OR has been linked to creativity due to the importance of idea generation in the OR process and in the processes involved in effectively exploiting opportunities (Dimov, 2011; Ardichvili *et al.*, 2003).

The term opportunity development is frequently used to describe both the recognition of an opportunity and successfully identifying and acquiring the necessary resources to realise the opportunity (Vaghely and Julien, 2008; Pretorius *et al.*, 2006; Ardichvili *et al.*, 2003). However, they are not the same and Baron (2006:107) clearly distinguishes OR from opportunity development by defining OR as the “cognitive process (or processes) through which individuals conclude that they have identified an opportunity”. Baron (2006) clearly sees OR as the initial step in a process which then continues with evaluation of the feasibility of that opportunity, assessing its value and taking active steps to realise the opportunity.

The current research ascribes to Barons’ view of OR. The focus of this study is therefore firmly focused on the OR process, leaving resource acquisition and opportunity exploitation outside the remit of this thesis.

### **3.3.1 Different perspectives on entrepreneurial opportunities**

Interest in researching opportunities has grown since the early part of this century (Hansen, Shrader and Monllor, 2009). It is acknowledged in the literature that earlier research paid scant attention to the nature and source of entrepreneurial opportunities (McMullen, Plummer and Acs, 2007; Eckhardt and Shane, 2003). Hansen *et al.* (2009) observe that this early research seemed to assume a common understanding of opportunity or opportunity related processes, and thus no commonly accepted definition of opportunity exists. As Chelly (2011:3) describes, “the term ‘opportunity’ is very similar to ‘love’, everyone knows what it is, but it is difficult to define because it means different things to different people”.

Opportunities can be viewed from a number of different perspectives. McMullen *et al.* (2007) claim that some researchers see opportunities as being inseparable from the individual while others view opportunities as being objective i.e. visible to or created by an entrepreneur. Most frequently, researchers make a clear distinction between the Kirznerian view versus the Schumpeterian view of opportunities (Dimov, 2011; Chelly, 2011; Puhakka, 2011; Hansen *et al.*, 2009; Dutta and Crossan, 2005).

### **3.3.1.1 Kirznerian perspectives**

The Kirznerian perspective provides the foundation of the 'discovery' approach to opportunities which suggests that opportunities exist as objective phenomena in the environment through market disequilibrium (Kirzner, 2009; Alvarez and Barney, 2005; Kirzner, 1997). The entrepreneurs' role is to recognise and seize these opportunities and create profit in so doing (Kirzner, 2009; Eckhardt and Shane, 2003; Shane, 2000; Kirzner, 1997). Information asymmetry, where different people have different information, is considered central to this perspective (Eckhardt and Shane, 2003; Shane, 2000) and entrepreneurial alertness and information acquisition are seen to go hand in hand with OR (Ashkelon, 2010; Kirzner, 2009; Dutta and Crossan, 2005; Alvarez and Barney, 2005; Shane, 2000; Kirzner, 1997). However, Kirzner (1997) argues that opportunities do not arise from systematic search as the entrepreneur is generally unaware of what they do not know and 'surprise' accompanies the realisation that they had overlooked something relevant. Chelly (2011) contends that both the role of the entrepreneur and environmental conditions are equally important as these environmental conditions lead entrepreneurs to identify opportunities.

### **3.3.1.2 Schumpeterian perspectives**

Schumpeter (1934) recognised the value of the entrepreneur as the 'innovator' in a firm, thereby recognising the importance of the entrepreneurs' creativity in creating opportunities. The Schumpeterian view has therefore informed the 'creation' approach to opportunities which assert that entrepreneurs create opportunities through new combinations of information, resources and market forces (Alvarez and Barney, 2005). In this view, the entrepreneur is seen as an innovator who disrupts the marketplace by creating new products, or transforming old ones in a new way by using new methods through a process of 'creative destruction' (Schumpeter, 1976). The focus of creativity perspectives of OR emphasises personal attributes, experience and skills (such as motivation and creativity) that enable the entrepreneur to create opportunities (Dutta and Crossan, 2005). Recent studies on creativity have identified individual qualities that affect creative behaviour such as personality traits, cognitive styles, motivation, knowledge and antecedent conditions (Puhakka, 2011; Alvarez and Barney, 2005). In particular, the role of cognitive styles of thinking and processing information is increasingly present in creative approaches to entrepreneurship (Gielnik, Frese, Graf and Kampschulte 2011; Dimov, 2007a; Ward, 2004).

Of note is that Kirzner (2009) does not see both these views as being mutually exclusive. Indeed, in his article Kirzner (2009:148) acknowledges the need to clarify this common misconception regarding these differing perspectives as he explains his "understanding of the dynamic market process certainly can (and should!) also encompass the consequences of Schumpeterian entrepreneurship".

Differing perspectives are considered to lead to subtle differences in definitions and McMullen *et al.* (2007) argue that this lack of clarity is problematic for research purposes. Sarasvathy (2001) also suggests that the perspective one takes can influence the approach they take to entrepreneurship. However, the literature

suggests that multiple perspectives encourage researchers of opportunities to expand their thinking beyond one narrow point of view (Gartner, Carter and Hills, 2003 as cited by Hansen *et al.*, 2009).

This research adheres to the creativity view of opportunities, where opportunities are considered to emerge based on the creative ability of an individual to link previously unrelated information and patterns. The researcher also recognises that entrepreneurial opportunities can emerge due to changes in market forces but that individuals need to use their creativity to recognise the true nature of these opportunities (Dimov, 2011; Hansen *et al.*, 2009).

### **3.3.1.3 Process perspectives**

Opportunities are rarely pre-formed and are frequently imprecisely-defined (Hansen, Monllor and McMurchie, 2012; Ardichvili *et al.*, 2003). There is strong agreement throughout the literature that OR is a multifaceted iterative process, which is more a constant stream rather than a one off event (Hansen *et al.*, 2012; Dimov, 2011; Dimov, 2007a; Dutta and Crossan, 2005; Ardichvili *et al.*, 2003; Hills, Shrader and Lumpkin, 1999) and one that is time-sensitive and time-dependant (Vaghely and Julien, 2008). OR is seen as an emergent process (Hansen and Lumpkin, 2009) that happens as a result of a series of path-dependant actions (Dimov, 2011).

Dimov (2011) puts forward the idea that the recognition of opportunities is inseparable from the opportunities themselves thus opportunities involve a range of activities from initial insight right through to fully shaped opportunities. Gielnik *et al.* (2011) consider the first step of the OR process to be the generation of multiple original ideas. This is supported by Hansen *et al.* (2012) who contend that opportunities are then developed through a process of fleshing out an idea such that they are reshaped and re-defined.

While scholars appear to agree that creativity is linked to entrepreneurship by the way entrepreneurs come up with new venture ideas, others argue that the nature of this link is a little understood phenomenon (Gielnik *et al.*, 2011). Prior research makes the argument for linking creativity and OR in a number of ways. The focus of much creativity literature is on the creative product, service or process being 'unique' and 'useful', thereby making it relevant from an entrepreneurial perspective (Ward, 2004). Ideas require development in order to become opportunities and this, the literature contends, requires creativity (Hansen *et al.*, 2012; Gielnik *et al.*, 2011). Some entrepreneurship researchers see OR as the output from a creative process (Gielnik *et al.*, 2011; Heionen *et al.*, 2011; Dimov, 2011; Puhakka, 2011) while others view OR as being a creative process in itself (Hansen *et al.*, 2012; Dimov, 2007; Hills *et al.*, 1999).

Gielnik *et al.* (2011) recognise the complexity inherent in understanding the link between creativity and entrepreneurial opportunities as they argue that it requires a disentangling of the different stages of both the creative process and the entrepreneurial process. Research also indicates that generating creative ideas in themselves do not directly lead to viable or successful opportunities (Heinonen *et*

*al.*, 2011; Dimov, 2011; Gielnik *et al.*, 2011). Dimov (2011) poses an interesting question in relation to 'timing' i.e. when do you call a creative idea an opportunity? Both feasibility and action are identified as being a key ingredient in distinguishing ideas from opportunities (Clydesdale, 2012; Dimov, 2011; Chelly, 2011; Dimov, 2007b; McMullen and Shepherd, 2006).

### **3.4 Defining creativity**

The hunt for an agreed definition on creativity reveals many different perspectives. McWilliam and Dawson (2008:635) present Koestler's (1964) definition of creativity as: "the defeat of habit by originality". Amabile (1983) submits that something is judged to be creative depending on whether it is considered to be both novel and appropriate for the task at hand while other commonly mentioned components of creativity include usefulness, value and appropriateness (Padget, 2013; Ward, 2004). Boden (2004) suggests that creative ideas announce themselves with surprise and it is that which indicates novelty, although Csikszentmihalyi (1996) contends that creative ideas are rarely the result of sudden 'insight' but rather they result from hard work.

The social constructionist view is proposed by De Sousa, Pellisser and Monteiro (2012) who present creativity as a social construct in which people come up with an idea and communicate it in a way that is original and meaningful to the creator. De Sousa *et al.* (2012) therefore position creativity as a communication process between the creator and audience or creator and the creative output itself, making it context specific. This supports earlier views by Csikszentmihalyi (1996) who argued that creativity involves recognition by others that it is creative.

The literature distinguishes between different types of creativity, big 'C' creativity (reserved for the great and which is assimilated into and has the potential to change culture) and little 'c' creativity (everyday, small scale, individual expressions of creativity) (Amabile, 2012; Kaufman and Beghetto, 2009; Csikszentmihalyi, 1997). However, it is argued that while such classifications are useful in understanding that all creativity is not the same, these categorisations can be too broad leading to sub-classifications such as mini-creativity (earliest expressions of creativity) and Pro-C (expertise approaching big C) suggesting paths of creative maturation (Kaufman and Beghetto, 2009).

An alternative view of creativity combines what is already known by juxtaposing unrelated facts and ideas to reveal possible solutions (Johnson and Carruthers, 2006; Boden, 2004). However, this approach is not suited to all situations as Puhakka (2011:91) argues that creativity is rooted in context and that "creativity is needed when situations and problems are complex, new and the old solutions do not work anymore". Boden (2004) argues that for ideas to be considered creative it is not enough that they are value-laden and novel, but that they also convey a sense that these ideas could not have happened before. Therefore she distinguishes between two types of creativity: H creativity (historical context) and P creativity (psychological / individual creativity). Indeed the literature reveals that creativity can be viewed from many lenses, which include, but are not limited to:

the individual, the group, the process, the environment or the product perspective (Pei-Ling Tan, 2015; Henry, 1991 as cited by Puhakka, 2011; Amabile, 1983).

### **3.4.1 Creativity lenses**

Individual creativity is associated with psychometric approaches towards creativity which considers the ability of the creative individual and looks at traits, motivation and cognitive styles that make creativity possible (Puhakka, 2011; Ferrari, Cachia and Punie, 2009; Boden, 2004). Some view creativity as being something all people possess to a greater or lesser degree (Kaufman and Beghetto, 2009; Amabile, 1983). However, it is argued that creativity is not just an individual act and it frequently involves others in the act of co-creation (Carter, 2004 as cited by Padget, 2013; Amabile, 1983). Pei-Ling Tan (2015) argues that the concept of 'value' in the creative solutions developed is an important consideration and this decision tends to be made at a group level, implying therefore that creativity is typically a collaborative process. Drazin, Glynn and Kazanjian (1999) illustrate this process where an initial idea is communicated by individuals to a group, whose feedback influences the modification or potential enhancement of these ideas. Therefore, they assert that an individual's creative frame of reference is shaped by their interactions with others.

The environment view, on the other hand, seeks to understand how external conditions influence creativity and acknowledges that creativity can be influenced by an individual's background, community, culture, physical and cyber environment (Padget, 2013). The product view looks at creativity as an outcome in light of product criteria such as novelty and appropriateness (Ferrari *et al.*, 2009; Amabile, 1983). Puhakka (2011) argues that while creativity can be examined through each of these lenses separately, the true nature of creativity considers them together.

#### **3.4.1.1 Creativity models**

Creativity as a process adheres to the phased-oriented studies which look at the mental activity behind why people choose to engage in producing novel ideas (Puhakka, 2011; Ferrari *et al.*, 2009; Drazin *et al.*, 1999; Amabile, 1983). Cognitive approaches towards creativity consider creative behaviour to require several steps. Csikszentmihalyi (1996) contends that process models can give a distorted view of creativity if taken too literally as, in reality, it is more recursive than linear. However, their merit is seen to lie in the simple way they represent the complexity involved and emphasising that creativity does not emerge in mystical ways (Ferrari *et al.*, 2009; Csikszentmihalyi, 1996).

Many of the existing models for creativity processes tend to begin with problem definition (Mumford, Medeiros and Partlow, 2012; Ward, 2004; Csikszentmihalyi, 1997; Amabile 1983). Ward (2004) suggests that people must first define the problem and the way in which people phrase problems strongly influences their ability to develop creative solutions (Ward, 2004). Indeed, Penaluna, Penaluna and Diago (2014) contend that creative mindsets do not accept things as they are but rather seek problems that lie behind what is given by questioning the question. Therefore problem definition is considered instrumental in developing creative



outcomes as it allows individuals to consider a range of options (Ward, 2004 citing Mumford *et al.*, 1994).

Csikszentmihalyi (1996) suggests that it is necessary first to learn about something before we can change it. Therefore problem definition leads to information gathering and searching for concepts that can help the individual make sense of the information in an attempt to solve the problem (Ward, 2004). These concepts then become the basis for conceptual combination leading to new knowledge from which new ideas are generated. Subsequently, these ideas are evaluated, viable ones are selected, implementation is planned and outcomes monitored as they are actioned (Mumford *et al.*, 2012; Ward, 2004; Boden, 2004; Amabile, 1983). Ward (2004) explains how initial ideas may not be creative in themselves but that creativity may emerge as they are explored and developed. These steps are shown to interact with each other and interact with knowledge and motivation to result in creative outcomes. Typically failure at any stage leads people to cycle back to earlier stages.

#### **3.4.1.1.1 Types of problems**

Some view creativity as a special case of problem solving (Treffinger, Selby and Isaksen, 2007 citing Newell, Shaw and Simon, 1962) while others suggest that “creativity is fundamental to the process of problem solving” (Ruscio and Amabile, 1999:252), thus echoing the debate within the creativity literature regarding the distinction between the two. One suggestion is that the difference lies in the types of the problems being considered (Treffinger *et al.*, 2007).

Csikszentmihalyi (1996) distinguishes between presented problems and discovered problems where presented problems are described as being solved faster and requiring less effort yet they can result in creative solution generation. Discovered problems on the other hand are described as those that have not yet been recognised as problems, are more difficult to resolve and which have the potential to have a larger impact on the world. Defined problems are considered to have closed problem definitions in which all the information and problem conditions are made available and only one ‘right’ answer prevails (Chuderski, 2014; Amabile, 1983). These problems tend to be associated with traditional problem solving (Treffinger *et al.*, 2007). Problems with open definitions, are fuzzy, ill-defined novel or rare and therefore have many possible solutions. Such ‘holistic’ type of problem requires fully creative solutions for which a ‘creative type of problem solving’ is more appropriate (Treffinger *et al.*, 2007; Amabile, 1983).

Research has identified the existence of contrasting approaches to problem solving: insight-led and non-insight, or analytical problem solving (Salvi, Bricolo, Fancorneri, Kounios and Beeman, 2015; Csikszentmihalyi, 1996). Insight is described by Kounios, Fleck, Green, Payne, Stevenson, Bowden, and Jung-Beeman (2008:282) as being “the sudden awareness of the solution to a problem with little or no conscious access to the processing leading up to that solution” resulting in individuals being unable to describe the thinking that enabled them to come up with the insight solution (Bowden, Jung-Beeman, Fleck and Kounios,

2005). On the other hand Csikszentmihalyi (1996:83) contends that “insights come to prepared minds” when people have thought long and hard about a problem.

Insight is commonly described as being surprising to individuals whilst analytic problem solving is considered to be a conscious and a deliberate search for solutions (Salvi *et al.*, 2015). Prior to the insight, problem solvers are described as frequently reaching an impasse, which stops them progressing towards a solution (Salvi *et al.*, 2015). For example, cognitive processes such as functional fixity [difficulty in attempting to think about using objects in unconventional ways] and cognitive set [cognitive rigidity in thinking only one possible solution exists] are considered to have an influence on an individual’s problem solving ability (Ruscio and Amabile, 1999 citing Duncker, 1935/45 and Anderson, 1983). Kounios *et al.* (2008) found that insight-led problem solving is prone to errors of omission, where the correctness of a solution is not determined before it enters awareness and therefore can ‘time-out’ without producing any response. Analytical-led problem solving, on the other hand, tends to be prone to errors of commission, where the evidence points to a partial solution prior to completion and individuals are more likely to guess the answer. This corresponds to the description of a barrier to creative thinking known as ‘premature articulation’ which is described as “bringing a solution to bear before it has been fully researched in the broadest possible way” (Penaluna *et al.*, 2013:7).

#### **3.4.1.2 Cognitive approaches**

Cognitive style has been found to influence all phases of the creative process. In particular cognitive styles that demonstrate “flexibility, fluency, originality, lateral thinking and complexity” are considered more inclined to result in individuals processing information into novel ideas (Puhakka, 2011:89). Two complimentary ways of thinking, convergent and divergent thinking, are seen to be associated with the generation of novelty (Csikszentmihalyi, 1996). Geilnik *et al.* (2011) argue that divergent thinking leads to more novel ideas while convergent thinking leads to the selection of the most useful and viable ideas, albeit their study considers limited aspects of creativity. Ashton-James and Chartrand (2009) present convergent thinking as that which enables people to recognise patterns and similarities between disparate pieces of information while Csikszentmihalyi (1996) identifies it in solving problems, which are rational, well defined and which have one possible answer.

Divergent thinking involves the generation of multiple possible solutions, switching perspectives and linking disparate pieces of information in generating solutions (Csikszentmihalyi, 1996). Divergent thinking is described by Geilnik *et al.* (2011:562) as being “the end result of more specific cognitive processes underlying idea generation, such as the application of knowledge, analogical reasoning, conceptual combination / reorganisation or abstraction”. Penaluna *et al.* (2011) consider divergent thinking to be the most critical part of creativity where information is both absorbed and recorded.

#### **3.4.1.3 Pragmatic approaches**

The pragmatic approach to creativity sees creativity being developed using a series of tools and techniques and is closely aligned with the aforementioned cognitive perspectives of creativity (Ferrari *et al.*, 2009). However, research suggests that the way in which students are taught problem solving can impact their problem solving ability where Ruscio and Amabile (1999) found that the type of instruction that students get does influence their perception of the problem solving task, their behaviour during the task and the final solution developed.

### **3.5 Existing creativity based opportunity recognition models**

An examination of models of OR shows distinct similarity with the aforementioned creativity models. Seminal models of OR include those developed by Hills *et al.* (1999) and Hansen and Lumpkin (2009). However, Tegtmeier (2011) argues that not many models of OR exist despite the interest in the subject.

The model of OR proposed by Hills *et al.* (1999) views OR as a special case of the creative process. This model, they argue, builds on the elements of Wallas' (1926) creative process and has the five creative elements: preparation, incubation, insight, evaluation and elaboration. Based on data from a quantitative study, Hills *et al.* (1999) argue that the nature of the creative process is an individual phenomenon, particularly in the early stages. The phases of the process are described in Table 3.1:

**Table 3.1: Five phases of the OR process**

Phase	Description
<b>Preparation</b>	The first stage of the process. It can be conscious, deliberate or unintended (Hansen, Lumpkin and Hills, 2011). It encapsulates the knowledge and experience that a person has before they engage on the journey of OR (including prior knowledge drawn from one’s experience, training, hobbies and social networks). In addition, people need to be sensitive to market forces and demand in order to identify opportunities, and this can be achieved in either a non-deliberate or deliberate way (Hills, <i>et al.</i> , 1999).
<b>Incubation</b>	Occurs when a person is mulling things over in an intuitive and non – intentional way (Hansen <i>et al.</i> , 2011). It frequently occurs when the person is taking a break from thinking about their idea and is frequently doing something else (Hills <i>et al.</i> , 1999). Hansen <i>et al.</i> (2011) describe it as the stage where knowledge domains collide so as to allow for new combinations and associations to take place.
<b>Insight</b>	That light-bulb moment, that spontaneous moment of realisation of a solution or idea (Hills <i>et al.</i> , 1999). This stage does not necessarily move the process forward, as it can in fact lead the person back to preparation and further incubation before an idea or solution is fully formed. Three different types of insight are described: an ‘aha’ idea; a solution to a problem; an idea that becomes available through the person’s social network.
<b>Evaluation</b>	This stage occurs when insights are examined to determine their viability. This normally involves some research to ascertain if the idea is workable in terms of skills, resources, technology etc. It frequently results in the need for further preparation or incubation of the idea. The evaluation stage is most commonly associated with feasibility studies, where ideas are put to the test to determine if they are in fact worthwhile opportunities. It requires the person to be brutally honest and tests their commitment to their idea (Hills <i>et al.</i> , 1999).
<b>Elaboration</b>	Where the idea is put into a form suitable for presentation. It is typically seen as being the most difficult and time consuming part of the process. It represents the ‘business planning’ phase of a new venture where the finer details are worked out. As small problems arise or issues need to be teased out then outputs from this stage of the process tend to feedback into earlier stages for further consideration (Hills <i>et al.</i> , 1999).

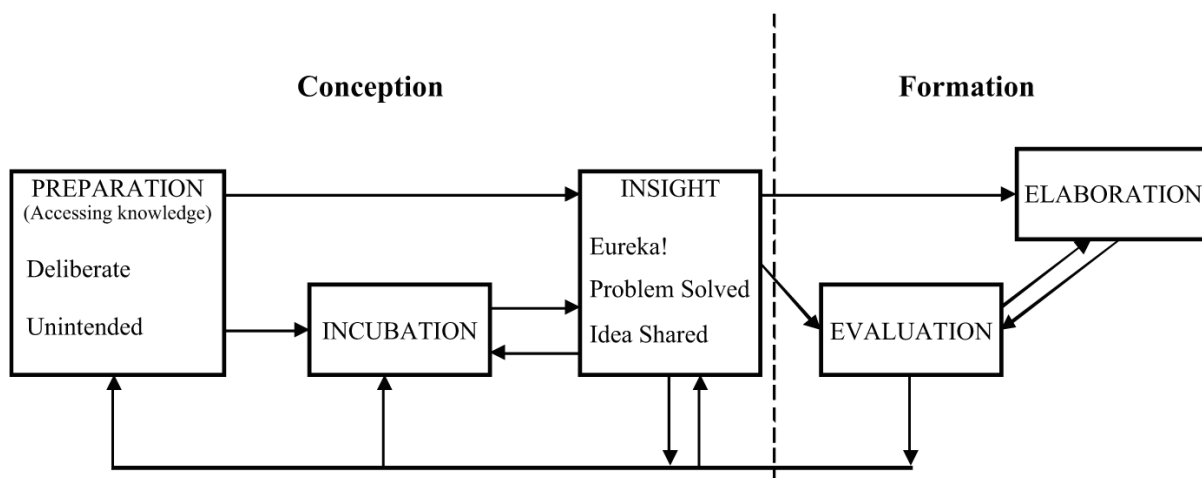
Source: Compiled based on Hills *et al.* (1999) and Hansen *et al.* (2011)

In their research Hills *et al.* (1999) found that OR precedes elaboration and in some instances does not include evaluation at all should a person move directly to elaboration based on their belief in their idea. However, the research was conducted with a group of successful entrepreneurs and the criteria used were based on their recollection of the process, which may have been distorted over time.

In their study of successful entrepreneurs, Hansen *et al.* (2011) further develop this model by categorising it into two phases, conception and formation (Figure 3.1). They describe conception as everything that leads to an idea coming into existence whereas formation is concerned with activities surrounding the

verification of an idea. Their study supports the link between creativity and opportunity seeking as they found a significant relationship between creativity and both incubation and elaboration. During incubation the link with creativity is described as being intuitive, where ideas are being bounced around. Throughout the elaboration stage Hansen *et al.* (2011) argue that many weaknesses and flaws in an idea will become clear which requires creativity to overcome these obstacles. In support of their hypothesis, Hansen *et al.* (2011) did not find a significant relationship between creativity and preparation, insight or evaluation. However, the empirical nature of their study restricted Hansen *et al.* (2011) from exploring the true nature of creativity as it evolved throughout the process.

**Figure 3.1: Hansen, Lumpkin and Hills' (2011) extension to the creativity-based model of opportunity recognition**



Source: Hansen *et al.* (2011:521)

Tegtmeier (2011) builds on the above creativity model by adding an additional step called maturation. This step highlights that entrepreneurs need to convince themselves of the ideas feasibility in addition to convincing themselves that acquiring both the personnel and resources are also feasible. In her model Tegtmeier sees Evaluation and Maturation taking place partially in parallel. Additionally, Tegtmeier (2011) suggests that the enhancement of social capital also tends to run parallel to the Incubation, Insight, Elaboration and Evaluation and Maturation stages, although this was not empirically proven in the study.

Hansen and Lumpkin (2009), in their study of student groups, extended Hills *et al.*'s (1999) model. They identified that multiple layers of creative processes take place during the OR process. These processes result from primarily non-routine tasks that require creativity in order to be completed resulting in creative products. Creative products are defined by Hansen *et al.* (2012) as being new ideas, concepts, business plans and business models. Hansen *et al.* (2012) discovered that during each stage of the OR process, four of the five elements of the OR process itself were evident, leading to a creative output that fed into the next stage of the process.

Consideration of the preceding literature has led the researcher to view OR as a creative process, in which creativity leads to ideas which require further creativity to be developed and refined into opportunities. The researcher considers these models to be important in understanding the phases of the OR process and acknowledging the role creativity plays in the process. However, the literature suggests that there are many factors that influence this process and these will now be explored in the following section.

### **3.6 Factors that influence opportunity recognition**

The literature reveals a range of factors which have been shown to influence the OR process. For clarity, the researcher has grouped them into two categories: environmental factors and individual factors. Environmental factors include: knowledge, context and social networks while individual factors include: cognitive factors, alertness, intrinsic motivation, entrepreneurial intention and self-efficacy. Each of these will be discussed in turn.

#### **3.6.1 Environmental factors**

##### **3.6.1.1 Knowledge**

Information and knowledge are seen as being both enablers and constraints of creativity and OR (Dimov, 2007a; Dimov, 2007b; Ward, 2004). Knowledge is defined by Vaghely and Julien (2008:74) as 'information combined with experience, context, interpretation and reflection.' The diversity of information an entrepreneur is exposed to and the size of their knowledge base is considered to have a considerable impact on initial idea generation (Gielnik *et al.*, 2011; Ko and Butler, 2007; Dimov, 2007a). More recent studies however, demonstrate that it is not the quantity or diversity of information that is beneficial, but rather its relevance to the problem context (Mumford *et al.*, 2012).

Corbett (2007a) argues that while knowledge is important, it is the process through which people acquire knowledge that matters in relation to identifying opportunities. Knowledge acquisition is seen as a deliberate move to perceive, collect, organise and interpret information (Riquelme and Fatrouni, 2012; Heinonen *et al.*, 2011). Ardichvili *et al.* (2003) present an alternative argument suggesting that people do not systematically search for opportunities but rather recognise the value of new information when they come across it.

The literature does support the link between prior knowledge and OR (Ko, 2012; Dimov, 2011; Chelly, 2011; Ko and Butler, 2007; Baron, 2006; Corbett, 2005a; Ward, 2004; Scott and Venkataraman, 2000; Shane, 2000). Prior knowledge can exist in the areas of knowledge of markets, ways to serve markets and customer problems (Shane, 2000) or a combination of special interest and domain specific knowledge (Sigrist, 1999 as cited by Ardichvili *et al.*, 2003). Shane (2000) suggests that people are more likely to discover opportunities in areas that are familiar to them. This is supported by Baron and Ensley (2006) who suggest that experience does appear to be beneficial in developing focused frames of reference that assist in identifying opportunities. Chelly (2011) cites Ucbasaran *et al.* (2003) who suggest that previous experience such as work, entrepreneurial

and relevant past experience are linked to the recognition of more innovative opportunities.

However, the literature suggests that too much focus on one's previous domain can act as a barrier in generating new or novel ideas (Gielnik *et al.*, 2011; Ward, 2004). Indeed Ward (2004:175) acknowledges that "sometimes knowledge provides a bridge to the next new development and sometimes it becomes a fence that blocks our path". Ward explains that when people generate new ideas, these ideas tend to be built on base level conceptualisations of prior knowledge which act as a starting point for the new idea. These new ideas, Ward suggests, can result in a sense of familiarity and less originality. This reflects hindsight and foresight arguments where studies show that finding out about an outcome using hindsight increases the likelihood of its re-occurrence and therefore looking to the past while anticipating solutions for the future poses limitations (Fischhoff, 2003). However, Ward (2004) does acknowledge that this approach can have the added advantage of a new product being more rapidly accepted by a target market than a more radical one. Conversely, Ward suggests that where redundant features of the old product are retained in the new idea, a more abstract approach may be more beneficial, albeit these suggestions require testing in an entrepreneurial context.

### **3.6.1.2 Context**

Context is considered in the literature as having both an enabling or constraining influence on OR (Dimov, 2011; 2007a; 2007b). Context has been shown to provide information and resources and influence the rewards associated with OR (de Koning, 1999). Circumstances are seen to influence the source of new opportunities [pull / push factors] (Chelly, 2011), an individual's experience or market opportunities (Chelly, 2011; Gielnik *et al.*, 2011), how an individual reacts to an idea (Dimov, 2007a) and the interpretation applied to it (Dimov, 2007a; Dimov, 2007b; Drazin *et al.*, 1999).

Dimov (2011) suggests that opportunities themselves epitomise the interaction between an entrepreneur and the environment. Individuals are seen to develop a meaning of a situation based on their social setting and interactions with others (Rae, 2004; Drazin *et al.*, 1999). Similarly, it is argued that there must be a person situation match, between individual qualities and environmental circumstances, for ideas to be generated and to facilitate the recognition of opportunities (Puhakka, 2011; Dimov, 2007b). Indeed, Puhakka (2011) proposes that it is the interaction between context (environmental conditions concerning creativity) and individual characteristics that enable some entrepreneurs to be more alert to opportunities.

### **3.6.1.3 Networks**

OR requires gathering information and discussing ideas, all of which require people in the entrepreneur's social context (de Koning, 1999), including customers (Rae, 2004). Social networks therefore play an important role in identifying opportunities (Riquelme and Fatrouni, 2012; Dimov, 2007a; Ko and Butler, 2007; Baron, 2006; Rae, 2004; Sarasvathy, 2001; de Koning, 1999). However, Rae

(2004) suggests that entrepreneurs demonstrate selectivity in the types of networks that they become involved in and how they interact in these networks.

The literature suggests that weak ties, through casual acquaintances, tend to provide entrepreneurs with unique, idiosyncratic, unrelated pieces of information which the entrepreneur then connects in OR (Riquelme and Fatrouni, 2012; Ko and Butler, 2007; Ardichvili *et al.*, 2003; de Koning, 1999). Ardichvili *et al.* (2003) contend that participation in extended networks influences an individual's level of alertness, creativity and ability to recognise more opportunities.

Exposure to wider networks is considered to extend the knowledge base, interpretations, pattern recognition, schema development, resources and sources of motivation potentially available to individuals (Dimov, 2007a; Baron, 2006; Ozgen and Baron, 2006). It is suggested that such interaction in turn influences the subsequent shaping and development of ideas into opportunities (Dimov, 2007a; Sarasvathy, 2001). Rae (2004:498) argues that effective development and use of social networks requires entrepreneurs to engage actively with customers and potential users to develop effective relationships which require "the skills of listening, understanding the other party's position, negotiating and storytelling".

### **3.6.2 Individual factors**

#### **3.6.2.1 Cognitive factors**

The way in which people process information has been shown to influence both idea generation and OR. Baron (2006:108) asserts that those who are good at identifying opportunities "possess the cognitive frameworks that permit them to do so". Dimov (2007a) concludes that different heuristics and schemata held by entrepreneurs can lead to differences in interpretation of the same situation by individuals. Heuristics are described as simplified rules of thumb that the brain develops to allow us to make sense of all the information we gather while schemata are knowledge structures that are built up by a number of heuristics (Puhakka, 2011; Boden, 2004). These allow us to quickly retrieve past experiences and 'decision rules' to help us to make sense of new experiences (Puhakka, 2011). The literature suggests that they guide and direct how entrepreneurs gather and interpret information and Riquelme and Fatrouni (2012) consider them important predictors of OR. Puhakka (2011, citing Manimala, 1992) suggests that dissimilarity in heuristics can influence how pioneering, innovative or ordinary those opportunities might be.

Baron (2006) associates the cognitive processes of pattern recognition with OR. Penaluna *et al.* (2014:394) argue that "OR is dependent upon the breadth of contextualised understanding and the ability to see and link the weak and potentially disconnected concepts", which they argue develops over time as brain development is required. Penaluna *et al.* (2014) demonstrate that the brain is plastic, it grows and contracts, expands and shrinks over time, making and cutting off linkages (unlearning). Penaluna *et al.* (2014) contend that unlearning, a natural cognitive process, may be necessary for creative thinking to take place.



Unlearning involves changing beliefs (such as mental models and cognitive maps) routines (embedded procedures) and artifacts (tools, physical layout which act as sensory stimuli) in tandem. These lead to changes in declarative (know what) and procedural (know how) knowledge (Akgün, Byrne, Lynn, and Keskin, 2007).

Jones and Penaluna (2013:808) argue that the development of multiple solutions is necessary for OR “much like the solving of a riddle, a singular answer offers limited insight and insightful thinking strategies are essential in any forward facing scenarios”. As such Penaluna *et al.* (2011) argue that OR is reliant upon divergent thinking. Gielnik *et al.* (2011) support this view and suggest that both divergent thinking and diversity of information enhances the creativity of new ideas in the initial stages of the OR process. However, Gielnik *et al.* (2011) acknowledge the experimental nature of their study as a limitation to the generalisability of their findings.

### **3.6.2.2 Alertness**

Kirzner (1997) suggests entrepreneurs are naturally alert to opportunities. Alertness can be described as a state of mind where an individual is sensitive to information and cues in the environment that could lead to new opportunities (Chelly, 2011; Puhakka, 2011; Ko and Butler, 2007; Kirzner, 1997) or a constant state of ‘being on call’ (Ashkelon, 2010). Puhakka (2011:90) defines it as “the creativity of an individual, consisting of creativity base (individual situation match), creative process (cognitive activity) and creative product (opportunities)”. Therefore, Puhakka (2011) argues that the creative process itself leads to entrepreneurial alertness and ultimately to opportunities. Rae (2004) considers that entrepreneurs who are alert can learn to recognise opportunities and use their “creative imagination” to envisage the opportunity before all the information or circumstances exist. However, Rae’s (2004) study, while providing detailed insights into learning experiences, is limited by its sample size of three entrepreneurs.

Ko and Butler (2007) suggest that in order to be alert in the first place, individuals must have enough information to know what to look for. Alertness has been shown to have an influence over the nature of the information and methods of information search used, the ability to recognise facts and linkages (Ko, 2012; Baron, 2006), the nature of thinking that leads to entrepreneurial creativity (Ko and Butler, 2007), the nature of the information recalled and subsequent motivation to act on an opportunity (Dimov, 2007) or the probability of recognising an opportunity in the first place (Chelly, 2011; Puhakka, 2011). However, while there are different perspectives on OR, Puhakka (2011) argues that the alertness to the situation is the same, regardless of the viewpoint taken. This contrasts with Ardichvili *et al.* (2003) who argue that alertness needs to exceed a threshold level for opportunities to be recognised. They contend that heightened levels of alertness can be achieved if the entrepreneur’s traits of creativity and optimism combine with the existence of relevant prior knowledge, experience and social networks (Ardichvili *et al.*, 2003).

### **3.6.2.3 Intrinsic motivation**

Ko (2012) suggests that it is alertness combined with internal motivation to engage in cognitive activities (thinking and processing information) which enables entrepreneurs to recognise opportunities. This echoes findings in the creativity literature where intrinsic motivation is considered essential for creativity to take place (Dimov, 2007a; Gilson and Shalley, 2004; Amabile, 1998; Amabile 1983). Amabile (1983:366) defines internal (or intrinsic) motivation as occurring when a person is engaged in activity 'as an end to itself and not as a means to some intrinsic goal'. Intrinsic motivation is linked with individual creativity as creativity is seen as a deliberate decision of a person to engage in creating novel ideas (Gilson and Shalley, 2004; Drazin *et al.*, 1999). Amabile (1983) sees motivation as responsible for initiating and sustaining the creativity process, and a willingness to take risks when undertaking tasks. She argues that such creativity tends to be at its highest when fuelled by internal motivation, reinforcing the link between the two concepts.

Penaluna *et al.* (2013) suggest that creatively solving problems and spotting opportunities are themselves key drivers for intrinsic motivation. This is partly explained by Csikszentmihalyi (1987) who describes the experience of creative flow, or effortless action, which occurs when a person's skills are required to overcome a challenge. This involvement in 'flow', which is frequently associated with happiness, he suggests, acts as a magnet for new learning and new skill acquisition.

Chelly (2011) draws attention to the fact that pull and push motivations are important considerations in OR and therefore the initial process of OR is different for push and pull entrepreneurs. Research shows that it is negative motivation, as a reaction to their situation, which drives creativity for push entrepreneurs in OR while pull entrepreneurs are motivated by the positive prospects they perceive and may perceive many opportunities as a result (Chelly, 2011). Push entrepreneurs were found to engage in deliberate search strategies first, engage with networks and utilize prior knowledge before identifying opportunities while for Pull entrepreneurs passion for their area fuelled their 'discovery' (Chelly, 2011). However, these findings were based on just two cases and lack empirical evidence to support this claim.

### **3.6.2.4 Entrepreneurial Intention**

The literature shows a link between entrepreneurial intention (EI) and OR (Kirby 2006; McMullen and Sheppard, 2006; Ajzen, 1991). EI is described as a conscious state of mind that directs attention (and therefore experience and action) towards a specific object (goal) or the pathway to achieve it (means) (Bird, 1988). Entrepreneurial intentions are considered to depend on personal desire, the opportunity of achieving them, the propensity to act and the availability of support (Kirby 2006b; Bird, 1988). Factors that are associated with EI include rational and intuitive thinking, having values that align with opportunities identified and attunement with the environment to identify and harness support in pursuit of those opportunities (Bird, 1988).

Research into EI and OR frequently considers intention to act after the opportunity has been recognised. For example, McMullen and Shepherd (2006) argue that EI depends on the fit between the nature of the opportunity identified and the individual in determining whether an opportunity is considered appealing or not. In a more recent study however, Jarvis (2016) presents a conceptual model which considers the influence of entrepreneurial identity on intentions to engage in OR. Jarvis contends that a person who identifies with the role of an entrepreneur will seek out occasions to recognise opportunities. Jarvis sees this as a recursive process where the greater an individual's entrepreneurial identity, the more their search intentions will have a positive effect on OR, resulting in behaviours which influence their commitment intentions and in turn have a positive effect on entrepreneurial identity. Of note, however, is the absence of the role of creativity in Jarvis' as yet untested model. In contrast, Boddington and Berg (2014) consider an entrepreneur's creative self efficacy as central to unlocking entrepreneurial intent.

#### **3.6.2.5 Self-efficacy**

Self-efficacy is defined by Bandura (1977) as being the belief one has in their ability to achieve a goal and research shows that self-efficacy is strongly associated with OR (Boddington and Berg, 2014; Tumasjan and Braun, 2012; Ozgen and Baron, 2007; Krueger and Dickson, 1994). For example, Krueger and Dickson (1994) found that an increase in self-efficacy increases perceptions of opportunity and decreases perceptions of threat and that the reverse is also true. Increased self-efficacy is associated with increased optimism and higher OR (Ardichvili *et al.*, 2003) and Krueger and Dickson (1994) argue that building perceived self-efficacy increases peoples' receptiveness to opportunities and their persistence in following them. Similarly, high self-efficacy was found to influence individuals to be more proactive in both the search for and screening of opportunities (Ozgen and Baron, 2007).

Gibbs (2009) extended the link between self-efficacy and OR further by looking at task specific self-efficacy. In particular she examined both creative self-efficacy and entrepreneurial self-efficacy. Gibbs (2009:5) cites Tierney and Farmer (2002) who define creative self-efficacy as "measures of an individual's confidence in their ability to achieve creative outcomes" while entrepreneurial self-efficacy is described as "a persons' belief that he or she can successfully perform the various roles and tasks of entrepreneurship" (Chen *et al.*, 1998 cited by Gibbs 2009:4). In her research, both creative and entrepreneurial self-efficacy were found to have a positive impact on OR but creative self-efficacy had a greater influence on OR than entrepreneurial self-efficacy.

A link has been found between entrepreneurial curiosity, self-efficacy and creativity (Jeraj and Marič, 2013; Kashdan *et al.*, 2004). Curiosity is seen to be linked to positive evaluations of self and the future (confidence / optimism), beliefs that goals are attainable and that barriers can be overcome (self-efficacy), an openness to new ideas and new experiences, and self-determined tendencies to

engage in activities for mere pleasure and challenge (Kashdan *et al.*, 2004). Boddington and Berg (2014) suggest that improving an entrepreneur's belief in their own abilities to be creative will raise their self-efficacy in this area which might improve their ability to respond creatively to opportunities.

### **3.7 Enabling opportunity recognition in an educational context**

The preceding sections reveal that OR is a complex phenomenon. It is presented as a creative process which yields many potential creative outputs and which is influenced by a range of factors, including the individual themselves. However, closer examination of these influencing factors reveals a number of attributes, behaviours and skills which are associated with OR (Table 3.2).

**Table 3.2: OR attributes, behaviours and skills as derived from the literature**

	Description
OR attributes	<ul style="list-style-type: none"> <li>• Alertness (Chelly, 2011; Phukakka, 2011; Ko and Butler, 2007)</li> <li>• Creative and entrepreneurial self-efficacy (Boddington and Berg, 2014; Tumasjan and Braun, 2012; Gibbs, 2009)</li> <li>• Intuition (Hansen <i>et al</i>, 2011)</li> <li>• Intent (Jarvis, 2016)</li> <li>• Passion (Chelly, 2011)</li> <li>• Willingness to take risks (Amabile, 1983)</li> </ul>
OR behaviours	<ul style="list-style-type: none"> <li>• Environmental scanning (DeTienne and Chandler, 2004; Jones and English, 2004)</li> <li>• Solution development (Jones and Penaluna, 2013)</li> <li>• Action (Dimov, 2011; Chelly, 2011; McMullen and Shepherd, 2006; Dimov, 2007b)</li> <li>• Network development (Riquelme and Fatrouni, 2012; Tegtmeier, 2011; Dimov, 2007a; Ko and Butler, 2007; Baron, 2006; Rae, 2004; Sarasvathy, 2001; de Koning, 1999)</li> <li>• Communication <ul style="list-style-type: none"> <li>○ Persuasion: Convince themselves and others (Tegtmeier, 2011)</li> <li>○ Storytelling (Rae, 2004; de Koning, 1999)</li> </ul> </li> <li>• Negotiating (Tegtmeier, 2011; Rae, 2004; de Koning, 1999)</li> </ul>
OR skills	<ul style="list-style-type: none"> <li>• Information Acquisition <ul style="list-style-type: none"> <li>○ Information literacy skills (Boyles, 2012)</li> <li>○ Creative information search (Heinonen <i>et al.</i>, 2011; Riquelme and Fatrouni, 2012)</li> <li>○ Observation (DeTienne and Chandler, 2004)</li> </ul> </li> <li>• Creativity and Innovation <ul style="list-style-type: none"> <li>○ Pattern Recognition (Boyles, 2012; Ozgen and Baron, 2007; Baron, 2006)</li> <li>○ Link un-associated information (Barron, 2006)</li> <li>○ Creative problem solving (Treffinger <i>et al.</i>, 2007; Ward, 2004)</li> <li>○ Development of new mental schemas (Puhakka, 2011; Ozgen and Baron, 2007; Boden, 2004).</li> <li>○ Divergent and convergent thinking (Boyles, 2012; Penaluna <i>et al.</i>, 2011; Rae, 2007; Nixdorff and Solomon, 2007; Scott, Leritz and Mumford, 2004; Ward, 2004; DeTienne and Chandler, 2004; Hills and Lumpkin, 1997)</li> </ul> </li> <li>• Analytical and conceptual thinking <ul style="list-style-type: none"> <li>○ Information analysis skills (Mumford <i>et al.</i>, 2012; Corbett, 2007; Shane, 2000)</li> <li>○ Prediction and anticipation of future problems (Gielnik <i>et al.</i>, 2011); Fischhoff, 2003)</li> </ul> </li> <li>• Networking <ul style="list-style-type: none"> <li>○ Networking (Riquelme and Fatrouni, 2012; Dimov, 2007a; Rae, 2004; Sarasvathy, 2001; de Koning, 1999)</li> <li>○ Collaborative creativity (Dimov, 2007a; Sarasvathy, 2001)</li> </ul> </li> <li>• Communication (Shepherd, 2015)</li> <li>• Negotiating (Tegtmeier, 2011; Rae, 2004; de Koning, 1999)</li> </ul>

Source: Researcher's own work.

Table 3.2 reveals a range of attributes, behaviours and skills that the literature suggests are associated with OR. In particular, it sheds light on a range of cognitive processing skills that are considered valuable, from a creative perspective. Krueger (2009) argues that many of the skills for OR can be enabled in an educational setting although Chell (2013) contends that some, such as alertness, cannot. Other researchers assert that it is the creative process which

leads to entrepreneurial alertness (Puhakka, 2011) and evidence suggests that these creativity processes and skills can indeed be enabled in an educational context. However, as Krueger (2009:44) reminds us, acquiring the necessary skills in OR may not be enough as it is a student's belief in their ability to apply those skills that can influence their behaviour:

Self-efficacy theory (Eden, 1992; Bandura, 1993) suggests that just acquiring skills is not enough to fundamentally change how we think, it also requires believing in those skills (perceived efficacy versus actual efficacy). No self-efficacy, no long-term skills acquisition or skill usage.

As this research is interested in the creative nature of OR this chapter will continue by examining how educators can enable students' creative competence in this regard.

### **3.7.1 Development of cognitive skills**

Research supports the view that pattern recognition is a key component in OR and that well developed cognitive prototypes assist in recognising links between different patterns of information (Baron, 2006; Baron and Ensley, 2006). Ko and Butler (2007:366) suggest that knowledge about how to link previously un-associated information to derive new combinations is potentially useful for enabling "entrepreneurs and students to be more creative in ways that make entrepreneurial behaviour more likely". Baron (2006) argues that it is indeed possible to train people in pattern recognition by showing them how to search in the best places and in the best ways, encouraging them to identify changes in forces that play an important role in business and to actively identify ways in which observed trends are linked or connected (look for emergent patterns). Baron (2006) also suggests that exposure to a very broad range of experiences of opportunities, ranging from good to poor, allows individuals to store exemplars from which they can make future decisions. However, it is noticeable that Baron (2006) takes a very rational approach towards pattern recognition and the role of creativity in pattern recognition is, at best, assumed.

At the cognitive level, Riquelme and Fatrouni (2012) also argue that educational institutions have a role in exposing students to situations and experiences that will assist them to develop relevant schemata. Breslin and Jones (2014:434) build on this argument when they claim that EE education should focus on the development of heuristics related to OR whereby students can interpret the world they live in. Hills and Lumpkin (1997:11) suggest that EE educators should strengthen such skills by giving students "an ability to think creatively, to speculate on opportunities and business conditions in an out-of-the-box type fashion and to learn the craft of creative leadership".

### **3.7.2 Pragmatic approaches towards skill development**

The pragmatic approach towards creativity is popular in education contexts (Ferrari *et al.*, 2009). Gundry *et al.* (2014) assert that “innovative behaviours emerge when students are taught the appropriate tools and methods for idea generation”. Tools, Pink (2012) argues, are activities which promote pattern recognition and relationship development skills, and promote alternative pathways to understanding.

Amabile (1983) acknowledges that creativity relevant skills require training yet she argues that training should not be limited to heuristic ‘tricks’. Similarly researchers echo concerns around exposure to occasional creativity sessions and their effectiveness on the development of creativity skills in the longer term (Penaluna *et al.*, 2014; All-Party Parliamentary Group for Micro Businesses, 2014). The literature suggests that the development of student creativity requires domain specific techniques and tools complimented by knowledge about the creative process which should be skilfully facilitated by educators (Best and Thomas, 2013 citing Best and Thomas, 2007; Amabile, 1983). Similarly, Van de Kamp, Admiraal and Rijlaarsdam (2016) support this view suggesting that students require instruction on four areas: divergent thinking tasks; divergent thinking methods; knowledge on method selection strategy and reflection on their performance.

Studies show that training in divergent thinking skills enables students to consider several approaches towards generating solutions (Schmidt *et al.*, 2012) and results in generating new ideas (Gundry *et al.*, 2014). Such training is considered to enhance their perception of and confidence in students’ creative ability (Gundry *et al.*, 2014; Robinson and Stubberud, 2014; Schmidt *et al.*, 2012) and raises their entrepreneurial intentions (Hamidi *et al.*, 2008). However, in each case the generalisability of the findings from these studies are limited by the single site nature of the studies undertaken. Importantly, from a cognitive perspective studies argue the importance of practice “because the cells in the brain are sensitised once they have been connected, and the more they are connected, the more able they are to re-connect again” (Penaluna *et al.*, 2014:368).

### **3.7.3 Creative learning environments**

As creativity is an essential part of OR, an environment that encourages creativity, creative leadership and experimentation is considered to “enhance understanding of the OR process” (Hills and Lumpkin, 1997:11) and they argue that the ‘classroom’ can provide such an environment. While the literature concerning creative learning environments is not exclusive to the EE learning environment, it is of particular interest to the researcher, in the context of this research.

#### **3.7.3.1 Environmental conditions**

It is argued that barriers to creativity for undergraduate students relate to task achievement, in the form of lack of self-confidence, risk taking and the physical environment (Nordin and Malik, 2015). This supports the European Commission (2009) who contend that the learning environment, including the internal and external physical environment, has particular influence in securing, stimulating or killing an individuals’ creative ability. The literature suggests that it is easier to

enhance peoples' creativity by adjusting their environment rather than working on their ability to think more creatively (Amabile, 1998; Csikszentmihalyi, 1996). This is reflected in the computational theory of creativity (Amabile, 1983) which identifies contributing factors towards creativity related to the person (expertise, creativity-relevant skills, processes and motivation) and those related to the social environment. The environment is noticeably the only factor that is outside the individual and therefore Amabile argues that it is the factor which is most easily changed.

Creating learning opportunities which welcome generative thought, critical reflection, ownership of ideas and respecting individual choice are considered important conditions for the creative eco-system in an educational context (Harrison, 1990 as cited by Padget, 2013; Puhakka, 2011; Amabile, 1998). It is acknowledged that these factors *alone* will not directly lead to creative outputs, but if handled incorrectly they can kill creativity (Puhakka, 2011). In particular, Padget (2013:24) contributes by describing a creative classroom as one where:

- There is questioning and challenge;
- There is the opportunity to make new connections and see new relationships;
- Learners are able to envisage what might be;
- There is the exploration of ideas and the options are kept open;
- There is mental space to reflect critically on ideas, actions and outcomes;
- There is the expectation that all are involved;
- There is support for and value given to each learner's efforts.

Penaluna *et al.* (2011) explain that in cognitive neurology, the conditions and environments that enhance creative thinking can be both described and predicted thus suggesting that learning environments that enhance the ability of students to be creative can indeed be created. Newton (2012) contends that autonomy gives freedom to imagine, allows ideas to be explored and results in the encouragement of creative behaviours, although these claims require testing. Best and Thomas (2013:37) argue that in addition to external conditions, fostering creative processes requires an 'internal state' which is described as "the readiness in the mind of pupils and teachers to be creative". This they associate with the willingness to take risks, to let go and to try new things. Best and Thomas (2013) claim that when all three conditions are plentiful, then creativity thrives.

This link between creativity, the environment and risk is supported in the literature. An encouraging, open, non-threatening environment is considered to enable exploration, experimentation and risk taking, creating an atmosphere of playful enquiry and encouraging self-directed learning (Padget, 2013 citing Harrison, 1990; Schmidt *et al.*, 2012; Hansen *et al.*, 2012; European Commission, 2009; KEA, 2009; Amabile, 1998). Indeed, the European Commission (2009) contend that by placing learners in situations of uncertainty, it forces them to make decisions and take risks. However, Fazey and Fazey (2001) draw attention to the



fact that students need to have confidence in their competency to complete a task to be prepared to undertake the risk associated with that task, if they feel that it is important.

This perspective on failure is supported by the All-Party Parliamentary Group for Micro Businesses (2014) who suggest that EE educators should permit student failure (in the context of not always fulfilling anticipated responses and considerations), encourage learners to articulate why they think they failed and provide them with opportunities to generate multiple potential solutions to problems. For example, Penaluna and Penaluna (2009) cite Timmons (1999), who acknowledges that in certain circumstances learning from failure in entrepreneurship can be emotionally painful. Therefore Penaluna and Penaluna (2009) argue that as educators we should prepare our students to be exposed to such emotions.

Considered as a whole the literature reveals a number of creative conditions which are listed in Table 3.3.

**Table 3.3: Creative learning environment conditions**

Conditions	Sources
<ul style="list-style-type: none"> <li>• supportive yet relaxed</li> <li>• provides freedom and autonomy</li> <li>• replicates real life</li> <li>• unpredictable</li> <li>• challenges existing mental models</li> <li>• encourages curiosity</li> <li>• opportunities for slow and pressurised learning</li> <li>• encourages creative information search strategies</li> <li>• open</li> <li>• non-threatening</li> <li>• encourages reflection</li> </ul>	<p>The Fifth Report by the All-Party Parliamentary Group for Businesses, 2014; Robinson and Stubberud, 2014; Penaluna <i>et al.</i>, 2013; Padget, 2013; Newton, 2012; Hansen <i>et al.</i>, 2012; Puhakka, 2011; Penaluna, 2011; Macosko, Johnson and Yocum, 2009; European Commission, 2009; KEA, 2009; Fayolle and Gailly, 2008; Heinonen and Poikkijoki, 2006 ; Amabile, 1998; Hills and Lumpkin, 1997</p>

Source: Researcher's own work.

### **3.7.3.2 Emotional attunement**

The literature suggests that success in developing creativity and associated behavioural change, in an educational context, could be enhanced if greater emotional harmony was evident (Newton, 2012; Kirketerp, 2012). Positive moods are considered to lead to more divergent thinking thereby increasing both the number and quality of ideas and reducing concern about being judged by others

(Newton, 2012). Lackeus (2013) contributes to this debate by providing evidence which demonstrates that emotions play an important part in determining entrepreneurial action while Kirketerp (2012) advocates the need for emotional attunement, to enable students to evaluate their experiences correctly and influence changes in their behaviour.

Research is considering the role of moods and emotion on whether creative engagement takes place at all but the findings are mixed (Lackeus, 2013; Newton, (2012 citing Adler and Obstfeld, 2007; Dew, 2009; Amabile, 1983). Amabile (2012) contends that creativity is enhanced when people experience intrinsic motivation combined with more positive emotions, such as passion and interest. Similarly Penaluna *et al.* (2014) contend that emotional constructs prepare the mind for creative engagement while Dew (2009) acknowledges the influence of change of mood on motivation during creative problem solving, depending on the perceived likelihood of success or failure at various stages during the process. Indeed more recent research in the cognitive domain suggests that the effects of serotonin, which are linked to emotional and motivational facets of human behaviour, play a key role in learning and memory (Menses and Liy-Salmeron, 2012) which has particular relevance from an education perspective.

#### **3.7.4 The role of the educator**

It is argued that educators can nurture or destroy students' creative potential (Ferrari *et al.*, 2009). Educators are therefore recognised as one of the key enablers of creativity (Ferrari *et al.*, 2009). Alternatively, educators can create barriers to creativity by setting tasks that do not challenge the individual, being closed to new ideas, instituting rigid procedures and methods of working, having unsuitable resources, homogenous team composition, lack of recognition for creative ideas and lack of organisational support for creativity (Ferrari *et al.*, 2009; Amabile, 1998). Newton (2012:36) suggests that if the regime is one of "coercion, obligation, punishment, comparison with 'better' performers, and fine control of action, there is likely to be stress, anxiety and stifled creativity".

Padget (2013) points out that the educator's role in embracing relevant strategies and techniques is important while the European Commission (2009) emphasise the need to get a balance between intuitive experimentation, guidance and mentoring. EE educators have a role, Penaluna (2011) argues, in building learning environments that support and encourage students to develop their curiosity, draw out information in response to their needs and in the order in which they need it. Penaluna (2011) claims that "curious students are engaged students who seek out relevance through enhanced understanding" although these claims are unsupported (Penaluna *et al.*, 2013:368).

The European Commission (2009) extoll the value of having creative educators with a good understanding of ways to integrate creative approaches into what they do to enable creative learners. Therefore, they argue the need to train professionals in creative education processes. This is supported by Penaluna *et al.* (2014) who suggest that educators may need to help students to unlearn

connections or habits that are unhelpful to the creative endeavour as disconnecting old linkages, they contend, can be as important as creating new ones. Penaluna *et al.* (2014) consider that the educator has responsibility for developing tasks that stimulate and test student creativity, yet they acknowledge that the creativity of the educator can influence the creativity of the tasks they develop. In addition, Penaluna *et al.* (2014) argue that emotional constructs impact students' capacity to engage in creativity and therefore educators need to understand this to enable students to make creative linkages.

In summary, the literature suggests that creative competence, which is required for OR, can be enabled in an education context. With this in mind, the researcher now considers how current approaches in EE education are addressing the creative aspects of OR.

### **3.8 Opportunity recognition education**

The preceding sections indicate that the challenge for EE educators lies in enabling creativity related OR competence in students (Clydesdale, 2012; Penaluna and Penaluna, 2009). The literature suggests that EE educators should use a variety of pedagogies when addressing OR, which offer the flexibility to respond to students' learning requirements and permit learning from failure (Kyro, Kurczewska and Osei-Bonsu, 2011; Penaluna and Penaluna, 2009; Corbett, 2005b; De Tienne and Chandler, 2004). However, Kyro *et al.* (2011) suggest that how educators interpret the nature and process of OR influences the way that it is taught.

Penaluna and Penaluna (2009) argue that flexibility in curriculum is required to enable students to develop their own OR strategies. This, they suggest, could be achieved by enabling students to use a variety of approaches which can lead them to identify opportunities arising from problems they have identified. Kyro *et al.* (2011) support this view by illustrating the diversity of ways that students approach OR and categorise them as the search, discovery and action approaches. Kyro *et al.* (2011) argue that educators need to adopt the appropriate teaching pedagogies and tools necessary to develop student competence in this area (Table 3.4). The framework is limited, however, by its lack of guidance for educators on mechanisms for determining individual preference, its broad categorisation of 'tools' and the single site nature of the case study which informed these findings.

**Table 3.4: Teaching methods for OR**

	TEACHING METHODS		
	Focus on	Enhanced Competences	Tools
<b>Students with Search Approach</b>	Problem formulation and rational problem solving methods.	Enhancing problem identification and formulation competences to provide alternative solutions for problem solving and decision making.	Problem based learning and for example Business Plan Training.
<b>Students with Discovery Approach</b>	Cognition process	Enhancing alertness to outside world and influencing on cognitive patterns.	Concept mapping  Mind mapping and other idea generation techniques.
<b>Students with Action Approach</b>	Effectuation	Enhancing entrepreneurial venture creation process	Putting students into the process in which they create and try to exploit opportunities in order to experience venture creation processes.

Source: Kyro *et al.* (2011:23)

DeTienne and Chandler (2004) suggest that education approaches in OR should resist the reductionist, generalist approach and equip individual students with the ability to interpret their own environment and identify opportunities that are related to their individual position. This, they suggest, can be achieved by encouraging students to look out for opportunities, encouraging students to expand their thinking through creativity exercises, exposing students to diverse and changing learning situations, and encouraging students to challenge themselves through failure.

This view is supported by Tumasjan and Braun (2012) who recommend educating students to be more attentive to cues and emergent patterns in ambiguous situations. In this environment, they encourage educators to guide students in 'joining up the dots' and promote more goal focused behaviour. More recently, Jarvis (2016) argues that EE educators need to be aware of the importance of entrepreneurial identity in ORedu and he suggests that educators need to provide opportunities for individuals to be recognised as such.

A review of the literature reveals a limited number of approaches employed in ORedu, supporting arguments that very little is done to specifically equip students to participate in OR (Neck and Greene, 2011; Krueger, 2009; Penaluna and

Penaluna, 2008; Nixdorff and Solomon, 2007). The following section reviews approaches currently adopted in ORedu.

### **3.8.1 Discovery approaches to OR education**

Discovery approaches, Kyro *et al.* (2011) suggest, have emerged from the Kirtznerian view of opportunities where opportunities exist due to changes in the environment. Such opportunities are considered to exist as objective phenomena which need to be discovered (Alvarez and Barney, 2005) and therefore discovery approaches emphasise alertness, cognitive abilities, prior experience, information acquisition and reflection (Kyro *et al.*, 2011; Alvarez and Barney, 2005). Discovery approaches encourage students to observe changes in their environment. Kyro *et al.* (2011) suggest that discovery approaches enhance student alertness through reflection and changing cognitive patterns over time.

Discovery approaches define traditional EE education, with its emphasis on the business plan, which are criticised for producing documents on opportunities that lack creativity and are rarely understood (Jones and Penaluna, 2013). Similarly, they contend that such approaches result in students recognising “singular linear solutions” (Jones and Penaluna, 2013:810) or believing in one correct approach (Shepherd, 2015).

The discovery approach has can be recognised in a relatively new tool, The Opportunity Analysis Canvas (Green, 2015), where the aim of the tool is to enable students to identify and analyse entrepreneurial ideas. The approach is driven from a strategic decision making perspective, which is reflected in the framework design. Green takes an analytical approach towards OR which is reflected in his claims that “strategic decisions demand critical analysis” (Green, 2015:19). The focus of the book is to make students better decision makers and the text is noticeable in the absence of creativity in this process. As OR is considered a creative process (Hills *et al.*, 1999), this researcher considers the omission of the creative dimension as a significant limitation.

### **3.8.2 Creation approaches**

Creation approaches towards OR do not see opportunities as being objective (Alvarez and Barney, 2005) and do not believe that opportunities are recognised before being acted upon (Kyro *et al.*, 2011). Rather they recognise that opportunities are shaped and developed over time through feedback from the environment and ongoing processes of adjustment and re-adjustment (Kyro *et al.*, 2011; Alvarez and Barney, 2005). Kyro *et al.* (2011) recognise these approaches as being non-linear, with less focus on information and a greater focus on action. It is suggested that such approaches seek to develop competencies in network engagement, risk-taking and negotiation through practical experience (Kyro *et al.*, 2011). A number of popular approaches such as evolutionary / ecological approaches, effectuation and social learning fall into this category.

### **3.8.2.1 Evolutionary and ecology approaches**

Breslin and Jones (2014) contend that evolutionary and ecology approaches enable students to become more aware of their situated environment when recognising opportunities. Evolutionary processes such as variation – selection – retention are adopted to frame the ecology / evolutionary approaches. As such, ideas are seen to change and develop over time and are retained (or discarded) as an entrepreneur receives feedback and moves through opportunity exploitation. The emphasis of this approach is on the evolution of these ideas, based on students' interpretation of existing or anticipation of future needs (based on feedback from the wider audience) thus enabling students to appreciate the influence of wider systems on OR (Breslin and Jones, 2014).

These approaches encompass new perspectives such as the Lean Start-up (Reis, 2011) with its emphasis on validated learning as an approach for recognising and clarifying opportunities. The concept of pivoting, or making a major change in the strategy adopted based on feedback around key assumptions, is central to this perspective. As situations change, there is a need for students to use their creativity to identify new opportunities around new key assumptions.

The researcher of this thesis considers that while evolutionary and ecological approaches seek to develop student competencies in OR, often times these approaches assume that the individual has 'an idea' to work with from the beginning. Therefore, these approaches appear to lend themselves more towards the elaboration stage of OR. Indeed, evolutionary processes are recognised as facilitating the refinement of those initial ideas and enabling them to be developed into working business models (Reis, 2011).

### **3.8.2.2 Effectuation approach to OR education**

Effectuation has its foundation in experimentation which lends itself to the development of OR potential in students. Effectuation processes consider the entrepreneur to be clearly aware of who they are, what they have and who they know, and approach OR on that basis. Four principles that embody effectuation are: affordable loss rather than expected returns; strategic alliances rather than competitive analysis; exploitation of contingencies rather than exploitation of pre-existing knowledge and controlling an unpredictable future rather than predicting an uncertain one (Sarasvathy, 2001). Sarasvathy (2001) positions causation as the alternative to effectuation. Causation by its nature is analytical and it relies on predictability, and the pre-determination of goals for the future based on available evidence. This leads to the recognition of opportunities which present the best possible return (Maine, Pek-Hooi and Dos Santos, 2014; Sarasvathy, 2001). As such, Sarasvathy (2001) associates causation with effective knowledge acquisition, analysis and synthesis skills.

Effectuation therefore suggests a shift in focus from "how to build a successful firm" or "how to be a successful entrepreneur" to "what types of ideas and opportunities should you pursue" (Sarasvathy, 2001:259). As such, effectuation can be viewed as an experimental process in which opportunities are adjusted

continuously throughout (Maine *et al.*, 2014). Kyro *et al.* (2011) consider the process to be cyclical, where OR and evaluation are intertwined. Maine *et al.* (2014) found that effectuation tended to be more prevalent than causation in situations where there were low levels of external constraints. However, their findings indicate that effectuation leads more frequently to the recognition of existing opportunities rather than the 'creation' of new ones.

### **3.8.2.3 Social learning approach to OR education**

Rae (2004) proposes teaching OR from a social learning perspective where one's identity as an entrepreneur emerges through interaction with the social world and practice in their entrepreneurial ventures. Rae (2007; 2004) uses the entrepreneurial learning model to develop a framework which includes three dimensions: personal and social emergence of entrepreneurial identity, OR arising from contextual learning and the negotiated enterprise. Rae (2007) argues that this model encourages deeper personal reflection and identity awareness, emphasises the importance of shared meaning and contextual influences and the importance of negotiated relationships with others. Rae (2004) argues that the framework provides a holistic and activity based approach for teaching OR within contextual boundaries.

Rae (2007:2004) considers that the merit of this approach is that students can make sense of their own learning. In his book, Rae (2007) presents some useful exercises and frames to engage students in OR using the proposed framework. Albeit Rae openly asserts the link between creativity and OR and encourages the use of creativity techniques and tools, creativity is briefly addressed, moving swiftly to analytical processes associated with opportunity development.

The merit of evolutionary, effectuation and social learning approaches is that they reflect the ongoing nature of OR, recognising the need for individuals to 'pivot' as required (Reis, 2011) although, how individuals use their creativity to respond to these pivot opportunities is at best, assumed in these approaches. The researcher contends that these approaches do not proactively engage with the creative nature of the early stages of the OR process itself.

### **3.8.3 Creativity driven approaches to OR education**

Informed by the Schumptarian view of opportunities, which recognises the role of creativity in OR, this research struggled to identify ORedu approaches which specifically focus on enabling student creativity. This is despite calls for EE education curricula which are aimed at developing creative entrepreneurial capabilities (Kirby, 2006a). Jones and English (2004:419) clarify that such approaches seek not to "teach" creativity but to "assist students to develop whatever creative capacity they bring".

However, the literature does offer a myriad of creative tools and techniques which educators can use to enhance their teaching of OR (Pink, 2012; Heinonen, 2011; Heinonen and Poikkijoki, 2007; Rae, 2007; Rae, 2004; DeTienne and Chandler,

2004; Jones and English, 2004). Indeed, Neck *et al.* (2014) advocate the use of tools and techniques to enable student creativity, which they firmly associate with OR. With increasing calls for students to be skilled in creativity and an increasing array of activities being recommended, a review of methods that are used to facilitate OR reveals a shopping list which includes, but is not limited to, those listed in Table 3.5.

**Table 3.5: Creativity tools and techniques used in OR education**

Tools and techniques	Sources
Opportunity logs, brainstorming, knowledge sharing, readings on the source of creative ideas, problem redefinition / reframing, systematic search, mind mapping, morphological analysis, lateral thinking, creative problem solving, conceptual combinations, storytelling, design thinking, engaging with creative practitioners.	Neck <i>et al.</i> , 2014; Neck and Greene, 2011; Fayolle and Gailly, 2008; Rae, 2007, Rae, 2004; Nixdorff and Solomon, 2007; DeTienne and Chandler, 2004; Jones and English, 2004

Source: Researcher's own work.

Reflecting Lackeus' (2013) views, the problem with such a list is that it does not provide clarity to the educator as to when it is appropriate to use such methods, nor what can be achieved by their use in terms of student competence development in the context of OR.

The literature is clear that enabling student creativity is an area in which art and design educators have significant experience (Penaluna *et al.*, 2013; Carey and Matlay, 2010; Penaluna and Penaluna, 2009; 2008). There are increasing calls for design approaches to be adopted in both teaching and assessment of EE education (Nielsen and Storvang, 2014; Laviolette *et al.*, 2014; Neck *et al.*, 2014; Penaluna *et al.*, 2013; Fixson and Read, 2012; Penaluna *et al.*, 2011; Neck and Greene, 2011; Carey and Matlay, 2010). However, clarity as to the exact nature of these approaches and when or how they should be used is lacking. This puts the non-art and design educator in a challenging situation where they must select for themselves the most suitable approach.

### 3.9 Assessment of opportunity recognition

There is a dearth of literature on assessment of OR in the EE education literature. Pittaway *et al.* (2009) found that educators indicated a preference for student self-assessment where it came to attributes and behaviours such as opportunity seeking. However, in practice the use of such assessments was limited. There is some evidence that traditional approaches are used for OR assessment where, for example Breslin and Jones (2014) explain that ideas are assessed based on resource requirements and legitimacy of the idea. However, traditional methods for assessing business ideas are considered potentially detrimental to creativity and the generation of creative ideas (Carey and Matlay, 2010). More recently,



Neilson and Storvang (2014) have considered using assessment methods traditionally associated with DE.

In an attempt to find relevant literature, a systematic search was carried out of ten leading journals using the search terms ‘opportunity recognition assessment’, ‘assessing opportunity recognition’, ‘assessing ideas’, ‘assessing creativity’, ‘ideas assessment’ and ‘assessing student ideas’. This search revealed just three relevant articles demonstrating a gap in this area (Table 3.6). However, the existence of this gap is relatively unsurprising in light of the recognised gap in assessment research in EE education in general, as discussed earlier (Chapter 2, section 2.5.1).

**Table 3.6: Search results opportunity recognition assessment**

Journal	Relevant Articles
Academy of Management Review	No matches found
Academy of Entrepreneurship Journal	No matches found
Education and Training	Penaluna <i>et al.</i> , 2011; Carey and Matlay, 2010; Penaluna and Penaluna, 2009
Entrepreneurship Theory and Practice	No matches found
International Journal of Entrepreneurial Behaviour and Research	No matches found
Journal of Business Venturing	No matches found
Journal of Entrepreneurship Education	No matches found
Journal of International Entrepreneurship	No matches found
Journal of Small Business and Enterprise Development	No matches found
Teaching in Higher Education	No matches found

Of the three articles found, none of them specifically focus on OR but they do focus on ‘assessing ideas’, ‘creativity based assessment’ and ‘assessing creativity’. As this research has shown, OR is considered a creative process (Hills *et al.*, 1999) from which creative products such as ‘ideas’ emerge (Hansen and Lumpkin, 2009) making the above articles relevant from an OR perspective. Indeed Penaluna and Penaluna (2009:718) directly link the assessment of creativity in an EE education context to “ideas generation, innovation and opportunity recognition”.

Carey and Matlay (2010) revealed that assessment practices used in creative industries education focus on the generation of multiple ideas and exploring ideas. Such practices they found are considered rigorous, incorporating both clearly defined objective criteria in addition to some subjective judgement. Penaluna *et al.* (2013:8) are strong in their support for design-based pedagogies which they argue “align with the requirements of enterprise and entrepreneurship education, providing frameworks for ‘constructively aligned’ assessment and interdisciplinary endeavour”. The nature of such assessment practices and support for such claims is discussed further in Section 4.5.5.

### **3.10 Opportunity recognition summary**

This chapter draws attention to the increasing focus on OR competencies as an outcome from EE education. However, this contrasts with, what is seen in the literature as, the relative oversight of OR in current EE education provision. The chapter provides an insight into the creative nature of OR and explored different perspectives of creativity. This led to a discussion of creativity based OR models which illuminated the creative nature of key stages of the process.

A consideration of factors which influence OR led the researcher to identify, from the literature, attributes, behaviours and skills associated with OR. The role of education in enabling creativity relevant OR competencies was discussed, leading to a consideration of current approaches employed in ORedu. This review revealed a lack of creativity-driven approaches in both OR education and assessment practices.

There are increasing calls for EE educators to look towards the art and design domain for education approaches that enable student creativity and facilitate its assessment (Penaluna *et al.*, 2013; Penaluna and Penaluna, 2009; Penaluna and Penaluna, 2008). In response to these calls, the final chapter of this literature review explores the nature of design and considers its relevance to EE education and ORedu in particular.

# Chapter 4 Design

## 4.1 Introduction

This final literature review chapter begins by considering art and design in the context of 'creative industries' and explains why the focus of this chapter rests firmly on the discipline of design. The chapter continues by exploring the features of design and in doing so, critically reviews its growing popularity in the form of design thinking. Adopting a broad perspective towards design, the chapter then considers the nature of design education (DE) and the way in which it enables creative competency development in design students. Illustrating the growing acceptance of design in EE education, the chapter draws to a conclusion by considering the potential suitability of DE approaches to ORedu, as suggested by the literature.

## 4.2 Creative industries

Art and design exists within a category known as the Creative Industries. Carey and Matlay (2010:695) cite the UK Department of Culture, Media and Sport (2006:3) who define Creative Industries as "industries with their origin in individual creativity, skill and talent and with the potential for wealth and job creation through the generation and exploitation of intellectual property". The category contains 13 specific sub-sectors under the one umbrella term (Carey and Matlay, 2010).

Lyon (2011) explains that the frequent coupling of 'art and design' together has evolved over time, yet the two are not the same. Art tends to more firmly associated with self-expression, whereas design is more associated with creating things which add value at the personal, societal and industry level (Lyon, 2011). As Penaluna and Penaluna (2009) explain, designers have become the focus of much attention due to their commercial orientation, where they need to be attentive to, and interpreters of, business needs in order to gain advantage, both for their clients and themselves. Due to the overlap in commercial focus between design and EE education, this thesis focuses more specifically on design over other creative industry disciplines.

## 4.3 Defining design

A definition of design has been attempted by many but no agreed definition exists. For example design is defined by Bruce and Bessant (2002:33) as "the purposive application of creativity through the process of innovation" whilst Lawson (1990:6) simply suggests it is "a highly complex and sophisticated skill". However, design researchers acknowledge that design is difficult to define precisely and that broad definitions are abstract in nature and deny that differences exist between the design fields (Lyon, 2011; Dorst, 2003; Lawson, 1990). For example, Lyon (2011) argues that design is an elusive concept, which has a variety of meanings across both mass and popular culture and oftentimes it is left up to the individual to interpret its meaning. She cites Swan (2010:i) to illustrate this diversity where design is viewed as "a link from creativity to innovation; design as a source of competitive distinction; design as an approach to planning and problem-solving;

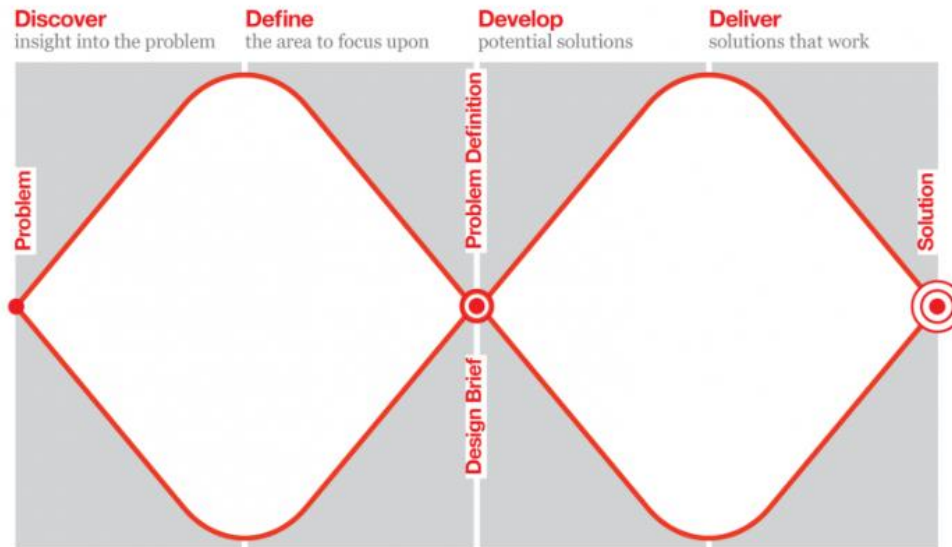
design as a means of creating order out of chaos; and design as an approach to systems thinking” (Lyon, 2011:27). This, she argues, contributes in part to our perception of the designer and therefore our expectation in terms of the designer’s many roles. Therefore, she contends that a singular definition of design cannot cover all of these dimensions and different interpretations of design demand different perspectives. However, it is acknowledged that the nature of design is influenced by contextual variables such as source of the problem, time, values, use of space, language and behavioural expectations (Lyon, 2011; Lawson, 1990).

#### **4.3.1 Design as a process**

Cross (2007) cites Donald Schön (1983) who portrays design as a process which is artistic, intuitive and which can be brought to situations which are uncertain, unstable, unique and provide value conflict. Nielsen and Storvang (2014:9) assert that design leads to the construction of new knowledge which emerges “from processes of discovery and exploration”. Laviolette *et al.* (2014) cite Rowe (1998) who positions design as having two dimensions: a reliance on supposition coupled with a problem solving approach, which together yield creative solutions.

Looking at design as a problem solving approach has led to the development of phased models of design (Dorst, 2003). In this respect Badke-Schaub *et al.* (2010) caution that design processes are not homogenous and should not be treated as such. Due to the complexity of design they argue the reality is not so simple as it consists of many dimensions on several levels. Indeed, Dorst (2003) is critical of the many abstract models of design which are distilled to such a level as to oversimplify what is actually involved, making them questionable in their value. Similarly, Lawson (1990:133) argues that models of design must be malleable in response to the particular problem at hand and contends that “there is not one route through the design process, but many”. Dorst (2003) acknowledges acceptance by design researchers that it is not possible to capture or model all design has to offer. However, the Design Council’s double diamond model (Figure 4.1), developed in 2005 (Design Council, 2007), is recognised for its simplicity and clarity and has been widely accepted in the industry (Nessler, 2016).

**Figure 4.1: Double diamond design process**



Source: Design Council (2007)

The double diamond design process (Design Council, 2005 as cited by the Design Council, 2007) represents modes of divergent and convergent thinking that designers use when engaging in design processes. It identifies four distinct phases: discover insight into the problem (divergent), define the area to focus on (convergent), develop potential solutions (divergent) and deliver solutions that work (convergent). The model is considered iterative and not linear in nature which supports claims in the literature that design processes are not straightforward. Design processes are considered to require successive iterations, shuttling between the problem and proposed solutions, which results in both problems and solutions becoming clearer as design processes evolve (Dorst, 2003; Lawson, 1990). Schön considers reflection to occur throughout the entire process (Johnson and Carruthers, 2006) which is reflected in his view of the designer as a 'reflective practitioner' where the designer engages in 'reflection in action' (Bousbaci, 2008 citing Schön, 1983).

#### **4.3.2 Ways of thinking**

Creativity is considered by Bruce and Bessant (2002) as the engine of design while Dorst (2011:531) contends design involves "quite specific and deliberate ways of reasoning". A characteristic of creative design is described as the 'creative leap' which is the emergence of a novel concept as a potential solution to a problem (Cross, 1997). This creative leap is described by Cross (1997:439) as the "throwing of a bridge across the chasm between problem and solution".

Design encourages the use of multiple thinking styles: deduction, induction and abduction. Deduction is described as moving from the general to the specific in knowing the subject matter and how things work to predict the outcome (Dorst, 2011; Dew, 2007). Induction is moving from the specific to the general in that one knows the result and how things work to determine what the product or subject

matter might be (Dorst, 2011; Dew, 2007). Abduction imagines what could be (Nielsen and Storvang, 2014; Martin, 2009) and connects known patterns back to a hypothesis about how things might work in order to create the desired value outcome (Razzouk and Shute, 2012; Dorst, 2011; Martin, 2009; Dew, 2007). This, Dunne and Martin (2006) contends, results in the creation of new ideas and the development of multiple possible options (Penaluna *et al.*, 2013; Dunne and Martin, 2006). Abduction is seen as the bridge between analysis and intuitive thinking (Dorst, 2011) which allows solutions to progress in the absence of complete knowledge (Stewart, 2011).

In a review of 168 items of literature on design, emanating from both the design and non-design fields, Johansson-Skoldberg *et al.* (2013) distinguish between what they term 'designerly thinking' and 'design thinking'. In summary, Johansson-Skoldberg *et al.* (2013) present five sub-discourses in the literature on designerly thinking as:

- the creation of artefacts (citing Simon, 1969).
- a reflective practice (citing Schon, 1983) where the designer reflects upon the creation which then allows for constant improvement and re-creation.
- a problem-solving activity towards wicked problems using a professional way of thinking (citing Buchanan, 1992).
- a way of reasoning / making sense of things which is reflexive and practice based (citing Lawson, 2006; Cross, 2011).
- the creation of meaning which is the core of the design process and the artefact becomes a medium for communicating these meanings (citing Krippendorff, 2006).

#### **4.3.3 Design problems**

Design is more typically associated with dealing with wicked problems where the true nature of a problem is not immediately known but needs to be discovered through exploration (Nielsen and Storvang, 2014; Dorst, 2011; Stewart, 2011; Cross, 2007; Dorst, 2003; Buchanan, 1992; Lawson, 1990). Cross (2007) suggests that in the 1960s 'wicked problems' were considered as those which were not suitable to being solved using scientific techniques. As such, wicked problems are defined as being those which are "ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values and where the ramifications in the whole system are thoroughly confusing" (Buchanan, 1992:15, citing Rittel, 1967). Such problems have built in constraints and contradictions which makes them difficult to solve (Dorst, 2003; Lawson, 1990; Green, 1974).

Therefore, it is recognised that design involves uncertainty and it is only by repeatedly generating solutions (and failing) that designers identify the boundaries of such 'wicked' problems, and thereby reduce uncertainty. Tracey and Hutchinson (2016) cite Ball and Christensen (2009) who suggest that designers are often aware of what it is they don't know in a design and that it is this uncertainty that motivates designers to find solutions.

Lawson (1990) explains that in the majority of cases problems are 'brought' to designers by their clients. These problems are needs that the client (or the client's

customers) are unable to solve. The designer is seen to bring a unique approach for tackling such problems where initially the problem may appear misleading (Kimbell, 2009b; Lawson, 1990). Dorst (2011) suggests that a starting point for these problems is to consider what makes them so hard to solve. To do this, Dorst suggests expert designers tend to take time to focus on issues surrounding the problem itself in an attempt to truly understand it. He explains that in tackling such problems designers need to work backwards from what is known, although it is acknowledged that this can inhibit creativity and have a mechanising effect (Ward, 2004; Dormer, 1999; Lawson, 1990). Working from what is known is considered to allow designers to develop assumptions, or a frame, about a problem. A frame is defined by Dorst (2011:525) as being “the creation of a novel standpoint from which a problematic situation can be tackled”. Once a credible frame is developed then the designer tackles the problem using abductive reasoning, followed by deductive reasoning, to see if value is created.

#### **4.3.4 Visualisation**

Features of design include visualisation through the development of artefacts and prototypes (Nielsen and Storvang, 2014; Laviolette *et al.*, 2014; Leavy, 2012; O’Grady, 2012; Fixson and Read, 2012; Brown, 2008; Dormer, 1999). Lawson (1990) explains that visualisation allows designers to externalise their thinking and such visuals also act as a form of memory for recording ideas and their evolution. Prototyping is simply described by Brown (2008) as ‘learning by making’ or using the process of building to facilitate thinking (Leavy, 2012). Visualisation, using artefacts and prototypes, allows designers to trace the development of designs and thoughts through subsequent design iterations (Fixson and Read, 2012; O’Grady, 2012). As such, artefacts express both creative and analytical thinking (O’Grady, 2012). These artefacts can exist as sketches or models which can be used as tools by designers to engage with users in an attempt to seek out contradictions and identify what will and will not work in their designs (Nielsen and Storvang, 2014; Laviolette *et al.*, 2014; Dorst, 2003; Dormer, 1999).

Whilst designers represent their ideas as drawings, artefacts and prototypes “these things are by no means explicit about that is going on” in the designers head, and this Lawson (1990:24) contends is what is most important. This argument is supported by Dorst (2003) who argues that much of what we would like to know about design is hidden in the designer’s head and that designers typically find it difficult to explain the what, how and why of what they do. Whilst design is considered ‘visual’, much of what designers do is implicit and difficult to expose.

#### **4.3.5 Verbalisation**

Schön (1992) recognised that designers both draw and talk whilst working in groups and such commentary allows reflection on the action of designing in practice. Verbalisation is therefore considered an important part of the design process where designers must put words around their designs, thereby forcing them to identify “which of their ideas can be easily put into words and which

cannot” (Dormer, 1999:409). However, the use of this technique too early on in the idea ‘germination’ phase is cautioned as it can disturb the thinking process (Dormer, 1999) and as mentioned earlier, designers can struggle to find the words to explain their designs (Dorst, 2003). However, the inability of a designer to express their designs can result in an inability to evolve them (Dorst, 2003).

Design is positioned as a social process which necessitates negotiation between stakeholders in determining the final outcome and a considerable part of designing is described as reconciling and integrating different perspectives into the design (Dorst, 2003). Therefore, Dorst (2003) contends that design must tell a story and show a logic for how the designer arrived at the final outcome.

#### **4.3.6 Design as practice**

Kimbell (2009b) suggests that more recent theories of design have moved from objects, to individual cognition, to design as a form of thinking that can be applied to more general problems leading to greater attentiveness on designerly practices. Taking a practice theory perspective, Kimbell (2009b) suggests looking at design-as-practice, which recognises it as being habitual, somewhat routinized, rule-based, shared and situated. However, the recent growth in popularity of design thinking in particular, warrants taking a closer look at this perspective of design.

### **4.4 Design thinking**

Design thinking has grown in popularity since the mid-1980s (Johansson-Skoldberg *et al.*, 2013). It has become the popular face of design across multiple domains and has been embraced by educators, strategists and scientists alike as the route to stimulate innovation and achieve competitive advantage (Hardin, Wescott and Berno, 2014; Kimbell, 2009; Dunne and Martin, 2006). The attractiveness of design thinking lies in that fact that it is perceived as emerging (Stewart, 2011) as it has a focus on what might be (Nielsen and Storvang, 2014). Design thinking is described as beginning with a fuzzy image of the possible ideas (Dormer, 1999) which crystallise as designers develop prototypes, work through iterations, invite and consider feedback and draw inferences from other sources (Razzouk and Shute, 2012; Dew, 2007; Dormer, 1999).

Lewis and Elaver (2014) consider that design thinking approaches, in an educational context, provide conditions for creative insights. They consider a variety of design thinking models and determine that in general they tend to contain the following steps:

- A research-oriented stage at the beginning.
- A problem-definition and investigative portion.
- A divergent, creative-thinking phase.
- A convergent, more analytical phase to realise the selected creative solution(s).

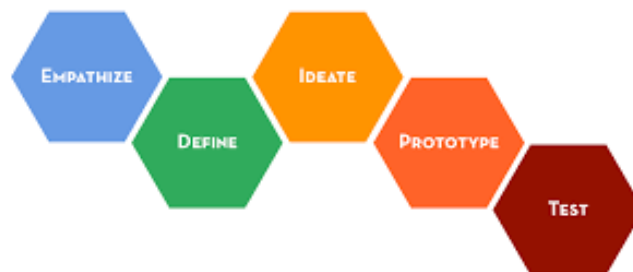
Design thinking is considered human centred as central to its philosophy is achieving a deep understanding of the user experience (Nielsen and Storvang,



2014; Leavy, 2012; Martin, 2009; Dunne and Martin, 2006) in determining value creation (Neck and Greene, 2011). Indeed, this view is supported by Hardin *et al.* (2014) who suggest that industry considers empathy as a core competency which drives design thinking. Some authors consider observational research as an important first step in design thinking, to get a deep understanding of the user and determine the exact nature of the problem and where to begin having ideas (Nielsen and Storvang, 2014; Leavy, 2012, citing Brown, 2008). This user perspective is considered to be reflected through idea visualisation and prototyping (Nielsen and Storvang, 2014). As such, design thinking is seen as a collaborative, participative endeavour where collaboration expands and promotes different perspectives and the range of ideas explored (Nielsen and Storvang, 2014; Leavy, 2012 citing Brown, 2008; Dunne and Martin, 2006).

There are many advocates of design thinking, such as the Hasso Plattner Institute of Design at Stanford (Stanford d.school), IDEO, Rotman School of Management (Toronto), HPI School of Design Thinking (Germany) and the University of Ljubljana (Slovenia) to name but a few (Huber, Peisl, Gedeon, Brodie and Sailer, 2016; Hardin *et al.*, 2014). These institutions offer programmes of various duration and academic levels on design thinking. Stanford's d.school is best known for its design thinking programmes and wider promotion of their design thinking methods, such as their design framework (Figure 4.2) which involves the five stages: Empathise, Define, Ideate, Prototype and Test (Stanford d.school, 2015).

**Figure 4.2: d.school design thinking framework**



Source: Stanford d.school (2015)

In their research with representatives from business, design and education, Hardin *et al.* (2014) describe design thinking in education as a revolution which requires empathy, collaboration and leadership as the most important skills, in addition to retaining a focus on design education. Interestingly they contend that “skills and capabilities that address future needs and thus support personal growth are also important” (Hardin *et al.*, 2014).

#### 4.4.1 Alternative perspectives on design thinking

The growth in popularity of design thinking is causing clear opposition from the design community (Johansson-Skoldberg *et al.*, 2013; Dorst, 2011; Stewart, 2011; Badke-Schaub *et al.*, 2010) who are concerned that the liberal application of design principles, coupled with a lack of understanding, leads to an oversimplification of design concepts (Dorst, 2011; Stewart, 2011). Kimbell (2009a:2) reflects its growth in popularity, particularly in the business domain by suggesting that “in popular culture, everyone might be a designer but in management, it seems, everyone should be a design thinker”. Indeed, Dorst (2011) suggests that the situation has reached ‘crisis point’.

Design thinking is positioned as a ‘panacea’ for modern business and an alternative problem solving approach which can change the world (Badke-Schaub *et al.*, 2010). As such, it is in danger of being considered a fad rather than an enduring concept as the design community see it as largely anecdotal and not empirically supported (Badke-Schaub *et al.*, 2010). It is criticised for ambiguously re-defining the core principles of design which has led to increasing anomalies regarding the core assumptions of design (Johansson-Skoldberg *et al.*, 2013; Dorst, 2011; Badke-Schaub *et al.*, 2010). Design researchers consider that its current fashionable status will probably die out if it does not develop the academic base more closely aligned with ‘designerly thinking’ which is considered robust and thoughtful, “having discourse which is argued and reflected on by scholars over several decades” (Johansson-Skoldberg *et al.*, 2013:127).

Concerns have been raised that the literature on design thinking appears to leave out a number of fundamentals. Design thinking is frequently equated with creativity but other aspects of a designer’s competence are not considered (Johansson-Skoldberg *et al.*, 2013). However, Johansson-Skoldberg *et al.* (2013) do not elaborate as to what these aspects are. Design thinking is positioned as an alternative problem solving approach (Badke-Schaub *et al.*, 2010) yet Kimbell (2009a) cites Hatchuel (2001) who contends that problem solving comprises just one part of a design process. Indeed, Dorst (2003) contends that limiting design to simply problem solving leaves it ‘silent’ regarding how much more design can offer. Similarly, design thinking is associated with a ‘toolbox’ and methodologies which are considered prescriptive and idealistic, with little cognisance of the need to be trained or know when to use them (Johansson-Skoldberg *et al.*, 2013; Badke-Schaub *et al.*, 2010).

Models of design thinking stand in stark contrast with views of design which acknowledge that it is not possible to model all that design has to offer. Dorst (2003) argues that these models ignore the properties of design problems, the designer and the context in which the design is evolved. As such, Dorst claims that simplified models of design represent a limited way of thinking. Indeed, the rationale behind prescriptive processes is questionable, as the literature suggests there is little evidence indicating that designers actually follow such processes (Badke-Schaub *et al.*, 2010; Lawson, 1990).

There are calls for researchers to have a pluralistic perspective in relation to design in order to make an academic contribution and that such a perspective will signal maturity within the domain (Johansson-Skoldberg *et al.*, 2013). This pluralism is attempted by Johansson-Skoldberg *et al.* (2013) themselves, who have a representation from both design and business disciplines, albeit with a stronger bias on the design side. In light of the aforementioned arguments, the researcher of this thesis seeks to move beyond 'design thinking' and look to the field of DE to explore the potential suitability of design approaches to ORedu.

## **4.5 Design education**

Cross (2007) provides an overview of the development of design in the 40 years to 2006 and comments that the 1980s saw design considered a discipline in its own right. Lawson (1990:2) explains that prior to then the emphasis in DE had been on the end product of design with the student working away on their designs in the background, but educators realised that "the end product of design was too important a commodity of the process to remain such a neglected, hit and miss affair". This argument closely echoes current arguments with respect to OR.

It is claimed that people have a natural ability to pick up design and this begins in early childhood (Lawson, 1990; Green, 1974). However, observation of design students suggest that early in their studies they do not have a consistent way of approaching problems but that this appears to be acquired throughout their education (Lawson, 1990). Dorst (2003) describes DE as 'design as learning' in which design is a process of going through learning cycles (propose-experiment-learn) until the student has created a suitable solution to the existing design problem. Approaches used in DE, and other creative industry disciplines, are described as being based around peer enabled, formative and discussion led approaches in which students must present and defend their work in a public forum (Carey and Matlay, 2010; Penaluna and Penaluna, 2009).

Penaluna *et al.* (2013) explain that pedagogic approaches used in the design disciplines tend to emphasise the process rather than the output. DE educators do not expect their students to "blindly go looking for new ideas, but train their students to employ a set of approaches that may lead to discovery", enabling them to respond to problems and see them as opportunities (Penaluna and Penaluna, 2009:729). The literature suggests that the way in which DE is delivered nurtures creativity, promotes critical thinking, reflection and innovation (European Commission, 2009).

### **4.5.1 Learning by doing**

Curricula in DE are typically based around the belief that design should be learned and not taught (Dorst, 2003). Design methods tend to be interwoven into design assignments in the early stages of DE and these are typically dealt with as a 'topic' during the course (Dorst, 2003). Learning by doing, through projects, is liberally accepted in DE, which models the client/practitioner reality of design (Lyon, 2011; Carey and Matlay, 2010; Carey and Naudin, 2006). Learning by doing is considered to develop both thinking and technical skills, encourage

experimentation and decisions based on intuition and to develop student potential and learning based on reflection (Lyon, 2011; European Commission, 2009; Dorst, 2003). It is argued that design students need to both acquire technical expertise along with developing their confidence to express their own value in their designs (McDonnell, 2016).

Lyon (2011) concluded that both learning by doing and the learning space (or design studio) are seen as pivotal in DE. Carey and Matlay (2010) also contend that a suitable academic environment is necessary to allow students to articulate and develop their ideas. Lyon (2011) considers that the learning space should offer students an environment in which to experience both formal and informal learning from educators and students alike. She suggests that different types of learning activities occur in these learning spaces, depending on the type of design, which places the focus on the process and the individual (Lyon, 2011).

#### **4.5.2 Reflection**

Reflection is considered a necessary component of DE, which facilitates depth of learning (Schön, 1992; Quayle and Paterson, 1989). Schön (1992) distinguishes between reflection-in-action, reflection-on-action and reflection-on-practice. In DE, reflective thought is considered to centre around 'informed reflection' on previous actions coupled with constant encouragement of reflection throughout the process. Informed reflection in this instance is defined as "the conscious re-consideration of a thought, idea or experience with expressed objectives" (Quayle and Paterson, 1989:34).

Reflection is seen to draw attention to what has been and what needs to be learned, developing a students' design intuition in the process (Quayle and Paterson, 1989). Tracey and Hutchinson (2016) recognise that engaging DE students in reflective exercises allows them to develop their sense of identity as designers. However, they draw attention to the need to provide scaffolding to novice students on engaging with the reflective process and enabling them to draw connections between their experiences and course content. This is supported by Ellmers (2015) who found that when design students are supported by a structured approach towards reflection then they reflect in a more critical manner, which they consider consistent with the principles of reflection-on-action.

Quayle and Paterson (1989) suggest that in DE student reflection can be encouraged in a variety of ways, most notably through the 'critique', the use of ongoing questioning, formalised peer to peer engagement complimented through the use of experiential techniques. Tracey and Hutchinson (2016) extend this by recognising the value of reflective writing in clarifying and transforming student orientation, particularly with regard to uncertainty, which is recognised as a defining feature of the design space (Buchanan, 1992).

### **4.5.3 The role of the tutor**

The role of the tutor is considered important in this environment where they give encouragement, feedback, propose alternative routes, find a students' strength and build upon it (Penaluna *et al.*, 2014; Lyon, 2011; European Commission, 2009; Quayle and Paterson, 1989). McDonnell (2016) identifies five roles of the tutor as: a source of expertise and authority; acting as coach and facilitator; being a buddy (instructional but constructive); enabling students to reason with and through design proposals (privately and publically) and enabling students to reason confidently. However, these findings are limited due to the single site, sole educator, nature of their study. Adams, Forin, Chua and Radcliffe (2016) expand this view by identifying other key tutor roles as integrating conceptual and procedural knowledge and tailoring information and support to situated practice.

Dorst (2003) suggests that the tutor must also push the student to reach their potential by criticising the work when needed. Cardoso and Badke-Schaub (2016) draw attention to the importance of questioning in influencing the way designers think yet Quayle and Paterson (1989) caution the frequency and veracity of questioning, suggesting that students can become overly self-conscious and potentially leading to an inability to perform (Quayle and Paterson, 1989).

Frequently, the DE educator is a practitioner in the area where they add value by exposing students to current trends and practices, thereby bringing reality into the process (Penaluna, 2011; Carey and Matlay, 2010; Carey and Naudin, 2006; Dorst, 2003; Quayle and Paterson, 1989). Therefore, demonstration is recognised as a frequently used approach in DE where it is considered that students develop skills by watching, participating, listening and then doing (Quayle and Paterson, 1989).

### **4.5.4 Process based**

DE encourages students to explore problems, consider future possibilities, take time to assimilate information and to arrive at solutions in a non-linear way (Penaluna and Penaluna, 2009). Design problems are typically presented to design students in the form of a design brief (Carey and Naudin, 2006) and Green (1974) suggests that this brief needs to position the problem in a way which:

- Ensures relevant experience is gained by students
- Involves self-evaluation
- Incorporates constraints to extend the creative boundaries of solutions and provide criteria for assessment.

In response to the brief, students typically consider what is required in the brief, research relevant topics, form a personal perspective around the context, absorb information and make linkages (initially quite tenuous) using divergent thinking processes (Penaluna and Penaluna, 2009). This they describe as a “cone that sucks all potentially relevant information into its core” (Penaluna and Penaluna, 2009:724), which they consider an established technique in DE.

Following a period of 'digestion' of the information, divergent thinking is used where students must filter the information, retaining that of most value, identifying gaps and acting upon them, thus repeating the process until relevant solutions to the brief are developed (Penaluna and Penaluna, 2009). Penaluna *et al.* (2014) contend that students become accustomed in these areas by repeated exposure, practice and feedback from assessment. The role of the individual is acknowledged in DE, where making decisions based on instinct is recognised as part of the process (Lyon, 2015; Dorst, 2003).

Design students are required to take risks as they can follow a route based on their intuition and incomplete information yet get nowhere (Dorst, 2003). This in turn drives students to use their creativity and experiment with different design options (Lyon, 2011). Therefore, Lyon argues that DE values providing students with both time and space to explore possibilities, respond to their emotions, to experiment, to take risks and to express their own individuality. Indeed, Penaluna and Penaluna (2009) argue on the importance of allowing sufficient time at each stage to facilitate creativity. In particular, they contend that "If the first periods of divergent thinking and reflection are not given a sufficient time allocation, the source 'material' from which to solve a problem will be limited to the students personal prior experiences" (Penaluna and Penalua, 2009:725).

According to Penaluna *et al.* (2013), creative expression in DE is considered along three dimensions:

- Ideational fluency (coming up with many alternatives to a problem)
- Expressional fluency (built on reflection and seeks to illustrate connections between triggers and interim solutions)
- Divergent production (encouraging broad and diverse solutions to the problem)

Considering creativity along these dimensions is thought to discourage 'premature articulation' (Penaluna *et al.*, 2013) where students come up with ideas too quickly without researching them in their broadest sense. This supports the argument that those who come up with answers right away tend to come up with the worst answers (Dorst, 2003) and the more predictable the solution, the less creative it is considered (Penaluna *et al.*, 2014).

#### **4.5.5 Assessment**

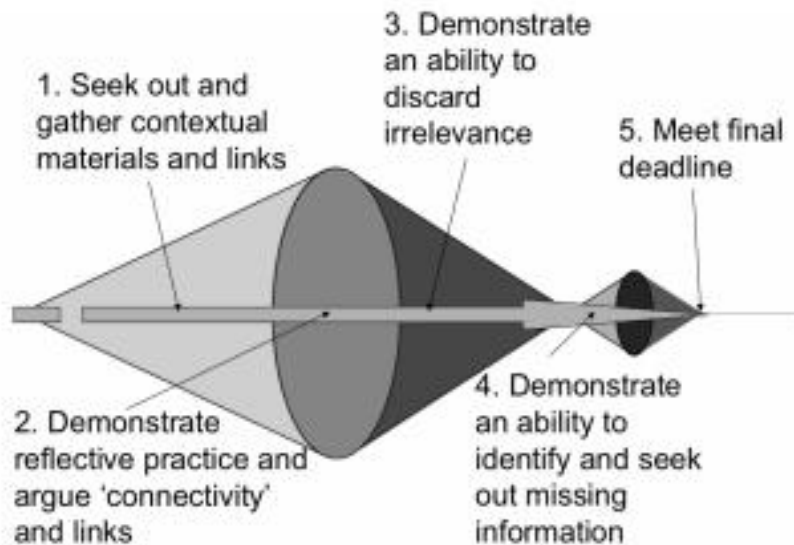
Assessment in the art and design domain is considered robust, emphasising objectivity where possible (Carey and Matlay, 2010). However, there is mixed debate as to how transferrable the approach is (Carey and Matlay, 2010).

Assessment of students' work tends to include presentations, reports demonstrating reflection (Penaluna and Penaluna, 2009) and in the form of a critique or 'crit' (Penaluna *et al.*, 2013; Lyon, 2011; Carey and Matlay, 2010; Penaluna and Penaluna, 2008; Carey and Naudin, 2006).

Penaluna and Penaluna (2009) explain that crits are considered an integral part of DE, and while not often used as formal assessment, they are frequently used for formative assessment and as a vehicle to provide feedback. In a crit, students present (and justify) their work to both educators and their peers and they are expected to 'defend' both their work and its rigour (Penaluna *et al.*, 2013; Carey and Matlay, 2010; Penaluna and Penaluna, 2008; Carey and Naudin, 2006). The ability to communicate is considered pertinent to DE (Penaluna and Penaluna, 2009) and the role of the crit is recognised as helping students to understand and articulate their own work (Lyon, 2011; Carey and Matlay, 2010). Lyon cites Percy (2004) who is critical of it as a vehicle by which students can demonstrate their learning through design and questions the degree to which it offers educational benefits to the students themselves. However, Penaluna *et al.* (2011) argue that this approach is seen to enable students to manage and cope with risk over time and that their skills of "intellectual enquiry [are] enhanced through the curiosity that the pedagogy develops" (Penaluna *et al.*, 2013:6). Of note however is that these claims are not evidenced in their research.

Penaluna and Penaluna (2009:725) present a 'Design-Based Enterprise Assessment Model' (Figure 4.3) which they argue, is not new, but which represents DE educators 'modus operandi'. This assessment model differs from the traditional approach as it is solutions focused rather than process driven and includes assessment of the three creative components of ideational fluency, expressional fluency and divergent production, mentioned earlier. The light cones in the model represent what Penaluna and Penaluna (2009) identify as divergent thinking stages, where students are required to seek out relevant information regarding a pre-determined brief. The dark cones represent convergent thinking, where more solution focused thinking is required by the student. From this convergent stage, gaps in knowledge or opportunities for further exploration can be identified, leading to further divergent and convergent thinking processes.

**Figure 4.3: Framework of the Design-Based Enterprise Assessment Model**



Source: Penaluna and Penaluna (2009:725)

Penaluna and Penalua (2009) argue that this model allows a number of 'drop-in points' for assessment, such as examining the knowledge gained from research undertaken prior to reflection, demonstrating an ability to be reflective and make linkages, demonstrate an ability to filter out irrelevant information, demonstrate an ability to identify and seek out missing information and finally assessing students ability to deliver output by their required deadline. This approach, Penaluna and Penalua (2009) contend, allows the DE educator to assess the process and not merely the project outcome.

#### **4.5.6 DE attributes, behaviours and skills**

A consideration of the literature regarding the nature of design, design processes and DE suggests the need for a range of attributes, behaviours and skills (Table 4.1) in designers. Of interest in this analysis is the presence of many attributes, behaviours and skills that are not ordinarily associated with EE education, such as exploration, experimentation and adaptability, yet in light of the literature presented in these chapters it could be argued that these are also relevant in an EE context.



**Table 4.1: DE attributes, behaviours and skills as derived from the literature**

DE	Description
Attributes	<ul style="list-style-type: none"> <li>• Curiosity (Penaluna <i>et al.</i>, 2013)</li> <li>• Empathy (Dorst, 2003; Lawson, 1990)</li> <li>• Intuition (Lyon, 2011; European Commission, 2009; Dorst, 2003; Quale and Paterson, 1989)</li> <li>• Self-confidence (Lyon, 2011)</li> <li>• Solution orientation (Penaluna and Penaluna, 2009; Dorst, 2003)</li> <li>• Tolerance for ambiguity (Dorst, 2003)</li> </ul>
Behaviours	<ul style="list-style-type: none"> <li>• Action [doing projects] (Lyon, 2011; Carey and Matlay, 2010; Carey and Naudin, 2006)</li> <li>• Adaptable / flexible (Penaluna and Penaluna, 2009)</li> <li>• Communication [Articulate ideas] (Carey and Matlay, 2010)</li> <li>• Defend their work (Penaluna <i>et al.</i>, 2013; Carey and Matlay, 2010; Carey and Naudin, 2006; Penaluna and Penaluna, 2008).</li> <li>• Exploration (Penaluna <i>et al.</i>, 2014)</li> <li>• Experimentation (Lyon, 2011)</li> <li>• Learning from failure (Penaluna <i>et al.</i>, 2011; Dorst, 2003; Lawson, 1990)</li> <li>• Negotiation (Dorst, 2003)</li> <li>• Risk taking (Penaluna <i>et al.</i>, 2011; Lyon, 2011; Dorst, 2003)</li> <li>• Solution development (Penaluna and Penaluna, 2009; Dorst, 2003)</li> <li>• Stakeholder engagement (Dorst, 2003; Lawson, 1990; Green, 1974)</li> </ul>
Skills	<ul style="list-style-type: none"> <li>• Communication / Verbalisation skills (Penaluna and Penaluna, 2009; Dorst, 2003; Dormer, 1999)</li> <li>• Independent learning skills (Penaluna and Penaluna, 2009)</li> <li>• Information acquisition <ul style="list-style-type: none"> <li>○ Research skills (Penaluna and Penaluna, 2009)</li> <li>○ Observation (Quale and Paterson, 1989)</li> </ul> </li> <li>• Negotiation (Dorst, 2003)</li> <li>• Technical skills (Lyon, 2011) <ul style="list-style-type: none"> <li>○ Artefact building (Nielsen and Storvang, 2014; Laviolette <i>et al.</i>, 2014; Leavy, 2012; O'Grady, 2012; Fixson and Read, 2012; Brown, 2008; Dormer, 1999)</li> <li>○ Well-developed aesthetic appreciation (Lawson, 1990)</li> </ul> </li> <li>• Thinking skills <ul style="list-style-type: none"> <li>○ Critical, reflective, divergent and convergent thinking (Penaluna <i>et al.</i>, 2014; Penaluna and Penaluna, 2009; European Commission, 2009; Quayle and Paterson, 1989)</li> <li>○ Intellectual enquiry (Penaluna <i>et al.</i>, 2013)</li> <li>○ Pattern recognition (Lawson, 1990; Penaluna and Penaluna, 2009)</li> <li>○ Linking un-associated information (Razzouk and Shute, 2012; Dorst, 2011; Penaluna and Penaluna, 2009; Dew, 2007)</li> <li>○ Problem solving (Dorst, 2003; Lawson, 1990)</li> </ul> </li> </ul>

Source: Researcher's own work

Closer examination of these attributes, behaviours and skills does reveal an overlap between those identified for OR (Table 3.2, section 3.7) in areas such as intuition, solution development, communication, information acquisition and negotiation. Of particular interest to this research however is the clear overlap between creativity and innovation skills associated with ORedu and thinking skills associated with DE.

## 4.6 Design-based EE education

Many authors comment on the growth in demand for design methodologies in other disciplines (O'Grady, 2012; Leavy, 2012; Dorst, 2011; Stewart, 2011), including entrepreneurship (Neck and Greene, 2011; Penaluna *et al.*, 2011). The literature suggests that interest is being driven by increasing environmental complexity, market volatility and globalisation (Fixson and Read, 2012; Stewart, 2011).

Design based EE is seen as “the merger of and mutual enrichment between business and design” (Nielsen and Storvang, 2014:1). It is argued that entrepreneurs and designers think in similar ways (Neck and Greene, 2011). The starting point for both is a dissatisfaction with the current state (Razzouk and Shute, 2012) and both need creative problem solving skills to succeed in domains with uncertain futures (Nielsen and Storvang, 2014). Laviolette *et al.* (2014) suggest entrepreneurs see opportunities as ‘possibilities’, when looking at it from a design perspective. Therefore “entrepreneurs have to use their imagination in order to transform opportunities in firms” (Laviolette *et al.*, 2014:4).

As the design field appears to offer established design practices that prove useful in the face of wicked problems or paradoxes (Dorst, 2011), it is suggested that design approaches can enable EE students to explore creative ways to turn such problems into opportunities, taking into account disparate stakeholder views (Nielsen and Storvang, 2014; Neck and Greene, 2011). Neck *et al.* (2014) describe design thinking as a ‘toolkit’ for enabling empathy and the development of entrepreneurial behaviour. Indeed, Neck and Greene (2011:64) suggest that a design thinking approach allows students to develop a broad range of skills such as “observation, synthesis, searching and generating alternatives, critical thinking, feedback, visual representation, creativity, problem-solving and value creation”. Fixson and Read (2012) argue that combining design with enterprise allows students shared vocabulary (design and business) which potentially allows them to navigate both the world of design and business and in doing so discover new connections. It also encourages students to develop frequent iterations which are considered important in the face of environmental change (Fixson and Read, 2012).

Huber *et al.* (2016) consider nine concepts from design thinking that they consider have the potential to enhance EE education: ill-defined and wicked problems, formalised design thinking process models, divergent and convergent thinking, iterations, t-shape students, multi-disciplinary teams, creative confidence, informed intuition and studio learning. Using a case study from Munich University of Applied Sciences, they illustrate how these concepts can be incorporated into EE programmes and they conclude that adding principles from design thinking to EE education is worthwhile (Huber *et al.*, 2016). Whilst providing interesting insights into the way in which design can be incorporated into EE, their research appears to be lacking an awareness of the limitations of design thinking. Huber *et al.* (2016) claim that at the end students have become intuitive problem solvers but their research lacks empirical evidence to support this claim.

However, the EE education literature clearly indicates a strong support for ‘design thinking’ in EE (Nielsen and Storvang, 2014; Laviolette *et al.* 2014; Razzouk and Shute, 2012; Neck and Greene, 2011) over any broader concept of design (Penaluna *et al.*, 2013; Penaluna, 2011; Carey and Matlay, 2010). Penaluna *et al.* (2013) are strong in their support for broader design-based pedagogies, which they argue provide ‘constructively aligned’ frameworks that fit with EE education requirements. Similarly, Carey and Matlay (2010:705) argue that, particularly in relation to the assessment of ideas in an academic framework, a number of factors are indeed transferable to EE such as giving rigorous consideration to multiple ideas, consideration of ideas in context and the justification of ideas to peers as part of their assessment. Penaluna and Penaluna (2009:729) contend that the ‘Design-Based Enterprise Assessment Model’ (Figure 4.3, section 4.5.5) is a suitable strategy for the assessment of creativity in EE education as the model “makes students adaptable, flexible and able to respond to problems that they have identified – seeing them as opportunities”.

Nielsen and Storvang (2014) comment on the dearth of knowledge aimed at improving EE education using design thinking. However, in recent times innovative design-thinking based models of EE education are slowly beginning to emerge (Laviolette *et al.*, 2014; Goldsby and Nelson, 2012; Bruton, 2010).

#### **4.6.1 Design based EE education models**

Nielsen and Storvang (2014) propose the DesignUni model (Figure 4.4) which focuses on the front end of idea generation and opportunity creation and then moving on to opportunity development and exploitation. The DesignUni model is based on the belief that imagination is the catalyst for action. This requires a specific designerly mindset, which results in the development of something new.

**Figure 4.4: DesignUni model**



Source: Nielsen and Storvang (2014:6)

Nielsen and Storvang (2014) argue that five key dimensions assist educators in bringing about desired changes in students. They propose design didactics, involving design thinking methods, tools and processes to enable students' creative capabilities. In addition, they contend that a suitable environment must be developed which includes facilitated teaching, use of knowledge, habitat and culture and appropriate assessment to stimulate to enable the desired change in students. Nielsen and Storvang (2014) acknowledge the need for further research into each of the individual dimensions of the model that support the development of a designerly mind-set. The merit of their approach is that it is creativity driven although, at the time of writing this thesis, their model required further testing.

Goldsby and Nelson (2012:83) consider a design thinking approach to opportunity creation to be suitable to student groups as it is process oriented and "since entrepreneurship at its root is creative, a design approach can help the student move an idea along". They criticise both systematic search and effectuation approaches for identifying opportunities with student groups due to their lack of available resources.

## 4.7 Literature review summary

This summary draws together the literature presented in chapters two, three and four. Chapter two drew attention to the important role that the EE education has in fostering entrepreneurial citizens who can respond to and compete in an increasing globalised world (Curth, 2015; World Economic Forum, 2014; European Commission, 2014; European Commission, 2013; Higher Education and Training Awards Council, 2013). The changing nature of EE education was illustrated and its move away from functionally driven, traditional pedagogic approaches towards more learning-centred, action oriented and self-directed approaches (Jones *et al.*, 2014; Lackeus, 2013a; Krueger, 2009; Fayolle and Gailly, 2008; Jones and English, 2004). Such changes have brought students' attributes, behaviours and skills more closely into focus, creating challenges for both EE education delivery and assessment (Penaluna *et al.*, 2011).

Chapter three drew attention to the fact that OR is considered to be at the heart of entrepreneurship and increasingly EE education is expected to develop student competencies in OR (Shepherd, 2015; QAA, 2012; Nixdorff and Solomon, 2007; DeTienne and Chandler, 2004; Hill and Lumpkin, 1997). However, the literature suggests that insufficient attention is given to OR in EE education and that the emphasis tends to be on the development of opportunities rather than their recognition (Jones and Penaluna, 2013; Saks and Gaglio, 2002). OR has been shown to be a creative process (section 3.5), which is multifaceted and iterative in nature (Hills *et al.*, 1999). The literature suggests this process is influenced by a number of factors (section 3.6.2) from which a number of creativity-relevant OR attributes, behaviours and skills can be identified (section 3.7) and the literature indicates that many of these can be enabled in an educational setting (Puhakka, 2011; Krueger, 2009). However, a review of current ORedu revealed a dearth of approaches dedicated to enabling the creative aspects of OR and its assessment.

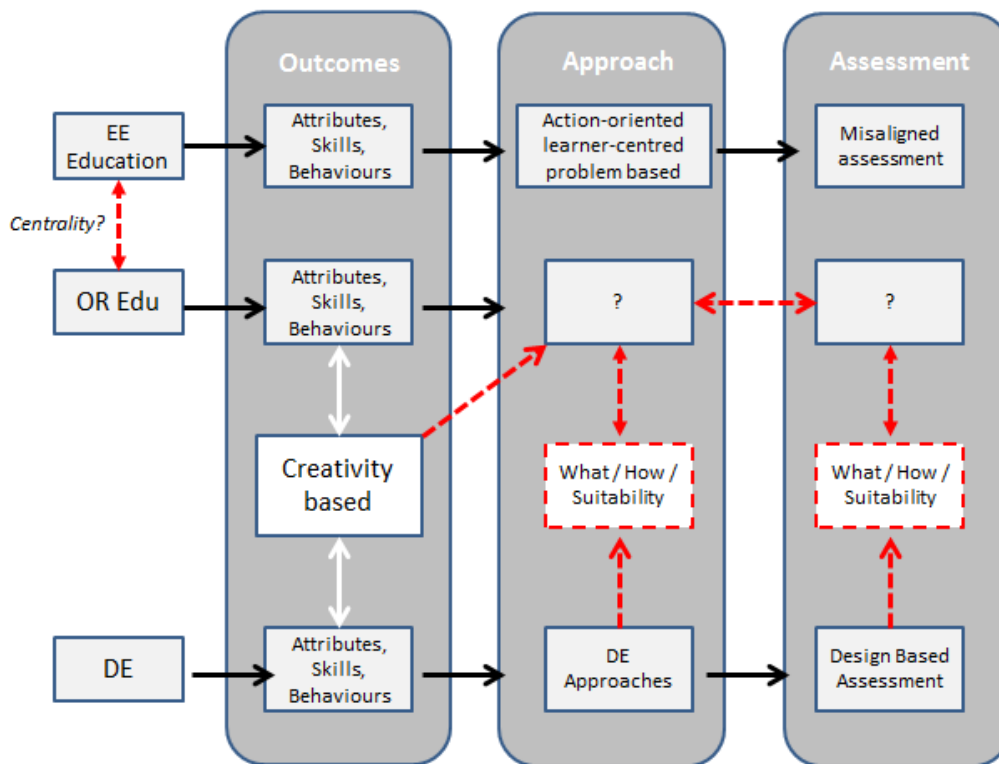
Chapter four considered arguments suggesting that design based methodologies could offer the potential to address this gap (Lavolette *et al.*, 2014; Goldsby and Nelson, 2012; Bruton, 2010; Carey and Matlay, 2010; Penaluna and Penaluna, 2009). Design appears to offer pedagogies and assessment methods, which provide students with the opportunity to develop a range of attributes, behaviours and skills, some of which echo those associated with OR, particularly in the cognitive domain (Carey and Matlay, 2010; Penaluna and Penaluna, 2009). The literature suggests that support exists for the use of design practices in EE education albeit to date there is a noticeable emphasis on 'design thinking'. However, advocates from the design domain encourage taking a broader perspective, thereby moving beyond simply prescribed methodologies (Penaluna *et al.*, 2013). Embracing design approaches in EE is a relatively new departure and in light of the extant literature, perhaps the broader DE domain has more to offer than EE educators currently recognise. OR as a creative process is relatively neglected in the discourse on design to date although Goldsby and Nelson (2012) have contributed to the area, with an initial consideration of OR in their design thinking-based DesignUni model. However, the field lacks informed frameworks

and methods informed by the broader design education domain that are specifically dedicated to ORedu.

### 4.7.1 Conceptual framework

These insights, derived from the literature review, facilitated the creation of a conceptual framework that informs the current research. Figure 4.5 depicts this conceptual framework which draws attention to gaps in the extant literature.

**Figure 4.5: Conceptual Framework**



Source: Researcher’s own work

The literature indicates that OR is considered an important feature of EE education, yet this literature review suggests that OR is not currently delivered as a competence (section 3.2.2). However, few studies provide empirical evidence to support such claims. Coupled with this is the growing expectation that EE education can enable OR as an outcome. While this research pointed to ambiguity surrounding entrepreneurial attributes, behaviours and skills in general, there is even less clarity as to what these might be in the context of OR (section 3.2.1). Indeed, OR is frequently identified in the literature as an entrepreneurial behaviour or a skill, yet this literature review has led to the identification of specific attributes, behaviours and skills that enable OR, many of which are creativity based. This literature review clearly indicates that there is a gap in existing knowledge relating to creativity driven education approaches specifically focused on OR competence development (section 3.8.4).

While assessment is recognised as a means by which educators can equate student achievement with educational outcomes, this literature review has clearly shown a dearth of research on OR assessment (section 3.9) indicating a

significant knowledge gap in this area. However, the literature suggests that design approaches can offer EE educators education and assessment approaches that could enable the development of creativity related attributes, behaviours and skills. However, while interest is growing in this area, little research exists which considers the suitability of broader DE approaches to ORedu in particular (section 4.6).

The following chapter will illustrate how the research gaps identified in this literature review translated into specific research questions and details are provided as to how the above areas were explored in the operationalisation of this research.



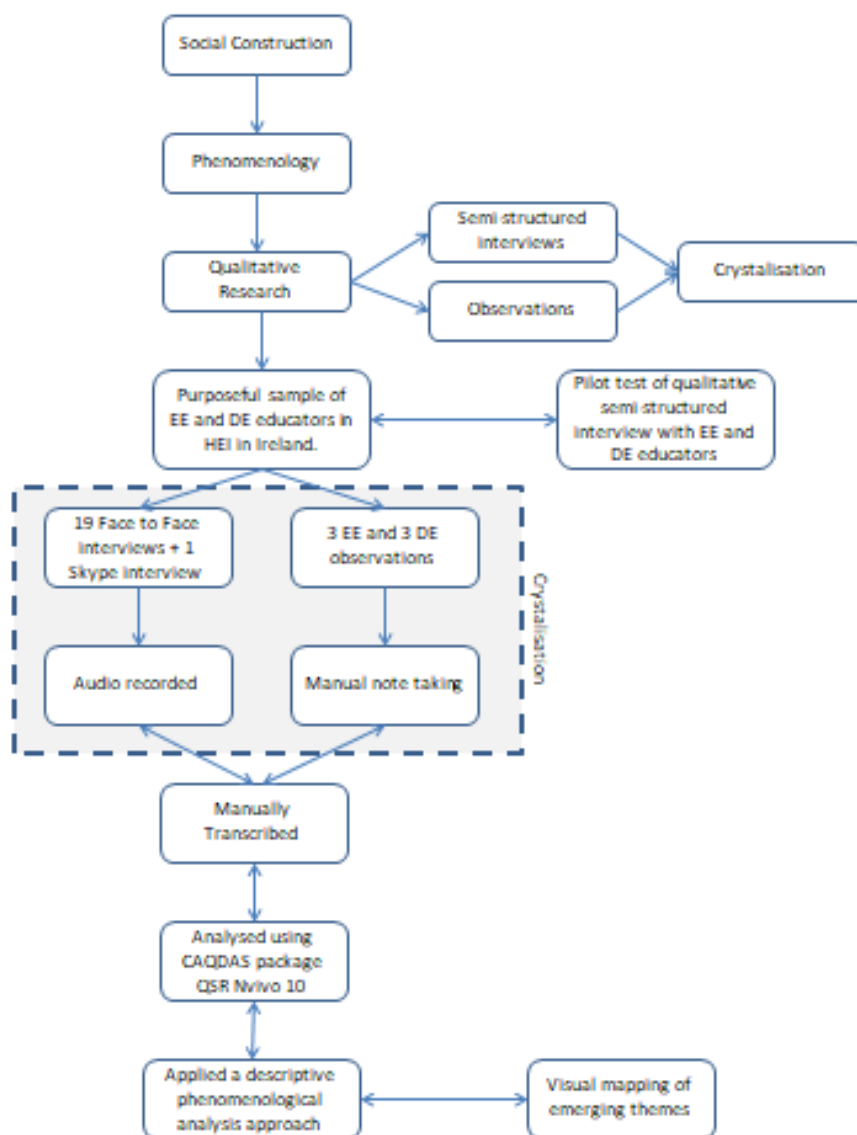


# Chapter 5 Methodology

## 5.1 Introduction

This chapter begins by positioning the research objective in the context of the literature already reviewed. The chapter develops by outlining the theoretical and conceptual considerations on which this research study is based. The ontological positioning of the study as social construction is explained, drawing attention to the phenomenological nature of the research approach. The ensuing qualitative research design, as illustrated in Figure 5.1, involving both interviews and observation of a purposeful sample of EE and DE educators at HE in Ireland, is then detailed. Justification is provided for the adoption of a descriptive phenomenological approach towards analysing the data, complimented by the use of, NVivo 10. The chapter concludes with a discussion of the steps taken to demonstrate rigor in this research study, such as the use of crystallisation and evidence of data saturation.

**Figure 5.1: Overview of research methodology adopted in this study**



## 5.2 Background to the research

The gaps in the literature that have led to the research objective of this study are outlined in chapter one and in the literature review chapters two, three and four. The following is a brief summary of the context of this research and the key points that emerged from the literature demonstrating the relevance of this research question.

Recent economic turmoil in Ireland, coupled with corresponding increases in unemployment, have prioritised the need to generate greater levels of entrepreneurship (Entrepreneurship Forum, 2014) (section 1.5). EE education is identified as a central pillar in the development of a culture in Ireland where entrepreneurship should be considered the norm. Similarly, the National Strategy Group (2011) acknowledges that the firms and indeed the jobs that some Irish graduates will perform in 2030 do not exist yet and therefore future graduates should be capable of “identifying and developing skills, competencies and knowledge that are needed to facilitate entrepreneurial behaviour” (Higher Education and Training Awards Council, 2013:7).

The literature suggests that EE education is recognised for enabling the development of student competencies in creativity and OR (Hills and Lumpkin, 1997; Krueger, 2009). OR is considered central to EE education (Hill and Lumpkin, 1997) due to the ongoing nature of OR in firms of all kinds and to enable students to seek out opportunities to create their own futures in a rapidly changing world (Curth, 2015; Hoidn and Kärkkäinen, 2014; European Commission, 2014; Gibb, 2007).

The literature submits that that EE education should enable students to become skilled at OR (Nixdorff and Solomon, 2007). While interest in OR as an outcome of EE education is growing at European policy level, in practice it appears to be overlooked (Nixdorff and Solomon, 2007; Kellet, 2006; Hills and Lumpkin, 1997). Extant research indicates that reasons for this include: OR not being considered a priority in EE education (All-Party Parliamentary Group for Micro Businesses, 2014; Neck and Greene, 2011; Krueger, 2009), it being considered ‘unteachable’ and a lack of relevant frameworks and teaching approaches (Saks and Gaglio, 2002). This is coupled with calls from the literature to make more practical guidelines or frameworks available (Goldsby and Nelson, 2012; Balan and Metcalfe, 2012).

Research shows that OR is a creative process (Hills *et al.*, 1999) and evidence suggests that the creative skills required for OR can be enabled in an education environment (Puhakka, 2011; Krueger, 2009). However the literature review revealed gaps in extant knowledge regarding creative approaches that can enable OR and its assessment in an EE education context. Design based methodologies appear to offer the potential to address this gap, as the literature suggests they offer pedagogies which enable the development of students’ attributes, behaviours and skills that are closely aligned with OR. The researcher questions if design-

based pedagogy, as practiced, could offer EE educators education approaches suitable for ORedu.

### **5.3 The research objective**

The principal research objective of this research is to:

Explore the suitability of design education approaches in enabling enterprise and entrepreneurship educators to enhance undergraduate students' opportunity recognition attributes, behaviours and skills, in the context of HE in Ireland.

### **5.4 Philosophical perspectives**

All research is underpinned by a researcher's philosophical assumptions as the relevant ontological and epistemological perspectives determine the most suitable choice of research methods (Holden and Lynch, 2004). Therefore, a brief overview of ontology and the position taken in this research will now be explained.

#### **5.4.1 Ontology**

Ontology is defined as "examined reality and being" (Seymour, 2006:138) or simply put, it is the researchers view of the nature of reality (Creswell, 2007; Holden and Lynch, 2004) or 'what is' (Crotty, 1998). Nominalism and realism are the pole ontological positions, where nominalism sees the world as created in the mind and realism viewing objects in the world having independent existence (Cohen, Manion and Morrison, 2007). For this study, neither ontological extremes are being held.

In ontological terms, the researcher views reality as being socially constructed (Saunders *et al.*, 2012; Holden and Lynch 2004). Bryman and Bell (2007) explain social constructionism as an ontological position which implies that the nature of reality is in a constant state of revision as reality is socially constructed. Crotty (1998:42) suggests that "all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context". Therefore, this perspective believes that ultimate reality cannot be defined with finality but rather that researchers must come as close to their version of the truth as possible. In this current research, people are viewed as social actors in their environment where they are involved in social processes from which they derive meaning in both conscious and unconscious ways (Mason, 2004).

#### **5.4.2 Human nature**

Human Nature considers the relationship between human beings and the world. Cohen *et al.* (2007) present Voluntarism and Determinism as two poles in the human nature debate. Voluntarism suggests that human beings have 'free will' and are initiators of their own actions which plays an active role in how they produce their own environment. Determinism on the other hand sees human beings as products of their environment in which they are controlled (Cohen *et al.*, 2007). Cohen *et al.* (2007) explain that determinism assumes events have causes

and events are determined by circumstances so therefore causal links can be identified through scientific methods. This research study does not subscribe to either extreme, but rather considers the middle ground, where research participants are seen to express their own opinions but that these can be influenced by the context in which they are socially embedded.

### **5.4.3 Epistemology**

The philosophical grounding for this study concerns peoples' opinions and epistemologically it is subjective in nature. Subjectivism is also referred to as anti-positivist which stresses the subjectivist experience of individuals in the creation of the social world rather than the positivist view which suggests that the world pre-exists man and that the world exists as an external entity (Cohen *et al.*, 2007). The subjectivist position posits that reality does not exist outside oneself, as it exists in one's mind and it leads to the epistemological stance that knowledge cannot be discovered in scientific ways (Holden and Lynch, 2004). Subjectivists believe that the social world can only be understood from the individual's view point as the participants themselves describe their reality (Cohen *et al.*, 2007). The emphasis in subjectivist research is on understanding the unique, the subjective, and focusing on the external reality (Cohen *et al.*, 2007).

Epistemologically this research seeks to explore the phenomenon of opportunity recognition education (ORedu) from the educators' perspective. Therefore it seeks to explore the subjectivist experience of educators to understand their constructed meaning of their experience of the phenomenon. This view is supported by Dimov (2007) who argues that epistemologically, research into opportunities lies in interpreting the meaning that people attribute to opportunity recognition.

Constructionism views meaning as being created when consciousness engages with the world people are trying to interpret (Crotty, 1998). In seeking to understand the world they live in, individuals create subjective meanings and in doing so people can construct different meanings in relation to the same phenomenon (Cresswell, 2007; Crotty, 1998). Constructionism therefore, views the natural and social world as being socially constructed and together these make up the world we live in (Crotty, 1998).

## **5.5 Research approach**

In approaching this research, this researcher embarked on a research journey, as illustrated in Appendix 2. This current research serves to gain insights into an area about which little is known, opportunity recognition education (Saunders *et al.*, 2012; Sekaran and Bougie, 2010; Bryman and Bell, 2007).

The view of OR taken in this study is informed by Baron (2006:107) who defines it as the "cognitive process (or processes) through which individuals conclude that they have identified an opportunity". An opportunity, in this context, is defined by the researcher as: *A chance to add value by doing something novel in response to a problem.*

*Opportunity recognition education (ORedu)* is defined by the researcher as being the variety of ways in which educators actively seek to develop opportunity recognition attributes, behaviours and skills in students.

In the context of HE in Ireland, the research seeks to address the following research questions:

- How is opportunity recognition currently addressed in practice within enterprise and entrepreneurship education?
- How does current enterprise and entrepreneurship education develop opportunity recognition attributes, behaviours and skills in students?
- How is opportunity recognition education currently assessed in practice within enterprise and entrepreneurship education?
- How does design education enable the development of creativity related attributes, behaviours and skills in design students?
- How suitable are design education approaches to opportunity recognition education?

To address the above research questions the researcher sought to explore the educators' view in an attempt to understand their lived experiences of ORedu in practice. Being idiographic (concerning individual/ human affairs) in nature this research drew from qualitative methods to explore individual, unique phenomena. Qualitative methods include grounded theory, phenomenology, ethnography and action research (Crotty, 1998; Creswell, 2007; Bryman and Bell, 2007; Bentz and Shapiro, 1998). Both grounded theory and variations of phenomenology were considered for this research and the rationale behind the choice of method is now explained.

## 5.6 Methodology selection

### 5.6.1 Research approaches considered

A number of research approaches were considered for this research. A description of each approach and the rationale for selecting or excluding each approach is given in the following section.

#### 5.6.1.1 *Informed grounded theory*

Thornberg (2012) cites Strauss and Glaser (1967) in developing grounded theory as a method for discovering theory from data. As such the theory is grounded in the data arising from the actions and behaviours of those being studied (Creswell, 2007; Robson, 2002; Goulding, 2002). It involves going to and from the field, gathering and analysing data from which the theory emerges (Denscombe, 2010; Creswell, 2007; Robson, 2002). Its major contribution is its focus on emerging theoretical categories which informs additional data gathering collection (Charmaz, 2011).

Informed grounded theory is a version of grounded theory which supports the inclusion of a literature review early on in the Grounded Theory process. It was proposed by Thornberg (2012), who sees it as a more complete form of grounded theory where both the product and the process of research are “thoroughly grounded in data by grounded theory methods while being informed by existing research literature and theoretical frameworks” (Thornberg, 2012:249).

Informed grounded theory was considered for this research, for a time, but deemed unsuitable for the following reasons. Grounded theory is a method that is suited to generate concepts and theories where existing theories are insufficient or are hard to come by (Denscombe, 2010; Creswell, 2007; Robson, 2002). This current research is investigating the suitability of design approaches in *ORedu* and while the initial literature review revealed little theory linking DE to *ORedu*, established theory does exist on the creative nature of OR and in the areas of both EE and DE pedagogy. Such theory was considered an appropriate basis on which to build this exploratory study linking these domains.

The development of theory seeks to “answer queries of why” and to provide logical causal explanations about a phenomenon (Sutton and Staw, 1995:378). This research however seeks to understand the ‘what and how’ of EE and DE pedagogies and their use in *ORedu*. Therefore, this research is both exploratory and descriptive in nature with the aim to illustrate what is happening from the educators’ perspective. The researcher therefore does not seek to develop a new theory of design-led *ORedu* and for this reason, it was concluded that grounded theory as an approach was not appropriate to the research study as a whole.

### **5.6.1.2 Phenomenography**

Phenomenography is a research approach that explores the “qualitatively different ways in which people experience, conceptualise, perceive and understand various aspects of a phenomena in the world around them” (Marton, 1986:31). It is an approach which is firmly associated with research on teaching and learning. Phenomenography considers the competency that educators attempt to bring forth in their students and this is believed to be embodied in the way in which teachers teach. It accepts that different conceptions of teaching, by teachers and students, represent different breadths of awareness of the phenomena of teaching (Akerlind, 2007). The phenomenographic method is used to examine educator experiences and specifically seeks to explain the variation in the underlying meaning of different ways in which people experience a phenomenon. As such it seeks out relationships between those different views (Akerlind, 2004).

Phenomenonography is interested in “the content of thinking” (Marton, 1986:32) or how things appear to people. In other words its focus is on their ‘conceptions’ of teaching (Akerlind, 2007). It is for this reason that phenomenography was not considered appropriate for this research study. This study does not seek to explore EE educators conceptions of teaching OR. Its focus is on the educators *experience* of enabling OR in an education environment, exploring *what* they do and *how* they do it, and not why they do it that way or how their conceptions of OR influence how they teach it.

### **5.6.1.3 Phenomenology**

A phenomenon is defined by Denscombe (2010:94) as being “something that stands in need of explanation; something of which we are aware but something that, as yet, remains known to us only in terms of how it appears to us directly through our senses”. Phenomenology therefore seeks to understand the way in which those who are being studied make meaning from their experiences (Conklin, 2007) to get to their essence and understand “how the mind makes them what they are” (Bentz and Shapiro, 1998:97). In other words it is the meaning of the phenomenon by those who have experienced it (Giorgi, 1997; 2006). Lincon and Guba (2013:40) identify it as “the basic methodology presupposition of constructivism” as it uncovers the constructions held by individuals as they make sense of their reality.

Phenomenology includes techniques such as phenomenological reduction which is a methodological device which was invented by Husserl to make research findings more precise (Phillips-Pula, Strunk and Pickler, 2011; Creswell, 2007). Reduction requires researchers to stand back and describe and examine the object of the research as it presents itself. This approach requires epoche (researcher bracketing) where the researcher attempts to set aside their own past knowledge and experience as much as possible, so that the phenomenon can be viewed in its fullness (Giorgi, 1997).

Phenomenology is appropriate when there is no established understanding of a phenomenon, or nothing close enough from which to make inferences (Bentz and Shapiro, 1998) as is the case with the use of design approaches in ORedu. It is

the phenomenon of ORedu that is of interest in this study and the researcher seeks to understand it in the educators' own terms (Crotty, 1998; Bentz and Shapiro, 1998). Phenomenological research attempts to discover interrelationships, logic and structures that exist in the relationships being researched (Conklin, 2007; Bentz and Shapiro, 1998). In this vein the researcher seeks to understand the nature of the interaction between actors and the subsequent relationships that emerge between these actors in the learning environment.

Challenges with undertaking phenomenology can reside in selecting carefully individuals who have all experienced the phenomenon and the challenges associated with bracketing (Creswell, 2007). Indeed, Creswell (2007) argues that interpretivism suggests that this is impossible, and therefore the researcher "needs to decide how and in what way his or her personal understanding will be introduced into the study" (Creswell, 2007:62).

Remenyi, Williams, Money and Swartz (1998) suggest that researchers need to understand context in order to understand behaviour. Phenomenology provides the researcher the opportunity to understand the relevance of the specific context in which this research is being conducted. In addition, phenomenology acknowledges the existence of multiple realities and the interpretation of phenomenological studies resides in identifying things that are shared between groups (Deanscombe, 2010). As an approach, phenomenology allows the researcher to investigate and understand the realities of two distinct groups, DE educators and EE educators.

The phenomenological approach allows themes to emerge through the literature and seeks to build rich and thick descriptions of the phenomenon which builds on the body of knowledge (Remenyi *et al.*, 1998). The literature informing this research study revealed a number of key areas around which the researcher has designed the data gathering phase of this research. In light of the aforementioned arguments, the researcher considered that a phenomenological approach was the best option, given the totality of this research design.

## **5.7 Research design**

A research design is "the structure that guides the execution of a research method and the analysis of the subsequent data" (Bryman and Bell, 2007:39). The researcher contends that this research study is exploratory in nature (Sekaran and Bougie, 2010) as exploratory research is undertaken when not much is known about a phenomenon and where more information is needed (Sekaran and Bougie, 2010). The literature clearly demonstrates that ORedu is an area that is only partly understood and gaps have been identified in the knowledge relating to this area. This research seeks to address these gaps, by adopting a qualitative research approach to enable detailed exploration of the phenomenon.

### **5.7.1 Qualitative approach**

Qualitative research is a method that is suitable when researchers need to gain a detailed understanding of a complex issue which can only be acquired through



interactions with research participants (Creswell, 2007). Webster, Seymour and Daellenbach (2010) argue for a qualitative approach to studying, or as the phenomenon requires people to draw on their own experience, to help them identify the uniqueness of the situation.

To achieve this level of understanding the researcher needed to get close to the participants, to probe, examine and question them on their experiences. Qualitative research was considered suitable as it involved understanding motivation, emotions and influencers that shape individual educator behaviour. In addition, qualitative research was also useful in identifying issues that influence educators in dealing with OR in an education context (Creswell, 2007). The research design adopted in this research is illustrated in Figure 5.1 at the start of this chapter.

### **5.7.2 Data collection**

As qualitative research is an inherently iterative process, engaging in cycles of data collection is considered essential (Rapley, 2011; Richards, 2009; Miles and Huberman, 1994). Rapley (2011:286) argues that the strength of iterative practice “can lie in the process of collecting something, drawing out the key issues, then going to discover, in your next round of data collection ... how relevant that issue is in a different context”. Therefore, a two phased process for data collection was considered important in this research. As the researcher was employed in a full-time capacity, a two phased approach was designed that allowed the researcher time to reflect on the data gathered from phase 1 before engaging in data collection in phase 2. Operational details of the data gathering phase are discussed in section 5.10.

A variety of data gathering methods are available to qualitative researchers (Creswell, 2007) such as: action research, participant observation, qualitative interviewing, focus groups, discourse and conversation analysis, analysis of texts and documents (Bryman and Bell, 2007). Qualitative interviews and participant observation were deemed most suitable to secure the data required for this study.

#### **5.7.2.1 Qualitative interviews**

Qualitative interviews were considered a compatible data gathering method for this research design as they allowed the researcher to gain an in depth understanding of the experiences from the individual educators’ perspective (Denscombe, 2010; Sekaran and Bougie, 2010; Bryman and Bell, 2007). Semi-structured interviews allowed the researcher to explore the experiences of the interviewees in order to get a thorough understanding of what happens in ORedu (Bryman and Bell, 2007). A broad set of questions were used but breadth of coverage had to be sacrificed for depth in some instances (Qu and Dumay, 2011; Mason, 2004). The benefit of this method was that it gave the researcher the flexibility to explore interesting issues that arose in the interviews and it allowed the researcher the opportunity to adapt the flow and use of questioning in the interview according to the specific context (Saunders *et al.*, 2014; Qu and Dumay, 2011; Bryman and Bell, 2007).

This allowed the researcher to gain a deeper understanding of the issues being researched (Sekaran and Bougie, 2010).

A range of questioning techniques, such as mixing open and closed questions, funnelling and probing questions were used during the interviews (Saunders *et al.*, 2014; Sekaran and Bougie, 2010). To allow the researcher to consider both what was said and how it was said the interviews were audio recorded, with the consent of the research participants (Saunders *et al.*, 2014).

The semi-structured interviews for EE educators and DE educators were based around broad categories, as summarised in Table 5.1 and detailed in Appendix 3. These categories were driven by the research questions and informed by initial engagement with the literature. Due to the relative lack of research on ORedu in general (section 3.8), the EE education interview structure was designed to explore the nature of ORedu at HE in Ireland. Similarly informed by findings from the literature review (section 3.7) the interview sought to reveal how current EE education develops OR attributes, behaviours and skills in students. Due to the creative nature of OR (section 3.5) the interview structure included questions exploring the role of creativity in OR and the learning environments (section 3.7.3) in which ORedu occurs. In the absence of literature on assessment of OR (section 3.9), the interviews focused on this area in particular. Finally the EE educator interviews sought to understand what EE educators currently understood by Design in EE education.

The DE interviews, while structurally similar, did not contain identical questions to the EE educator interviews, reflecting the specific focus of each domain. For example, the EE interview contained more questions on OR in practice while the DE interviews contained more questions that were DE specific. In response to calls in the literature for EE educators to look to DE (section 3.8.4), the interviews sought to understand what DE entailed at HE level in Ireland. Based on claims in the literature that DE enables students to see problems as opportunities (Penaluna and Penaluna, 2009) the role of OR in the context of DE was explored. The literature suggested that design can be considered as a process (section 4.3.1) and therefore questions were asked about these processes and how they work in practice. Informed by the creativity and DE literature (section 3.7.3.1 and section 4.5) the role of the learning environment in DE was explored. Similarly, the literature suggests that DE assessment practices could be useful in an EE context (section 3.1) so therefore this featured as an area of interest in the DE interviews. In light of the emergent debates in the literature on design thinking (section 4.4), the interviews also sought to explore DE educator views on design thinking and its use in non-design domains.

**Table 5.1: Broad categories used in qualitative interviews**

<b>EE Interviews</b>	<b>DE Interviews</b>
Opportunity Recognition	Design Education
Creativity and OR	Opportunity Recognition
Learning Environment	Design Processes
Assessment	Learning Environment
Design	Assessment
	Design Thinking

### **5.7.2.2 Observation**

Observation was used for crystallisation purposes (Richardson, 2000) as it allowed the researcher to gather information at the time that it occurred (Cooper and Schindler, 2003). The literature recognises that observation, by nature of the presence of an observer in a setting, may impact the actions of those being observed (Vinten, 2000, Silverman, 2010). It is frequently used in research on classroom interaction as it is considered a useful method to help understand what is going on in a situation by providing pointers and cues (Silverman, 2011). However, observation is restricted to information gathering at the surface level. When used in conjunction with other methods, such as interviewing which can explore issues which cannot be reached with observation alone, it is considered to add rigor to the research (Sekaran and Bougie, 2010; Bryman and Bell, 2007; Cooper and Schindler, 2003).

Observation studies can be either structured or unstructured in nature (Sekaran and Bougie, 2010). Silverman (2011) notes that it is not advisable to try to record everything when observing, but rather to use broad descriptive categories relating to the people, their interaction and the places that are being observed. The observation sought to gather information on the nature of DE and ORedu in practice in HE in Ireland. To this end, broad categories used to guide the observation centred around the learning environment, participant roles and what was taking place in this environment in terms of ORedu and DE respectively. The observation categories are outlined in more detail in Appendix 4.

### **5.7.2.3 Reflexivity and the research diary**

Engaging in reflexivity is necessary for a constructivist phenomenological researcher as it is seen to aid researchers in recognising multiple realities whilst also allowing the researcher to bracket their own pre-existing experiences and assumptions (Charmaz, 2011). Reflexivity is considered an ongoing process which starts at the beginning of the research and continues throughout the research process, with the researcher making explicit the conclusions reached as a result of such reflexion (Findlay, 2008; Dowling, 2006).

For this research a reflexive researcher diary was commenced before data gathering began as it allowed the researcher to tease out and reflect upon key methodological and design issues in advance of their execution. The diary facilitated a process of reflexive awareness where the researcher considered her

place in the research and considered her impact on the research process. The diary was kept in a free form style where frustrations, methodological challenges, observations and thoughts were recorded in handwritten format (Ortlipp, 2008).

The diary served as a 'quiet' space for the researcher to tease out her thinking and shape her ideas in a more concrete way by making explicit ideas, linkages, feelings and realisations that struck her as she engaged in the research. This included capturing reflections on experiences at conferences, feedback from peers and identifying overlaps in emerging research. In essence the diary also allowed the researcher to reflect on the messiness of the research process and to demonstrate how this messiness informed her understanding of the research, the research process and the decisions taken (Sinkovics and Alfoldi, 2011). In order to illustrate this process, extracts from the diary are contained in Appendix 8.

In summary the research data gathering strategy adopted for this research is outlined in Table 5.2.

**Table 5.2: Research Strategy**

<b>Data sources &amp; methods</b>	<b>Justification</b>	<b>Ethical Considerations</b>
Educator Interviews (EE and DE educators)	Semi structured interviews conducted with EE and DE educators in the higher education sector in Ireland. This method provided the researcher with a starting point from which to understand design education approaches and consider their relevance to ORedu.	Approaching participants, being open and honest about the approach, recording the data, use of the data, maintaining confidentiality, storage of the data, verifying accuracy of the data collected.
Observation of EE educators and DE educators.	Further data was gathered using observations which were recorded manually in a dedicated observation journal. This allowed the researcher to passively observe classroom interaction to enhance the depth of information gathered in the interviews.	Approaching participants, being open and honest about the approach, recording the data, use of the data, maintaining confidentiality of both educators and students, storage of the data, verifying accuracy of the data collected.
Researcher Reflexive Diary	A research diary was maintained to record interesting observations, reflections and thoughts and feelings which arose during the process. The research diary was also used by the researcher to question whether her experience and background was having an influence on the research participants or the research process.	Consideration of researcher / lecturer bias.

Adapted from: Mason (2004:30)

### 5.7.3 Researcher position

Richards (2009) argues that researchers do not have empty minds and that they are likely to have a view on the focus of their research study. Good research design, she argues, should take account of what is already known and should be designed to explore the relevance of such views. The researcher in this study is an

enterprise and entrepreneurship educator with 14 years lecturing experience at undergraduate and postgraduate level, in an Institute of Higher Education in Ireland. In particular, the researcher has been involved in enterprise education, with a particular focus on the entrepreneurial mind-set, for the past 5 years. In recent years, leading up to this research, the researcher became increasingly interested in the phenomenon of OR and developing student creativity, as outlined in the introduction (section 1.1).

At the outset of this research this researcher became interested in students reluctance to engage in OR, their enjoyment when engaging in creativity exercises and their resulting pride in their ability to actually identify potential opportunities. In many cases this was coupled with a sense of disbelief that they were able to come up with something. The researcher became initially interested in what was going on at this stage and if it could be improved if more was done on creativity. However, as a business educator, other than having a range of creativity exercises at her disposal, she recognised her limitations in enhancing student creativity as she realised that she did not quite understand the link between creativity and students' ability to engage in OR. At the start of this process the researcher felt that there was potential to do more to help students truly engage in OR in EE education.

## **5.8 Sampling approach**

In qualitative research Miles and Huberman (1994:30) define sampling as “decisions not only about which people to observe or interview, but also about settings, events, and social processes”. There are a number of sampling approaches such as probability, random, stratified, non-probability, opportunistic and convenience samples (Miles and Huberman, 1994; Bryman and Bell, 2007). Qualitative researchers frequently use non-probability, purposeful sampling which allows them to identify individuals or groups who best demonstrate the phenomena being studied (Burian, Rogerson and Maffei, 2010; Deanscome, 2010; Creswell, 2007; Miles and Huberman, 1994). As this research study warranted input from both EE and DE educators, a stratified, purposeful sampling approach was considered suitable. To facilitate comparability the participants were all from Higher Education Institutions (HEIs) in Ireland (section 1.5). In total, educators from nine HEIs took part in this study. All institutes, except one, offered courses both in EE and design. Therefore, educators from more than one discipline were interviewed at all research sites.

### **5.8.1 Sampling criteria**

To ensure the sample had the necessary experience and expertise in their domain at HE level in Ireland, the researcher identified individuals who best represented educators in their field. Research sites were identified based on the area of expertise of their academic institution.

EE educators were defined as those involved in the delivery of EE education as part of the formal curriculum in HE in Ireland. As this research is concerned with enabling the development of student attributes, behaviours and skills, ‘about’

forms of EE education, which are considered didactic and knowledge based were excluded from this study. The researcher deliberately sought EE educators across a range of disciplines who were involved in the delivery of 'for' and 'through' forms of EE education (section 2.3). Individual EE educators were identified from their public profiles both on their Institutes website or online through linked-in. Before participants were formally included in the research, an initial conversation with potential participants confirmed that they were involved in delivering 'for' or 'through' EE education at undergraduate level. These preliminary discussions resulted in two educators being excluded from the final sample.

DE educators were defined as those involved in the delivery of design education as part of the formal curriculum in HE. The literature indicates that not all design is the same (Dorst, 2003; Lawson, 1990). Criteria for discerning design includes, but is not limited to, a consideration of typical constraints involved in the design problems (open versus closed), origin of the design problem (inspired by the designers own mind versus unresolved needs of others), knowledge structure of the discipline (highly structured and technical versus relatively weak – personal preference), scale of production (highly customised versus capable of mass production) and the role of the designer in the complete process (Dorst, 2003; Lawson, 1990). This research focused on sectors of design education which dealt with:

- Open design problems
- Problems that arise from the needs of others
- Strong commercial orientation guiding their design
- Designs capable of repeated production (rather than one off works).

Therefore, the sample excluded artists, sculptors, musicians, fashion designers, theatre designers and film makers. Categories such as engineers and architects were not included due to the highly structured nature of their discipline. Therefore the sample comprised predominantly of product / industrial design and graphic design educators.

### **5.8.2 Sample size**

Sample size was an important consideration with Creswell (2007) recommending that researchers should aim to collect extensive information about each site or individual that is studied. The literature yielded mixed advice in terms of the size of a research sample for qualitative studies. Saunders *et al.* (2012) suggest that inductive studies tend to be concerned with context and therefore the use of a small sample of research subjects tends to be more appropriate than large samples. Hycner (1985) recommends that for the most part phenomenological studies requires only a limited number of people be interviewed. Creswell (2007) cites Dukes (1984) and Riemen (1986) who recommend sample sizes of up to ten individuals for phenomenological studies while Guest, Bunce and Johnson (2006) contend that twelve interviews should be sufficient for non-probability studies of relatively homogeneous groups using somewhat structured interviews. However it is recommended that when dealing with a stratified sample involving two or more

groups then it might be necessary to consider a minimum of 12 participants per group (Guest *et al.*, 2006).

Based on the aforementioned arguments, a sample size of twenty educators was identified for this research, comprising of 10 EE educators and 10 DE educators. This limit was initially set as a target but the researcher was open to reviewing this number subject to reaching data saturation (section 5.12.4).

## 5.9 Pilot Testing

The initial semi-structured interviews were tested in a pilot study, in early October 2015, with one design educator and one EE educator (Table 5.3). Pilot studies are recognised as an important stage in the research process as it allows the researcher to test the research instrument as a whole (Bryman and Bell, 2007; Cooper and Schindler, 2003). The pilot studies, allowed the researcher to gain experience in conducting research interviews, refine the research questions in light of the nature of the responses received and become familiar with the processes involved in data analysis [using NVivo10 analysis software] (Bryman and Bell, 2007; Mason, 2004).

### 5.9.1 Operational details of pilot studies

The pilot studies were conducted in Waterford Institute of Technology (WIT), where the researcher is a lecturer, due to ease of access to suitable participants. These participants fit the initial sample criteria in that they were experienced educators in a Higher Education Institute in the required domains (Cooper and Schindler, 2003). As a colleague of the pilot participants, the researcher was conscious of the 'insider effect' of role duality on their responses in the pilot (Brannick and Coghlan, 2007; Coghlan, 2007). For this reason, those involved in the pilot study did not form part of the final sample (Bryman and Bell, 2007). The pilot tests were recorded using a dictaphone and later transcribed by the researcher. Operational details of the pilot tests are outlined in Table 5.3.

**Table 5.3: Operational details of pilot study**

Pilot interviews	Date	Duration
<ul style="list-style-type: none"><li>• Pilot Interview 1</li></ul>	5/10/2015	49 mins
<ul style="list-style-type: none"><li>• Pilot Interview 2</li></ul>	7/10/2015	54 mins

### 5.9.2 Insights from pilot studies

The pilot studies revealed a number of interesting insights both in terms of sequencing of questions and use of terminology (Bryman and Bell, 2007; Cooper and Schindler, 2003). The researcher realised that opening questions were in fact too narrow and that a more general opening question was required to ease the participants into the interview. Similarly, the researcher identified the need for an open-ended closing question which both signalled the end of the interview and allowed participants free reign to contribute additional information in a non-structured way (Appendix 3).

Review of the pilot interviews indicated that some of the terminology used in the interviews was not necessarily understood, depending on the domain of the interviewee (Cooper and Schindler, 2003). For example the word opportunity or design caused some difficulty for interviewees, depending on their discipline. The word environment also caused both EE and DE educators difficulty. The word was too general to enable them to answer in a way that addressed the many facets of the learning environment. Therefore the researcher realised that a distinction needed to be made to the wording to distinguish the physical learning environment from the prevailing culture. Some questions led to similar types of answers, such as, 'how do you encourage creativity?' versus 'talk me through how students identify opportunities?' The researcher became aware of the need to be careful to steer away from questions if they have been already answered. The researcher also realised that questions on the skills associated with OR were missing from the pilot interview, yet these questions were important in the light of this research objective.

Playback of the interviews revealed that the researcher over explained questions in the pilot and that care needed to be taken not to lead participants. As a result the final interview schedule was re-structured and questions were more carefully worded (Appendix 3). Finally, the pilot testing allowed the researcher to experiment with NVivo 10 software and become familiar with its functionality, using her own pilot research data prior to engaging in the full study.

## **5.10 Data management**

### **5.10.1 Interview data**

The initial research participants were contacted by e-mail to inform them about the research and to secure their participation in the research study. Participants were provided with an information sheet which informed them about the study (Appendix 5). All participants were contacted by phone, as a follow-up, one week after receiving the initial e-mail. This allowed participants to ask questions regarding the research and, if they indicated interest in participating, to schedule dates for data gathering on mutually convenient dates. However, the researcher was careful to ensure that she did not put pressure on participants to participate at this stage and she re-iterated the choice to decline if they so wished. Before participating each participant read and signed a consent form (Bryman and Bell, 2007) (Appendix 6).

Thirty-three educators were contacted in total of which eleven did not respond to the e-mail or follow on call or openly declined to participate. A further two were excluded on the grounds that they did not exactly meet the criteria set. However, twenty participants, across nine HEIs, did agree to participate and six agreed to allow the researcher to observe their interaction with students. All participants were educators in either EE education or DE.

EE educators were defined as those involved in the delivery of EE as part of the formal curriculum in HE. These educators also delivered other modules in other



subjects such as accounting, health sciences or engineering. Design educators were defined as those involved in the delivery of design education as part of the formal curriculum in HE. These educators tend to be dedicated to the delivery of DE, albeit individual educators could have responsibility for delivering more than one aspect of DE, depending on their design specialism.

Prior to the interviews, the researcher put time into thinking about how she wanted to be perceived by the participants. She did not want her formal position as an educator to put her participants on edge so she decided that she needed to blend in with the student body as the researcher was a student and sought to be perceived as such (Appendix 8, extract 2).

### 5.10.2 Data gathering phases

In accordance with the proposed research design, the data gathering phase was conducted in two phases spanning a six month period. Phase 1 ran from October to mid December 2015 and Phase 2 ran from January to April 2016. Phase 1 consisted of seventeen interviews (Table 5.4) with nine EE educators and eight DE educators. Phase 2 involved a further three interviews (Table 5.5).

At the end of phase 1 the researcher paused the data gathering phase to allow the researcher time to reflect on the data gathered to date, conduct some initial data analysis and to allow the researcher the opportunity to examine discoveries which emerged from the data in the subsequent round of data gathering (Richards, 2009).

**Table 5.4: Phase 1 data collection schedule**

Participants	Date of Interview	Form of Interview	Duration of Interview
• EE1	27/10/2015	Face to Face	61 mins 9s
• EE2	27/10/2015	Face to Face	72 mins 45s
• EE3	28/10/2015	Face to Face	54 mins 16s
• DE1	29/10/2015	Face to Face	64 mins 9s
• EE4	02/11/2015	Skype	64 mins 2s
• DE2	06/11/2015	Face to Face	48 mins 50s
• DE3	10/11/2015	Face to Face	50 mins 54s
• EE5	12/11/2015	Face to Face	62 mins 33s
• EE6	13/11/2015	Face to Face	67 mins 42s
• EE7	23/11/2015	Face to Face	35 mins 54s
• EE8	23/11/2015	Face to Face	78 mins 27s
• DE4	30/11/2015	Face to Face	62 mins 27s
• DE5	30/11/2015	Face to Face	41mins 11 s
• DE6	7/12/2015	Face to Face	53 mins 05s
• DE7	14/12/2015	Face to Face	50 mins 12s
• DE8	9/12/2015	Face to Face	49 mins 39s
• EE9	9/12/2015	Face to Face	81 mins 16s

**Table 5.5: Phase 2 data collection schedule**

Participants	Date of Interview	Form of Interview	Duration of Interview
• EE10	19/04/2016	Face to Face	47m25s
• DE9	13/04/2016	Face to Face	61m
• DE10	22/04/2016	Face to Face	76m56s

The majority of interviews that took place were face to face interviews. This allowed the researcher the opportunity to adapt questions as required, clarify responses and to pick up on interviewee body language suggesting stress or discomfort (Sekaran and Bougie, 2010). Interviews took place in all but two cases on campus in the relevant HEI. Many interviews took place in quiet offices or empty tutorial rooms. On two occasions the interviews took place in a corner of a canteen when it was quiet, either first thing in the morning or last thing on a Friday evening. Two interviews took place in the lobby of a hotel, at the interviewees request. Due to the neutral nature of the location, the venue was not considered to have impacted negatively on the interviews. Interviews ranged in duration from 35 minutes to 81 minutes, with an average interview duration of 58.3 minutes. Total recorded interview time was 1,164.88 minutes, or 19.42 hours.

### 5.10.3 Data capture

Two methods were used for recording the data from the interviews: audio recording and taking notes as a back-up.

Audio-recording was used in the interviews as it offered a permanent and relatively complete record of the interviews (Denscombe, 2010). Prior to audio-recording the interview, permission was sought from interviewees to do so and interviewees were informed that the audio-recording equipment could be switched off at any time if they so wished (Saunders *et al.*, 2012). In all cases the participants were happy for the recording to take place and did not appear phased by the presence of the recorder. Digital recordings of the interviews were downloaded to the computer within 24 hours of the recording taking place.

A down side to audio recording is that they are noted for being relatively poor at capturing the contextual factors (Denscombe, 2010). Therefore note taking was particularly important to summarise points and to record non-verbal responses such as facial expressions, gestures, changes in intonation etc. (Saunders *et al.*, 2012; Silverman, 2011). Immediately following the interview the researcher recorded memos which described observations regarding the scene, behaviours and other contextual factors that were relevant to each interview (Saunders *et al.*, 2012; Bryman and Bell, 2007; Goulding, 2002). These observations were handwritten in a journal and this practice proved very useful in recording incidental events, the atmosphere in the interview, distinguishing characteristics of the interview, information shared with the researcher when the recorder was turned off and information gathered if the participant brought the researcher on a short tour on the way out of the premises.

One skype interview was conducted during the initial data gathering phase, due to convenience. The participant was located a significant distance away from the researcher, and skype was considered as a feasible alternative for to face to face interviewing (O'Connor, Madge, Shaw and Wellens, 2008). This form of interview offered the opportunity to video record the entire interview, thereby providing a more complete permanent record of how and what was discussed (Denscombe, 2010). Prior to recording the interview, permission was sought from the interviewee to do so and they were informed that the recording equipment could be switched off at any time if they so wished (Saunders *et al.*, 2012). Two copies of the recording were made, one as a working copy and the other as a back-up copy (Denscombe, 2010). The back-up copy was safely stored on an external hard drive while the working copy was saved on the cloud.

The researcher had originally considered doing a number of skype interviews, to reach those participants who were located a significant geographic distance away from the researcher. However, following this initial skype interview the researcher decided not to conduct any further skype interviews. The researcher felt that the skype format created a sense of distance between the researcher and the participant, as the brief time delay in transmission interfered with the flow of questioning and the interruption of conversation from time to time (Redlich-Amirav and Higginbottom, 2014). As the interview was the fifth interview in phase one, the researcher had sufficient experience of face to face interviewing to allow her to decide that all remaining interviews would be face to face.

#### **5.10.4 Data transcription**

The data was manually transcribed by the researcher (Silverman, 2011) within a few days of the interview taking place and while the interview was still fresh in the researchers head. On listening to the recording the researcher could recollect being back in the interview (Appendix 8, extract 3). Each 15 minutes of interview data took a minimum of one hour to transcribe. On occasion, due to background noise or a strong accent this would stretch to one and a half hours per 15 minutes. As the researcher is a touch typist the researcher felt there was far greater benefit from transcribing all interviews herself. All transcriptions were done using the slow playback facility on the dictaphone and using headphones, so that the interviews could be kept strictly confidential.

The transcriptions were anonymised, with all references to the participant, their colleagues, their location or other identifiable references removed from the transcript. Each interview was listened to on several occasions (minimum 4) to make sure that all nuances of the interview were correct and that the written record of the interview was true to the words used by the participants (Miles and Huberman, 1994; Richards, 2009). Working copies of the transcriptions were encrypted and saved on the hard drive of the researchers personal computer and back-up copies of the written transcriptions were saved on an external hard drive. When the researcher was satisfied that the transcripts presented a rich, true and accurate record of the interview, then a hard copy of each interview was printed. These were stored in a locked cabinet when not in use for analysis purposes.

### 5.10.5 Observation data

Observation of both DE and EE education in practice formed part of the data gathering methods for this study. Six individual observations took place comprised of three DE and three EE educators (Table 5.6). The observations took place in the six month period from October 2015 to April 2016, in their normal HE educational setting, lasting between 1 and 3 hours. Two observations were undertaken in phase one of the research (up to end December 2015) with a further 4 undertaken in phase 2 (up to end April 2016). In all instances the researcher, in co-operation with the educator, informed the students of the purpose of the observation in advance and their signed consent was secured prior to undertaking the observation.

**Table 5.6: Schedule of observations**

Date of observation	What was observed	Duration of observation
29/10/2015	Observation of interim student reviews DE	1.5 hours
09/11/2015	Observation of student tutorials DE	1.5 hours
26/01/2016	Initiation of the OR process EE	1 hour
28/01/2016	Student presentations of opportunities EE	2 hours
04/04/ 2016	Observation of group crit / feedback session DE	3 hours
29/04/2016	Workshop: Raising students' awareness to opportunities EE	1 hour

The observations proved valuable to the researcher in contributing to depth of understanding with regards to the context and the processes described in the research, particularly in the design domain (Bryman and Bell, 2007). Overt, non-participant observation was considered appropriate as it allowed the researcher to observe without becoming involved in the process (Silverman, 2011; Sekaran and Bougie, 2010; Vinten, 1994) and the researcher gained a greater insight into the research categories. To minimise disruption to both educators and students the researcher did not use any electronic recording equipment during the observation stage of this research. Rather the observer chose to record observations by hand in a dedicated observation journal. The handwritten notes were typed up into electronic format and considered as data for analysis purposes using NVivo 10 (Miles and Huberman, 1994).

The researcher was conscious of the impact that her presence would have on those being observed (Vinten, 1994), and took deliberate steps, (where possible) to position herself in a discrete location (Appendix 8, extract 13). The researcher maintained a reflexive diary throughout the data gathering phase of this research. Entries were recorded in the diary within two hours following each observation. These entries recorded initial impressions, details on the location, duration and in

addition to surprises or items of interest (Silverman, 2011; Miles and Huberman, 1994).

The observations undertaken provided valuable insight into this research study. They allowed the researcher to really understand what was taking place in each learning environment. Observation allowed the researcher to consider other relevant information that had not arisen in the initial interviews as the respondents may not have perceived such information as being relevant (Bryman and Bell, 2007; Cooper and Schindler, 2003). For example the observation revealed that one EE educator actually suggested solutions, which was not mentioned in any of the interviews. In addition, while educators had previously described what they did, the observations revealed subtleties and nuances that the words shared in the interviews had not disclosed. For example, both EE and DE educators described challenging students, but the observations revealed that the nature of this challenge was entirely different. EE educators challenged the ideas on the grounds of viability while the DE educators clearly challenged how students came up with ideas, what led to them, why they thought in that way etc. Also when presenting their ideas DE students in particular could be heard explaining what led them to their ideas, why they had followed a particular path and how they hoped to explore those ideas forward. DE educators were observed questioning students' reasoning, praising the angle they had taken, encouraging them to explore a particular angle they had found interesting and pushing students for a variety of options.

Observation allowed the researcher to become immersed in the learning environments, observing how, where and what was taking place and thereby obtaining more information and greater insight (Vinten, 1994). The observations gave the researcher an appreciation of the stark differences between the learning environments in, and between, EE and DE education locations. The physical layout, the wall decoration (or lack thereof), the degree of student ownership of the space, the chaos, the order, the noise, the silence, the movement, the passiveness and the engagement were all evident in the observations. This added valuable depth to the volume of descriptions provided by the educators in this study.

## **5.11 Data analysis**

### **5.11.1 Computer aided qualitative data analysis systems**

The analysis stage of the research is often considered one of the most difficult stages of the research process (Leech and Onwuegbuzie, 2011) due to both the volume and complexity of the data generated (Rademaker, Grace and Curda, 2012; Bergin, 2011). There is much debate in the literature on the use of computer aided qualitative data analysis systems (CAQDAS) in analysing research data although in recent times CAQDAS is increasingly becoming more accepted in qualitative research (Wickham and Woods, 2005; Silverman, 2010). In particular

the use of CAQDAS is encouraged in qualitative research as it can allow experimentation, demonstrate research rigour, provide transparency and lead to enhanced research credibility and trustworthiness (Sinkovics and Alfoldi, 2011; Carcary, 2011; Silverman, 2010).

The researcher used QSR NVivo10 to analyse the research data for this research study. The decision was made in light of the flexible research design approach adopted in this research and the need to demonstrate rigour (Leech and Onwuegbuzie, 2011; Sinkovics and Alfoldi, 2011; Carcary, 2011). NVivo is one of the most popular CAQDAS used by qualitative researchers (Leech and Onwuegbuzie, 2011). Bergin (2011) describes it as a software package produced by QSR International which was designed for qualitative researchers seeking deep level analysis for both large and small scale research projects.

As the data gathering tasks involved in this research were scheduled to take place over a period of time, the researcher sought a way to organise, record and undertake initial analysis, in a visual way. The researcher was also aware of her own limitations in relation to organisation and felt that the software would provide the necessary structure needed to manage a large quantity of data. However, the researcher was aware from the outset that she was responsible for undertaking the analysis and the software was seen as a tool to assist with the management of documentation and documentation of the process (Sinkovics and Alfoldi, 2011; Leech and Onwuegbuzie, 2011; Carcary, 2011; Wickham and Woods, 2005). The decision was finally influenced by the fact that the researcher had access to NVivo10 software and NVivo experts in her place of work. In advance of making the decision to use the software the researcher attended NVivo training and was given access to the software in order to learn it.

The researcher found that NVivo 10 did offer clarity to the analysis stage of the research stage of the research. The advantages in organising, indexing, storing and coding many forms of data proved useful for this study due to the variety of interviews and observations undertaken (Sinkovics and Alfoldi, 2011; Bergin, 2011; Silverman, 2010). Similarly it allowed the researcher to undertake robust research analysis in terms of comparing codes and categories of data, modelling of the data and running queries when required (Sinkovics and Alfoldi, 2011; Leech and Onwuegbuzie, 2011; Bergin, 2011; Wickham and Woods, 2005). The researcher found that the ease of accessing and moving through transcripts and other source documents allowed her to revisit the data several times resulting in her developing a closeness with the data from which patterns and connections could be identified and put into categories (Denscombe, 2010; Bryman and Bell, 2007; Braun and Clarke, 2006)(Appendix 8, extract 9).

The researcher found that NVivo10 facilitated, in a very orderly and non-cluttered way, the presentation of the raw data and all the analysis was undertaken by the researcher herself. The researcher found NVivo 10 to be relatively easy to use, with click and drop coding and facilities whereby nodes could be merged or cut and pasted with ease. Examples of node trees are available in Appendix 9. The

memo facility with NVivo10 proved very useful in capturing thoughts and insights and attaching them directly to the nodes where required (Carcary, 2011).

## **5.12 Data analysis approach**

### **5.12.1 Descriptive phenomenological approach**

A descriptive phenomenological approach was adopted for the data analysis stage of this research study. Whilst the approach originally emerged from the field of psychology, Giorgi (2006) contends that the method is generic enough to be applied to any human or social science. The descriptive phenomenological approach provides 'acknowledgement that there is a given that needs to be described, precisely as it appears and nothing is to be added to it nor subtracted from it' (Giorgi, 2006:9).

This approach was considered a good fit as it emphasises the phenomenon over the individual. This research sought to understand the phenomenon of opportunity recognition education (ORedu). The focus therefore was not on the individual educators themselves, but rather on their shared experience or ORedu. The descriptive phenomenological approach is considered more suited to research which explores specific situations from multiple participants (Giorgi, 2006). In the context of this research this approach allowed the collective experience as provided by participants to be accepted as such, without anything added or interpreted by the researcher. For the aforementioned reasons the researcher felt there was a good fit between the descriptive phenomenological approach and the research design.

### **5.12.2 Alternative data analysis approaches considered**

An alternative approach, Interpretative Phenomenological Analysis (IPA) was also considered at this stage of the study. IPA involves the speculative development of an interpretative account of participant responses (Larkin, Watts and Clifton, 2006; Brocki and Wearden, 2006). However, the researcher was uncomfortable with the notion of attaching her own meaning to interpret participant responses and deemed that IPA sat further along the interpretivist continuum than the researcher saw herself. Similarly IPA focuses on specific individuals and tries to provide a speculative interpretive account of the individual's relatedness to the phenomenon (Watts and Clifton, 2006). In this instance the research sought to understand the collective experience of educators and the researcher felt that the strong individual emphasis of IPA did not fit the research design.

### **5.12.3 Data analysis processes**

Using the descriptive phenomenological approach to data analysis Giorgi (2012; 2006: 1997) believes that it is important for the researcher to assume the phenomenological attitude and the attitude of the discipline in which one is working in, in order to frame their understanding of the experiences described by participants. Therefore an EE education frame was adopted by the researcher when analysing the data.

A process for data reduction and analysis, informed by Giorgi (2012; 2006; 1997) was adopted for this phase of the research. This approach involved the following steps:

1. Each transcript was read from beginning to end several times in order to get a full understanding of the experience and to become familiar with the data.
2. The researcher then went back to the start of the transcript, and each time a change in meaning was detected, this was coded, using the words of the participant. These were considered 'meaning units' for the purpose of the research.
3. An initial broad category system was driven from the topics used to guide the semi-structured interviews (Richards, 2009; Dey, 1993) in an attempt to manage the initial volume of codes.
4. Once each transcript was fully broken down into 'meaning units' the researcher then examined each meaning unit, coded to the relevant nodes, more closely in the context of the research. The research used 'free imaginative variation' at this stage of the process. Conklin (2007:279) describes free imagination variation as "arriving at the underlying and precipitating factors that account for what is being experienced" which requires the researcher to look at the phenomenon from a variety of perspectives and to use their imagination in determining the structural elements. The terms of the researchers own discipline were introduced (Giorgi, 1997) so that the data that would more clearly explain what was said in relation to the phenomenon in the context of the research.
5. Further analysis lead to a fuller and deeper categorisation of the initial categories identified (Dey, 1993).
6. An overall composite structure of the participants' experiences which represented the "core, most fundamental and essential structures shared by the participants" (Conklin, 2007:280) was developed by reviewing all the nodes and then grouping and merging nodes together in hierarchical node trees (Appendix 7). This stage resulted in duplicate nodes being deleted or re-named where appropriate such that the list of nodes was refined and grouped in a way that provided a more complete picture of the phenomenon.
7. A descriptive analysis of the accounts provided by educators was progressively developed to enable the researcher to get a clearer picture of the shared experiences which emerged from the data (Dey, 1993). The descriptive account provided a first level view of the data and writing served as an initial analysis tool where the researcher put words around what was found (Richards, 2009).
8. The data from the research was then considered and interpreted at a macro level in light of the overall structure developed. This allowed the researcher to make linkages between concepts and provided the researcher with opportunities to think about the data in new ways (Miles and Huberman, 1994; Dey, 1993). Insights were captured in memo format as the data was being analysed.



9. Relationships between the nodes were considered and patterns identified (Appendix 8, extracts 6-9). This process resulted in the researcher significantly re-structuring the data categories. Modelling was used as a way of clarifying linkages and initially these models were hand drawn to enable the researcher to recognise the linkages. Later these models were further developed and captured in NVivo10. These models enabled the researcher to graphically focus on variables and themes that were emerging from the data (Miles and Huberman, 1994). Themes are described as an expression of an idea in a way that “captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set (Braun and Clarke, 2006:82).

The researcher maintained a number of coding logs during the data analysis phase of the project (Richards, 2009). The coding log recorded new codes that emerged from the transcripts or observations. In addition, a change log was maintained which recorded changed, merged and deleted nodes in addition to the reason for the changes (Richards, 2009). This was particularly important for data reduction purposes and for deeper analysis of existing nodes (Appendix 7).

#### 5.12.3.1 Visual mapping

A visual approach to data analysis, using mapping (Miles and Huberman, 1994) was used to analyse and synthesise the findings which emerged from this current research. This allowed the researcher to consider the emergent themes and consider their relationship to each other (Appendix 8, extract 8). The visual maps are presented in each of the findings chapters (Chapter 6 and Chapter 7) and a visual of the overall synthesis map is depicted in Figure 5.2:

**Figure 5.1: Visual of data analysis mapping**



### 5.12.4 Data saturation

Guest *et al.* (2006:65) define saturation as “the point in data collection and analysis when new information produces little or no change to the codebook” or in other words the point where no new or little relevant data seems to be emerging (Bryman and Bell, 2007). Table 5.7 below demonstrates the additional codes added to the codebook for this research study.

**Table 5.7: Initial codes added to code book per interview**

	DE1	DE2	DE3	DE4	DE5	DE6	DE7	DE8	DE9	DE10
New Codes	97	40	35	12	<b>11</b>	1	3	2	2	1
	EE1	EE2	EE3	EE4	EE5	EE6	EE7	EE8	EE9	EE10
New Codes	81	32	18	9	24	<b>13</b>	3	3	1	0

Based on the above, the researcher recognised that data saturation was approaching after the 6<sup>th</sup> interview in relation to DE and after the 7<sup>th</sup> interview with EE educators. However, for research transferability purposes the researcher decided to continue interviewing until a minimum of 10 participants were interviewed from both EE and DE education (Creswell, 2007).

Analysis of coding patterns revealed that 96% of all EE codes were generated from the first six interviews (Guest *et al.*, 2006). While saturation was considered to be reached with considerably fewer codes being added to the code book from the seventh interview onwards, this did not mean that new codes did not emerge. Of the seven codes identified from EE7 to EE10, further analysis of existing transcripts resulted in additional coding to four of these codes, while two codes, were merged with existing codes. For example, example EE7 contributed codes on ‘uniqueness’ as a criteria in OR assessment and challenges for EE educators in ORedu such as ‘lack of time’ and ‘lack of buy-in’. These nodes allowed for further coding of existing transcripts, with three other sources coded to uniqueness and two other sources coded to lack of time. Lack of buy-in however was coded on to ‘culture’ as the initial term was considered too restrictive. This was recorded in the coding change log (Appendix 7).

A similar pattern was observed with 95.5% of DE codes generated from the first five interviews (Guest *et al.*, 2006). The final three transcripts combined contributed five new codes to the code book. Further analysis of existing transcripts resulted in no new sources being attached to the first three codes, but one additional transcript was coded to ‘demonstrate’. The code ‘the individual’ referred to the role of the educator in considering the individual student and this was re-coded to ‘tailor it to students’ due to the level of similarity between the codes.

### **5.12.5 Deviant cases**

While saturation was considered to have been reached, this did not imply that all interviews yielded the same type of data. Where anomalies arose, the researcher considered the significance of these anomalies in the context of the data as a whole. For example, EE6 showed a strong preference for a planning perspective in OR, where, in her opinion, creativity did not have a significant role. This view differed from those of other EE educators. Later in that same interview however, it emerged that she did engage in creativity activities with students to enable them to recognise opportunities. Drawing on this anomaly allowed the researcher to consider the role of educator perspectives in ORedu adding to the researchers understanding of the phenomenon (Silverman, 2010). This allowed for follow-on coding.

In a similar vein, the learning environment observed in two instances in DE stood in contrast with both the literature and that observed in other institutions and this surprised the researcher. Walls were bare and students did not have dedicated working space, beyond their timetabled sessions. These anomalies prompted the researcher to recognise the constraining influence of formal structures on creative learning environments.

## 5.13 Ethical considerations

Ethical considerations arose from this research for a number of reasons.

- The researcher was a peer of the research participants, particularly the EE educators. Therefore the researcher made every effort to be open and honest with participants as to the nature of the research, how the data was to be treated and used.
- The researcher was exploring a specific subset of EE, which the literature suggested was overlooked in practice and therefore the researcher had to be sensitive to the fact that participants could have felt exposed in their responses.
- Participant anonymity had to be maintained to ensure that participants could not be identified (Bryman and Bell, 2007). This involved deleting all references to people, places, specific projects or programmes that educators mentioned during the course of data gathering.
- Observation was conducted in educational settings in HE. Therefore, all students involved in the observations were fully informed of the observation prior to its taking place and students were reassured that they would not be identifiable in the research. All students signed a consent form prior to undertaking the observation (Bryman and Bell, 2007).

Ethical issues were reviewed and considered at all stages of the research.

Manson (2004) highlights that ethical issues can arise in face to face interviewing around what interviewers accept from interviewees and how the researcher treats that information. On a number of occasions participants either asked for information to be 'off the record' or information shared was of such a personal nature that the researcher had to make decisions around whether to include it in the typed transcript or not. In the case of a request not to include, then the researcher honoured such requests. Where information of a personal nature was shared it was not included in the transcript where it was deemed not relevant to the research question and objectives. Reference to omitted data was recorded on each transcript at the point at which it was omitted.

The researcher maintained participant confidentiality as a priority during data gathering and analysis. Similarly, the manner in which the findings were presented sought to preserve participant anonymity by treating it in an appropriate way (Bryman and Bell, 2007).

Students and educators were informed orally about the purpose of the research before each interview / observation. Consent forms were e-mailed in advance and additional paper copies were provided where required (Appendix 5 and 6). Consent forms were signed before every data gathering stage and the participants informed of their right to opt out at any stage (Bryman and Bell, 2007). Signed participant forms were filed in a secure cabinet.

## 5.14 Research legitimisation

There are mixed views on the use of the terms used to validate and evaluate qualitative research. Traditionally research was evaluated from a positivist perspective, using quantitative measures such as validity and reliability and applying them to the qualitative domain. Robson (2002), amongst others, acknowledges arguments against positivist terms in qualitative research yet suggests that deliberate omission of these terms can lead to accusations of such research being unreliable and invalid. Mason (2004) believes that these concepts have value in qualitative research as they demonstrate that qualitative research should be rigorous, of high quality and that researchers are accountable.

Creswell (2007:202) explains in some domains qualitative researchers believe that “authors who continue to use positivist terminology facilitate the acceptance of qualitative research in a quantitative world” and such positivistic language is not congruent with qualitative work. In response to this, researchers suggest the use of alternative terms such as credibility, authenticity, transferability, dependability, integrity and confirmability in qualitative research design (Creswell, 2007; Robson, 2002; Lincoln and Guba, 1985).

For the purpose of this research, the standards credibility, dependability and transferability were considered as illustrated in Table 5.8.

**Table 5.8: Research legitimisation standards**

Measure	Qualitative	Quantitative
Accuracy	Credibility	Internal Validity
Consistency	Dependability	Reliability
Representativeness	Transferability	External Validity

Source: Researcher’s own work

### 5.14.1 Credibility

In positivist research the term validity is most frequently used and it is closely aligned to “credibility or trustworthiness of the research” (Robson, 2002:170). Credibility is seen as the extent qualitative researchers can demonstrate that their research results are accurate (Denscombe, 2010) and this can be done by providing reassurances that the research has been produced in accordance with good research practice (Denscombe, 2010). For example, Sekaran and Bougie (2010) define validity as the extent to which the analysis of qualitative data: (i) accurately represents the data collected and (ii) can be transferred or generalised to other contexts of settings. The authors argue that counting the incidents of events and including evidence which both supports and contradicts the theory can be an advantage in demonstrating research validity. Also, providing an in-depth description of the research process will enhance validity.

To enhance research confidence, triangulation of method, is commonly used (Miles and Huberman, 1994). However, Silverman (2010:277) describes triangulation as “attempting to get a true fix on a situation by combining different ways to look at it” and this, he suggests is not compatible with constructivist research. However, Richardson (2000) suggests that crystallisation is a more

appropriate term for qualitative research, where researchers can gain a more comprehensive and deeper understanding of a topic. Fitting within the social constructive paradigm, crystallisation uses multiple forms of knowing which enable the researcher to discover subtleties in the data that may not be revealed by other forms (Ellingson, 2009). Crystallisation was enabled in this research using both in-depth interviews followed by observation. In particular observing student educator interaction allowed her to understand at a far deeper level the subtleties of ORedu and DE in practice (Appendix 8, extract 1).

When presenting the findings from this research the researcher counted the incidents of significant events (Sekaran and Bougie, 2010; Miles and Huberman, 1994). This was made possible with the visibility provided by NVivo 10 software. The researcher guarded against bias, as far as possible by bracketing her own experience and letting the data speak for itself. Therefore, only the findings which were observable from scrutiny of the data were relied upon. Such data was presented in the form of data displays and matrices in the findings chapters which follow, to illustrate how the research informed that which is presented (Miles and Huberman, 1994).

#### **5.14.2 Dependability**

Whilst reliability is associated with positivist research, dependability is a term which is more frequently associated with qualitative research (Denscombe, 2010; Creswell, 2007). Dependability considers the ability of the approach to deliver consistent results and therefore the researcher is required to ensure that the research is methodologically rigorous (Saunders *et al.*, 2014; Robson, 2002:176; Silverman, 2001). However, Crotty (1998) suggests that the very nature of qualitative research suggests that the context in which the research has been conducted and the involvement of the researcher in the research suggests that results cannot be entirely consistent if replicated in the same way. Therefore, researchers need to demonstrate that the results are dependable when research is conducted in that particular context.

Steps were taken in this research to ensure dependability.

- Each interview was orally recorded, thereby preserving the narrative constructed in each interview (Silverman, 2011).
- As the researcher was a lone researcher, she considered asking a peer, who was also an educator at the institution where the researcher worked, to objectively code a transcript. However, on reflection the researcher chose not to follow this path for two reasons. In the information sheet supplied to participants the researcher committed not to share the data with people who were outside the study. The researcher felt that by involving others not directly involved in the study then researcher ethics would be compromised. Similarly, the researcher was sensitive to the constructivist nature of this research, in that meaning was constructed between each educator and the researcher in each interview. Therefore, the researcher was uncomfortable involving others in the interpretation of meaning from these interviews.

- As a result the researcher undertook coder reliability tests (Richards, 2009) by manually coding two transcripts, one EE and one DE, in January 2016 (Table 5.9). The same transcripts were re-coded by the researcher in April 2016 and both coded transcripts were then compared and differences in coding noted.

**Table 5.9: Coder reliability tests**

Transcript	Number of codes (Jan 2016)	Number of codes (April 2016)	Number of similar codes	% similarity	Number of different codes
EE	103	174	84	81.5%	22
DE	76	104	61	80.2%	15

A comparison of the two EE transcripts revealed an 81.5% initial match between the original coding of the transcript and the second coding four months later. However, closer analysis of the coding revealed that the second transcript was more finely coded as a result of ongoing analysis and the re-categorisation or sub-coding of initial coding categories, thereby increasing the number of codes from 103 to 174 (Miles and Huberman, 1994). For example, the ‘student value OR’ code on the initial transcript was broken down into further sub-codes ‘future career and self-development’ in the coding of the second transcript. The number of different codes identified between January and April can also be accounted for, on the whole, through re-coding. For example a code ‘process’ used in the first transcript also described the process as a ‘journey’ and this was the code used in the second transcript. Examination of the nodes in NVivo 10 showed that the characteristic ‘process’ was sub-coded to include a node ‘journey’.

In the January coding broad category coding was more common and in the April coding, more detailed coding was applied (Richards, 2009). In six instances data was coded in the initial transcript, that on reflection the code allocated did not reflect accurately its content. For example an extract describing the need to be brave with students was coded ‘emotions’ in January but closer examination of this text in the second coding exercise re-coded this to ‘risk’.

Examination of the two DE scripts revealed a similar picture. There was a strong match in coding patterns from January to April, 2016 of 80.2%. The second transcript was more finely coded with a total of 104 codes identified. For example some codes labelled ‘process’ in the January transcript were more finely coded to specific stages of the process in the second transcript. However, some differences in coding patterns were also noticed. For example in the second DE transcript codes such as ‘progression’ were attributed to text referring specifically to first year, but this code was not applied in the first-pass coding. This was also seen with extracts describing how students reacted to challenging feedback from peers coded to ‘challenge’ in the second instance, but which were coded to ‘peer to peer’ in the first instance. Deeper analysis of the ‘peer to peer’ data revealed challenge as a feature of peer to peer feedback, so this would not have impacted the findings of the study.

Overall, the analysis of coding practices suggested that the difference in coding between the both sets of transcripts can be explained in the large part as being down to the greater familiarisation of the researcher with the material and evolution in the code book over time.

An audit trail (Richards, 2009) was maintained when coding the data, to enable the researcher to recognise when data saturation had been reached. This required the researcher to note down all new codes as they arose directly from the transcripts themselves. When all transcripts were coded the researcher began to analyse the findings more closely resulting in the generation of additional codes (Appendix 7).

### **5.14.3 Transferability**

As qualitative studies tend to be undertaken on a small scale there are questions over the degree to which qualitative research results are representative elsewhere (Denscombe, 2010). Due to the localised nature of much qualitative research it is accepted that it is difficult to generalise the findings. Therefore to decide its transferability an imaginative exercise is required and thus Denscombe (2010:301) suggests the issue becomes “to what extent could the findings be transferred to other comparable instances”.

Transferability is an issue in education based research as many studies tend to be based on single site studies (Bello, Leung, Radebaugh, Tung, Van Witteloostuijn, 2009). To address this issue, this current research was conducted across multiple third level education sites in the Republic of Ireland. In total, twenty educators representing eight HEIs participated in the research, thereby enabling the researcher to get a more accurate picture of what was happening across higher education in Ireland.

Similarly, the researcher aimed to have a spread of relevant disciplines included in the sample. While the participants in EE education were predominantly educators in business schools, the purposeful sample also included educators from both humanities and engineering. Similarly, DE educators were represented from graphic design, product design, furniture design and industrial design faculties.

## **5.15 Limitations in research design**

### **5.15.1 Sample size**

This research study set out to explore the suitability of design education approaches to ORedu. The research yielded rich insights into both domains and potential suitability was identified. The small sample size of 20 participants (10 EE educators and 10 DE educators) could have implications for the transferability of the results. However, the researcher was careful to ensure that the sample size was in line with that which is recommended for phenomenological studies (Saunders *et al.*, 2012; Creswell, 2007; Guest *et al.*, 2006) and initial coding was carefully monitored to examine for saturation (Bryman and Bell, 2007; Guest *et al.*, 2006) as outlined in sections 5.8.2 and 5.12.4 respectively.



### **5.15.2 Potential researcher bias**

As the researcher is an experienced EE educator it is possible that this experience did impact the research in some way. However, the researcher took steps to minimise the potential bias (section 5.7.2.3 and 5.7.3). In this vein, the researcher declared her baggage from the outset in her research diary in terms of her views prior to engaging in data collection, what she expected the research to tell her and what she hoped the research would tell her (Richards, 2009). The recordings, transcriptions and subsequent analysis were approached with openness where the researcher, to the best of her ability, suspended preconceived meanings and interpretations (Hycner, 1985). The researcher took every attempt to let the data speak for itself (Appendix 8, extracts 2, 4, 5 and 6).

### **5.15.3 Power influence**

In a related point, the fact that the interviewer is a lecturer could also have had an impact on the interviewees in terms of status and power (Bryman and Bell, 2007) which potentially could influence the credibility of the responses given in the interviews [interviewee bias] (Sekaran and Bougie, 2010). EE educators were being interviewed by one of their peers, from another educational institution, whilst DE educators were being interviewed by an educator from a completely different discipline. The status and power held by the interviewer differed in both situations. However, the researcher did consider carefully her potential effect on the interviewees in conducting the interviews both prior to and following the interviews (Richards, 2009). These were recorded in the researcher's research log, an extract of which can be found in Appendix 8, extract 2.

The potential status and power differential could also have led to potential limitations in relation to the observations which were undertaken. This was evidenced in EE educators being more reluctant to consent to the researcher observing their work. In addition, it is recognised that the presence of an observer in a situation can affect how those being observed act in a given situation (Vinten, 1994). The researcher made every attempt to reassure educators and students, by making her intentions unequivocal. The researcher emphasised why she was there, that she was a student, what she was studying and that the focus was not on them as individuals but on what was taking place in the situation. This was done both orally and in writing (Bryman and Bell, 2007; Miles and Huberman, 1993).

### **5.15.4 Research structure**

The semi-structured nature of the research could have limitations in terms of the dependability and transferability of the findings of this study. Holstien and Gubrium (2011) taking a meaning-making view of research interviews consider that answers in response to questions on one occasion will not be the same on another occasion as the circumstances will differ. For example Qu and Dumay (2011) contend that different responses can be evoked by different interviewers from the same interviewee, based on the way in which interview questions are asked and subsequently probed. Therefore they do not consider the interview a neutral tool and they view the interview as having a clear role in the situation. As

such, Holstein and Gubrium (2011) contend that under the circumstances qualitative researchers should aim to present results that are 'reliable enough'.

#### **5.15.5 Lone researcher**

Research studies can benefit from having more than one person involved in coding the data and cross-coder consistency can be developed by frequent checking, feedback and consideration of deviations over time (Richards, 2009). However, this research was coded as a lone researcher and potentially this invariably impacts the dependability of the results. The data analysis process used by the researcher is outlined in section 5.12 in this chapter. The researcher did undertake coding reliability tests in terms of re-coding sample transcripts, after a period of time, to ascertain the dependability of the researchers coding process (Richards, 2009; Dey, 1993) as outlined in section 5.14.2 in this chapter.

### **5.16 Conclusion**

As an exploratory study this research seeks to consider the suitability of DE approaches to ORedu at undergraduate level at HE in Ireland. The study is constructivist in nature, reflecting the researcher's view of knowledge as being created through social interaction between individuals and the world they live in. Therefore, the research takes a subjectivist stance, seeking to understand the experience of opportunity recognition education from the educator's perspective.

Phenomenology was adopted in this study as it enabled the researcher to get to the essence of the phenomenon by understanding its meaning from the perspective of those who have experienced it (Conklin, 2007; Bentz and Shapiro, 1998; Giorgi, 1997). A qualitative research design was used which included 20 semi-structured interviews and crystallisation was enabled through observation. Following pilot testing, the research was operationalised over a six month period and analysed using NVivo10 as illustrated in Figure 5.1.

A descriptive phenomenological approach was taken in analysing the data as it was considered more appropriate for the study of groups of individuals (Giorgi, 1997). To the best of the researcher's ability, this research was undertaken in a manner cognisant of the methodological and ethical standards required for research legitimisation. However, the researcher does acknowledge that limitations do apply to this research design.

The findings from the analysis of this data are presented in the following two chapters, Chapter 6 and Chapter 7. Chapter 6 outlines the findings on ORedu, as revealed from analysis of the EE educator interviews. Chapter 7 subsequently outlines the findings on DE education as revealed from analysis of the DE educator interviews.

# Chapter 6 Opportunity Recognition Education

## 6.1 Introduction

This chapter is the first of two findings chapters. Chapter 6 presents the findings specifically related to opportunity recognition education (ORedu) while the next chapter (Chapter 7), continues with the findings related to DE.

The findings from this chapter were obtained from interviews with, and observation of, EE educators and these serve to address the first three research questions of this study (section 5.5). A descriptive phenomenological approach was taken in analysing the data gathered from EE participants. The researcher was careful to accept the descriptions as a true account of their experiences. In keeping with the descriptive phenomenological approach the voice of the participants, as captured in the form of direct quotes, is used liberally throughout this chapter. Quotations were selected based on the degree to which they illustrated critical concepts, issues of contrast or clarified issues of definition (Richards, 2009).

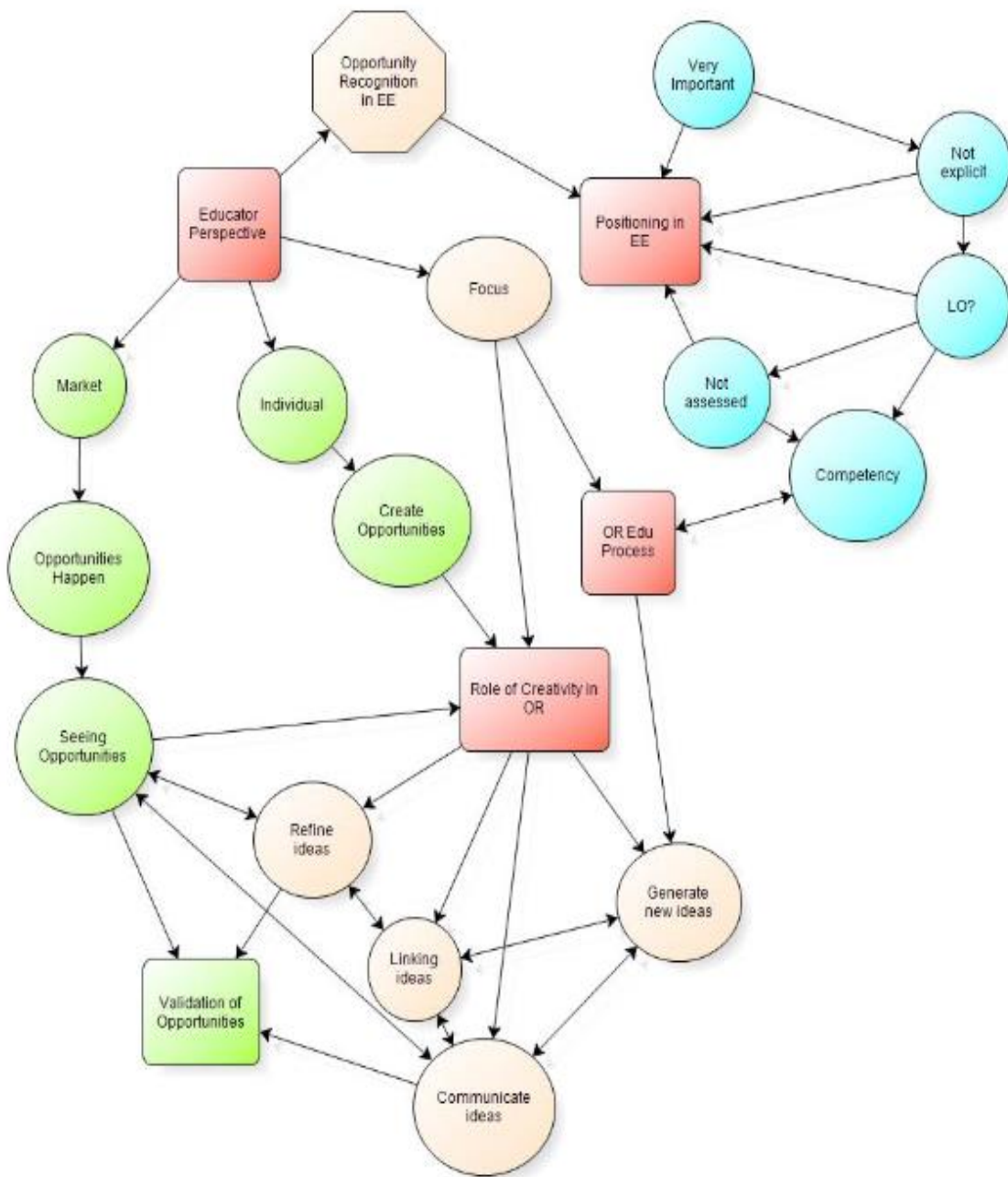
### 6.1.1 Emergent themes

Four key themes emerged from the analysis phase of this research.

- The prominence of OR in EE education (section 6.2).
- The current ORedu process (section 6.3).
- Features of current ORedu in EE (section 6.4).
- Creativity in ORedu (section 6.5).

The findings associated with these themes will each be explained in turn throughout this chapter. Figure 6.1 illustrates the emergent themes and associated linkages in ORedu as identified in this analysis. This chapter will expand on each of these themes in turn.

Figure 6.1: Emerging themes OR



### 6.1.2 Enterprise and entrepreneurship participant demographics

To facilitate interpretation of the findings, coding Table 6.1 below provides some background information on the participants involved in this research.

Of note was that five of the EE participants had some previous personal experience of entrepreneurship, describing themselves as entrepreneurs or self-employed, while two are currently still involved in their ventures. The average experience as an EE educator was 13.8 years, ranging from a maximum of 30 to a minimum of 2.5 years. Eight educators were associated with a business faculty, four of whom delivered EE education across other disciplines. Two educators were based in other disciplines, one each in engineering and humanities.

**Table 6.1: Coding table for EE interviews**

Interviewee	Discipline	Experience	Years Lecturing
EE1	Business	Lecturing, previously <b>self-employed trainer</b> , manager in an indigenous company.	15
EE2	Business	Lecturing, <b>entrepreneur</b> and consultant in music industry	9
EE3	Engineering	Lecturing	30
EE4	Humanities	Lecturing, currently <b>entrepreneur</b> , health care	7
EE5	Business / Cross discipline	Lecturing, currently <b>family business (Director)</b> , marketing advisor to Enterprise Ireland abroad	25
EE6	Business	Lecturing, Sales & Marketing	12.5
EE7	Business / Cross discipline	Lecturing , Marketing Manager	2.5
EE8	Business / Cross discipline	Lecturing, Audit Manager and Accountant	11
EE9	Business / Cross discipline	Lecturing, previously <b>self-employed</b> , admin posts	12.5
EE10	Business	Lecturing	11

Three opportunities for observation were offered by the EE participants in this study. This involved four hours of observation of EE educators addressing different aspects of ORedu, as outlined in Table 6.2.

**Table 6.2: Coding table for EE observations**

<b>Observation</b>	<b>Activity</b>	<b>Duration</b>	<b>Participants</b>	<b>Location</b>
<b>OBE1</b>	Initiation of the OR process	1 hour	11	Classroom
<b>OBE2</b>	Student presentations of opportunities	2 hours	39	Classroom
<b>OBE3</b>	Raising awareness of opportunities	1 hour	18	IT lab and tour

In presenting the findings from this research the researcher counted the incidents of significant events (Sekaran and Bougie, 2010; Miles and Huberman, 1994). Counting in qualitative data is supported by Silverman (2010) where it is based on categories generated by participants and where counting occurs after the categories have emerged (Remenyi et al., 1998). Counting was facilitated in this research by the use of a computer aided qualitative data analysis system (NVivo10), where the number of transcripts linked to each code was systematically recorded.

## 6.2 Theme 1: The prominence of OR in EE education

An analysis of the prominence of OR in EE education paints an interesting picture. Participants were unanimous in describing OR as being important in the overall context of EE education. Words that were used included 'very important', 'vital', 'the kernel' and 'essential'. Its importance was described in terms of students gaining experience and confidence, its economic importance to allow existing businesses to innovate and compete, finding a fit between the opportunity and the individual and it being character building for the students. OR was seen as being an important starting point and in some instances it was described as being 'what EE education is all about'.

Node	Quote	Emergent Themes
Importance	"All this as a key part of entrepreneurship begins with opportunity recognition. It's got very little to do with entrepreneur development, self-employment but more to be able to pursue opportunities and to see opportunities and be able to develop them." (EE3)	Prominence of OR in EE
Importance	"Oh I think without opportunities you cannot, sure you have no business without an opportunity." (EE5)	Prominence of OR in EE
Importance	"I think that's the most essential part of it because you have to recognise the opportunity first and then create the business plan around it." (EE7)	Prominence of OR in EE

Eight EE educators described OR as being important, from the students' perspective. Engaging in OR was considered by educators to have relevance for students' future careers, by acquiring skills that they can use to identify career opportunities, as employees, for use in their personal lives or in identifying opportunities that could enable them to start up a new venture (during or upon completion of their studies). At a personal level, engaging in OR was described by EE educators as contributing to student self-development by equipping them with the skills to solve problems in their own lives. In addition, educators explained that students learn from the process, even when the opportunities they identify are not successful.

Node	Quote	Emergent Themes
Future Career	"So OR obviously is very important if you want to move into that self-employment space because you need to have an idea to run with." (EE10)	Prominence of OR in EE
Future Career	"It gets the students thinking about you know, more, more what are the opportunities that are there, more opportunities outside the traditional ones that the course would teach them." (EE4)	Prominence of OR in EE
Self-development	"But I see the role of OR and in the context of EE for them if they can recognise this as an opportunity for them to develop life skills." (EE9)	Prominence of OR in EE

### 6.2.1 Visibility of OR in EE education

OR was considered an implicit part of what is done in EE education. This was reflected in the learning outcomes, where the word 'opportunity' was only explicitly mentioned by one EE educator. However, two EE educators described placing a greater emphasis on OR in more recent times. Interestingly, one educator, whilst recognising a change in emphasis in her own approach towards OR, still saw it as being an implicit feature of EE education.

Time was highlighted as a constraint as to why EE educators tend not to dwell on OR. Those who described a timeline for ORedu estimated it accounted for at least 20% of the time dedicated to their whole module. Time was considered an important factor in OR, in the context of confidence building and thinking time.

Node	Quote	Emergent Themes
Visibility	"Sometimes it's more implicit than explicit ... I think we're becoming more explicit about it in the how we do things and how we approach it." (EE1)	Prominence of OR in EE
Visibility	"No I don't. I don't isolate it out but you have me thinking ... it's not a conscious element of how, of the architecture of this module." (EE2)	Prominence of OR in EE
Time	"Again there isn't time within the module." (EE7)	Prominence of OR in EE
Time	"To recognise an opportunity there is a certain level of risk taking involved so having that confidence I think... it takes eh, a little bit of time to do that, to develop that confidence." (EE9)	Prominence of OR in EE

### 6.2.2 Opportunity validation

Opportunity validation was raised by nine of the EE educators interviewed in this study. Opportunity validation was described as checking to see if the opportunity was how the student initially perceived it. Validation in this context involved: clarifying the value offering to the customer, verifying it by doing some research on the market, analysing the competition, engaging with potential customers and identifying the resources that are required to make it work. Interestingly, opportunity validation was only referred to as a learning outcome by three of the EE educators.

The interviews revealed that validating opportunities was considered more important than the recognition of the initial opportunity itself, for six of the EE educators. In some instances educators considered the entrepreneurship process to begin after the opportunity was already identified by students.



Node	Quote	Emergent Themes
Validation	“What value are you adding, what will this do for them em and then have you verified that by doing other research which is about the marketplace and the competitor and then I guess to validate it, have you actually spoken to a customer or a potential customer about this.” (EE5)	Prominence of OR in EE
Validation	“You’re not always looking for the greatest idea em, I mean opportunity is, is part of the journey they are going on ... it’s what they do with that opportunity, how they validate it, and re-validate it, how they think about the, I suppose the research then what they will do too as part of the validation.” (EE1)	Prominence of OR in EE
Validation	“So, in that sense a good idea is important but only in the context of being able to validate it to some extent.” (EE10)	Prominence of OR in EE

### 6.2.3 Assessment

Seven EE educators clearly indicated that OR was not assessed in their modules. Educators described it as being ‘part of the process’, or not being ‘specific’ or not being ‘isolated’. In four instances educators emphasised that it was the opportunity development process that was being assessed, in terms of the market and how they proposed to move forward with the opportunity. Interestingly, one educator described their conscious decision not to allocate marks to OR, as she considered that the process begins once the opportunity has been identified. However, she believed that OR was threaded through what they do with that process.

Eight EE educators described assessment which focused on opportunity validation criteria. Educators assessed how developed the opportunity was and the evidence that supported the existence of an opportunity. The most common forms of assessment, where OR was not an explicit focus, included presentations / pitching, the submission of a written piece of work such as a feasibility study, business plan or a business model canvas. Only one educator described assessing a prototype. A reflective piece of work was mentioned by half of the EE educators and in one interview the educator explained how they had dedicated rubrics for assessing reflective work and that students were supported in doing their reflections. Half of the EE educators described the involvement of external parties, such as entrepreneurs or representatives from industry, in final presentations.

Whilst the participants may not have had explicit assessment mechanisms for OR, the data revealed that they do have tacit criteria that they apply to OR. These included: the existence of a market, market size, how actionable it is, person opportunity fit, uniqueness and if it solves a problem or not. Closer examination of this criteria revealed that, in the most part, the emphasis of this criteria was on opportunity validation. The emphasis on market was mentioned by eight of the participants, person opportunity fit was described by four, while ‘uniqueness’ was also mentioned by four of the participants. One educator suggested that ideas were considered based on how realistic they were.

Two participants described specifically allocating marks for problem definition and solution generation processes as part of the assessment, which tended to occur where introductory creativity modules formed part of the EE curriculum. In one case, assessment of the process was based on the submission of student journals at the end of the semester. Interestingly however, this EE educator expressed dissatisfaction with the fact that students were also summatively assessed with an exam in this module, something which appeared to be outside her control due to the shared nature of the module.

Being able to stand over the assessment of students' work emerged as an issue for EE educators. Five educators suggested that assessment rubrics and processes sought evidence and clarity and that grades had to be justified to external examiners. Two educators considered assessment rubrics as limiting the assessment of OR, while another two EE educators clearly expressed their concern at assessing the ideas themselves, due to their lack of expertise in the area.

Node	Quote	Emergent Themes
Assessment OR EE	"We have to get them to produce certain pieces that we can stand over, em so ... do we .. we don't always assess the opportunity." (EE1)	Prominence of OR in EE
Assessment OR EE	"No, we don't even look at that we're assuming they are starting off with their own projects." (EE3)	Prominence of OR in EE
Assessment OR EE	"I've made a decision not to give a mark for that because it's a means to an end, but they can't get to the starting block of developing their idea unless they go through that stage of the process." (EE9)	Prominence of OR in EE
Assessment OR EE	"I usually give 10 to 15% at the beginning and that's where they are actually able to scope out the problem they are solving and what is the solution they are offering and who is paying to solve it." (EE5)	Prominence of OR in EE
Assessment OR EE	"So what we look at is that .. for them, is it viable, if you were to actually go ahead and do this is would you be able to do it?" (EE7)	Prominence of OR in EE
Assessment OR EE	"They've to present on their problem and solution, they have to give us a reflective journal on the problem, identifying the problem, divergent, convergent thinking processes, em the solution." (EE8)	Prominence of OR in EE

#### 6.2.4 Determining competency

Nine of the EE educators had difficulty objectively determining student competency in OR. This was explicitly stated by four of the participants, with the others hesitating when answering the question in the interview. Six EE educators found it easier to identify those who were struggling with, or lacked competency in OR, over those whom they considered competent, while three educators considered OR to be something that some students are just naturally good at. The data revealed that competency was identified in tacit ways, through student interaction, observation of behaviour and through their final assessed assignments. This latter point is interesting as this research has shown that OR

tends not to be isolated in assessment and explicit objective metrics tend not to be used in OR assessment.

Node	Quote	Emergent Themes
Determining Competency	"I don't know, I don't know is the answer to that question. Because you know, you say to a student come up with four and they come up with six over night. I don't know what the difference is between that and someone who is struggling with it for two or three weeks. I just can't figure that out" (EE3)	Prominence of OR in EE
Determining Competency	"Eh see the trouble is here that with the modules that we have, em they are so varied, none of them will measure anything like that, it's really hard." (EE4)	Prominence of OR in EE
Determining Competency	"I know somebody who is smart and can see, as they refer to in the terms agile, I can see that they are agile in their thinking, that they can swap and change and they can do that, and I can see that", (EE6)	Prominence of OR in EE
Determining Competency	"It is down to the individual I think." (EE10)	Prominence of OR in EE
Determining Competency	"They are quick to tell you when they are struggling with it I think" (EE1)	Prominence of OR in EE

### 6.2.5 Progression of OR education

The issue of student progression proved challenging for all EE educators. Progression was interpreted as the evolution of programmes, the incorporation of EE modules in the formal curriculum (across disciplines), or the exposure of students to follow-on programmes and supports as part of the wider eco-system.

One EE educator described gradually exposing students to OR in the first year of their studies, by using examples of things that were familiar to students which they could identify with. In four instances EE Educators described initial introductory modules in creative thinking and innovation as students' first exposure to OR. Modules were described as delivering more focused EE content at later stages. EE educators observed a link, in enhancing problem solving skills, between these introductory modules and subsequent EE modules. However, the sequencing of these modules was not always ideal, with some students having to take an EE module on setting up a commercial business before being exposed to creativity and innovation modules.

Node	Quote	Emergent Themes
Progression OR Education	“Developing short scenarios, giving them scenarios, em and that’s even before you would get on to the idea generation techniques. Getting them to think of everyday situations and everyday problems.” (EE9)	Prominence of OR in EE
Progression OR Education	“I suppose for them, like we do, do a critical thinking and innovation module... it would be actually idea generation, and we would do things like brainstorming and mind mapping and that kind of thing.” (EE7).	Prominence of OR in EE

Nine EE educators described student ‘exposure’ to EE education in the context of the formal curriculum at undergraduate level. Where EE education was considered a strategic priority for institutions, it had a presence across a variety of disciplines (but not all). However, the interviews revealed that this translated into ensuring ‘some’ exposure for all students to EE education at ‘some’ stage in their studies. In many instances, EE education appeared to be offered in single stand-alone modules across disciplines. Most frequently, modules were delivered three hours a week, over fifteen week semesters. In one instance however, semesterisation did not apply.

Seven EE educators described programmes which had one or less modules of EE education, but only three mentioned programmes in which a small number of EE modules were progressively built into the curriculum. However, one institution provided the exception, as it offers EE education as one of its core specialisms.

Node	Quote	Emergent Themes
Progression	“We have a policy in the Institute that any student who joins us will leave with having received a module in entrepreneurship education”. (EE5)	Prominence of OR in EE
Progression	“We have ... is it 4 pillars, entrepreneurship is one of the key pillars. So because of that it has to be threaded through all of the programmes.” (EE9)	Prominence of OR in EE
Progression	“Yeah, and that’s in second year. Like Engineers would do it, wildlife biology, health and leisure, business students, not nurses now but say 2/3 the college would be exposed to it.” (EE9)	Prominence of OR in EE
Progression	“So that’s a level 7 three year programme, where they have it for the 3 years. So that’s a sort of a natural progression”. (EE9)	Prominence of OR in EE

Most EE educators described extra-curricular enterprise activities which supported the formal curriculum. These activities included: student drop-in clinics and linking students to both internal and external enterprise development supports. Four educators described other extra-curricular enterprise accelerator programmes that students could progress onto, at both undergraduate and post-graduate level. The limitations of extra-curricular activities was described by EE8, who suggested that

students are reluctant to enter into programmes due to the additional work and time commitments.

Node	Quote	Emergent Themes
Extra-curricular programmes	“Like we run business mentoring clinics for students that they can book.” (EE1)	Prominence of OR in EE
Extra-curricular programmes	“It’s an extra-curricular programme for students called [name] and that’s essentially an accelerator start-up business programme for students who are interested in pursuing an idea, exploring the idea” (EE5)	Prominence of OR in EE
Extra-curricular programmes	“The students felt that it required more lectures that they weren’t being assessed on, more workshops that they weren’t being assessed on, more projects that they weren’t being assessed on and they had too many other obligations.” (EE8)	Prominence of OR in EE
Extra-curricular programmes	“We would have the idea hub, the student society is much more prominent now, that student inc. over the summer you know” (EE10)	Prominence of OR in EE

### 6.2.6 Summary of findings: Prominence of OR in EE

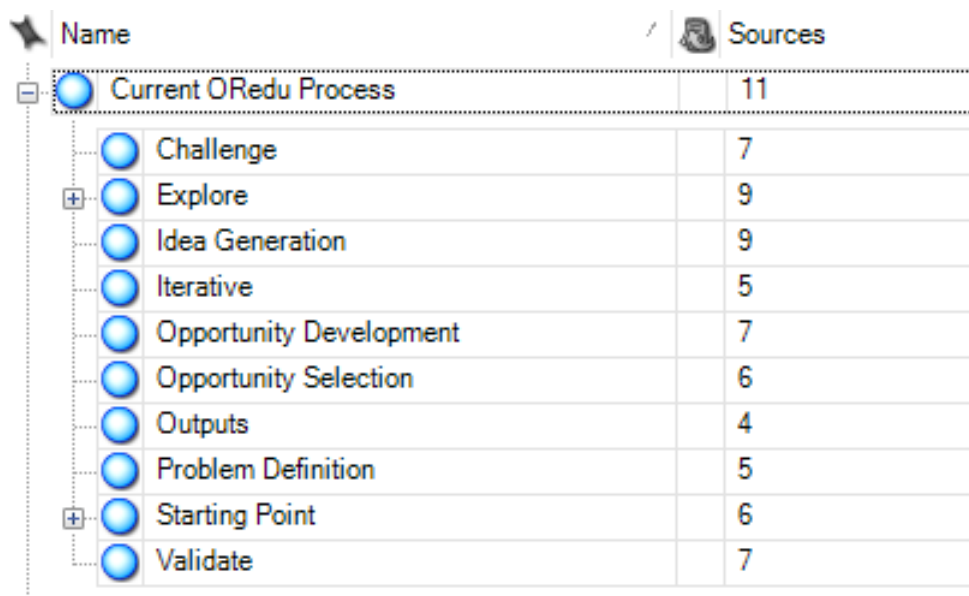
These findings indicate that while educators consider OR to be important, it does not appear to be a prominent feature of EE education at the HEIs represented in this study. It is considered implicit in what is seen as the EE ‘package’ in that OR is addressed, but the emphasis is clearly on opportunity validation over OR. This is borne out in assessment practices, where OR tends not to be assessed using objective metrics. Indeed, these findings reveal that OR competency is difficult for educators to recognise, with much of it being based on informal observations or interaction with students. The findings show that there is little evidence of ongoing progression in ORedu throughout a students’ undergraduate studies. These findings suggest that this could be due to the lack of exposure of students to EE education progressively throughout the curriculum or students’ tendency to opt-out of extra-curricular enterprise activities.

## 6.3 Theme 2: Current ORedu process

Analysis of the data revealed patterns and common features in the way educators address OR with students and these patterns suggest the existence of an ORedu process. Whilst educators did not refer to a specific process, their descriptions revealed certain features in common. Processes typically involved the following stages: explore, problem definition, idea generation, opportunity selection, opportunity validation and opportunity development.

This process will now be explained in greater detail. The development of nodes associated with the ORedu process is outlined in Figure 6.2 below.

**Figure 6.2: NVivo nodes ORedu process**



Name	Sources
Current ORedu Process	11
Challenge	7
Explore	9
Idea Generation	9
Iterative	5
Opportunity Development	7
Opportunity Selection	6
Outputs	4
Problem Definition	5
Starting Point	6
Validate	7

### 6.3.1 ORedu starting point

As revealed in both the interviews and observations, the starting point for the process can differ and this starting point can influence where in the process students begin to work on OR. The starting point for OR in undergraduate EE education can be:

- An idea that the student has coming into the module.
- A problem that is given to the student e.g. a company problem.
- A 'blank canvas' where the student is told they will need to come up with an idea as a course requirement.

This starting point is significant as it can mean that students begin at the start of the process, or it could mean they move directly into a later stage in the process such as problem definition, idea generation or immediately to opportunity selection. The most frequently observed starting point for undergraduate students was with a 'blank canvas'.

This research revealed a limited number of sources for ideas for undergraduate students. These sources were most frequently described as things that were

familiar to students in everyday life [such as every day products and services, simple low resource items, recent trends] and student interests [hobbies, passions, area of study or general interest]. In addition, participants mentioned the influence of prior work experience (where relevant for students). This was also supported in the observations, with students opting for ideas based on their hobbies, interests, prior experience and their specialisms at third level. The strong support for things that were familiar to them was likely to be due to the age and limited experience of typical undergraduate students, although EE6 did comment that many students do work, but in relatively unskilled jobs. This suggests that motivational drivers appear limited at this stage.

Node	Quote	Emergent Themes
Source of Ideas for OR	“In relation to recognising opportunities, I suppose one of them would be that em to realise that what they have is important and their experience to date is important.” (EE4)	Current ORedu Process
Source of Ideas for OR	“They would have been on work placement the semester beforehand so they would often see ideas during work placement that they would either work on or they would identify gaps that say their current workplace don’t actually service.” (EE7)	Current ORedu Process
Source of Ideas for OR	“But they are often aligned to things that they are interested in and when that happens you’ve got the level of interest and bit of you know the passion possibly can come through.” (EE1)	Current ORedu Process
Source of Ideas for OR	The student explained how his own interests in surfing could be integrated into his idea and how it fed into themes for his product range. (OB1EE)	Current ORedu Process

### 6.3.2. Stage 1 Explore

The first stage of the process, as described by nine EE educators, was Explore. Explore in this context included: exploration of self (passions, interests, work experience, prior knowledge) or exploration of context (user needs). This stage was particularly evident in situations where students were starting with a blank canvas, with the requirement to identify an opportunity. Four educators specifically described the explore stage being very clearly part of the module architecture.

In most cases, students were required to undertake this exploration in their own time. Closer analysis of the data revealed that the explore stage was described by eight educators as being a thinking or reflective exercise for students, with only four making reference to active engagement in research at this stage. Nine EE educators described the focus of the explore stage in the context of the present, where students considered what they currently knew, what currently exists, what others are doing now, current products and current problems. It was also suggested that this stage could be problematic for students who feel ‘lost’ and this could result in them committing to unsuitable opportunities.

In some instances, EE educators were observed suggesting solutions to students in an attempt to help with this part of the process. Observation also revealed that students’ thinking was gently challenged at this very early stage. This challenge

was frequently based on validation criteria i.e. what competition would you have, what is your market etc. indicating that at this early stage in the process validation criteria were introduced into the mix. The output from this stage was seen to lead to problem identification. Over half of the EE educators referred to this output as 'the idea', 'a new business idea', 'a problem' or 'a solution'.

Node	Quote	Emergent Themes
Explore	"So they are looking at their own personal environment, they are looking at their work environment they are looking at em I suppose trying to put themselves in a situation." (EE10)	Current ORedu Process
Explore	"That process of getting them to visualise who they are, and their passion, and what motivates them can be a way of looking at it, maybe looking at activities that they are involved in and that they always have this .. I only wish .. so if you have that 'only wish' what is that 'only wish'?" (EE5)	Current ORedu Process
Explore	"Those that are scouting around looking for something can't make up their mind and it's this idea versus that idea, and is that a real problem, and you know and they are kind of lost in a maze you know and I think that's a big challenge for them. And they end up committing to something and then I wonder if on hindsight they might have picked something else or you know." (EE10)	Current ORedu Process

### 6.3.3 Stage 2 Problem definition

Half of the EE educators described students engaging in some form of problem identification. Two participants in particular, saw problem definition as an important stage in the process. EE7 considered that, if not done effectively, it impacts the rest of the process, as students select convenient problems or rush into this stage. This tends to result in students not persisting with, or looking to change, their ideas. Similarly EE5 felt that this was an important stage from which students can't progress, until they can clearly articulate the problem.

In two instances a company problem was given to the students, which required them to learn about the context of the problem before they could progress. As such, this entry point into the process caused students to immediately iterate back to the explore stage. The other noticeable point was that problem definition was described in the singular i.e. students identifying 'a' problem, suggesting that students were only required to identify one problem in the majority of instances.



Node	Quote	Emergent Themes
Problem Definition	“So my role is to actually get them to go back on that and say, fundamentally what problem are you solving. So before they go any further it’s like, no, no we need to get very specific, what is the problem.” (EE5)	Current ORedu Process
Problem Definition	“Some students rush into it and then ... they realise that they haven’t got the right problem and they beg and ask you can they change.” (EE7)	Current ORedu Process

### 6.3.4 Stage 3 Idea generation

Nine EE educators described some form of idea generation taking place. The focus at this stage of the process was on the generation of solutions to the problem. In some instances, idea generation was considered to be the start of the process for students, particularly for those who entered a programme with a problem or an idea of their own. Only one educator described challenging students’ assumptions on their ideas and getting them to re-think solutions. All nine educators described using a variety of creativity tools and techniques to facilitate idea generation at this stage of the process. Similar to problem definition, educators required students to undertake idea generation independently, in their own time.

Node	Quote	Emergent Themes
Idea Generation	“We’ve been getting them to bring to brainstorm getting them to em .. just challenging assumptions all the time.” (EE1)	Current ORedu Process
Idea Generation	“If they turn up and say .. “well what will I do it on?” I say .. go off and look at an idea and they might say “when will I come back” and I’ll give them two or three days and I’ll say “come back with four ideas” (EE4)	Current ORedu Process
Idea Generation	“You are still using tools like brainstorming or brain writing or you are using morphological matrix or you are using the tools or the de bono hats to get them to refine it as they are going along” (EE5)	Current ORedu Process

### 6.3.5 Stage 4 Opportunity selection

Six participants described students then going through a stage to narrow down their choices to their selected opportunity. All six educators described the use of filtering techniques and five mentioned assisting students in the selection process. Most frequently the outcome of this stage of the process was an opportunity. One educator suggested that this stage was potentially problematic for students, particularly those working in groups where friction can emerge during the selection process.

In one instance opportunity selection was the entry point into the OR process for students, where students presented with an idea at the start of the module. These

students moved immediately to opportunity development upon initial discussion of their idea with educators.

Node	Quote	Emergent Themes
Opportunity Selection	“That particular girl came back with six, all workable solutions all workable projects and we eliminated two on the basis of technology and the other four were ideal and we just picked the one that was best suited to the girl.” (EE3)	Current ORedu Process
Opportunity Selection	“They have to show me on paper that they have considered at least four. Background of maybe a one pager on each idea and then to tell me which idea they are proposing and the rationale for that, why are they proposing that idea.” (EE9)	Current ORedu Process

### 6.3.6 Stage 5 Opportunity validation

Seven EE educators required students to justify their selection by providing some initial validation behind their choice of opportunity. This part of the process usually involved some initial research. Validation required students to demonstrate that their solution solved the identified problem and that it is what users needed. Justification of the opportunity was done through informal discussion with educators and / or in the form of an academic deliverable.

At this stage of the process educators described having a stage gate. Stage gates typically occur where defined activities are punctuated by key decision points (Cooper and Kleinschmidt, 2007). In this context students were typically challenged to justify their choice of opportunity and the outcome from this stage either enabled them to move to opportunity development, or required them to revert to earlier stages in the process. For those who succeeded in passing this stage gate, the process then progressed into opportunity development with educators referring to developing the opportunity, moving on to feasibility studies or working on business models and business plans.

Node	Quote	Emergent Themes
Opportunity Validation	“So that is the idea that they will take and they will develop over the semester and they will develop their feasibility idea around and deliver their pitch on.” (EE9)	Current ORedu Process
Opportunity Validation	“For those who haven’t been able to validate they might go back looking at the opportunity and deconstructing it again. For others that are able to demonstrate that there is some validity in it, we will look at probably doing eh, a whole exercise around the business model” (EE1)	Current ORedu Process
Opportunity Validation	“What happens sometimes is, they are told they can get three different lights, eh, a green, red or amber. So the green is brilliant you go with that, you have provided a great rationale, em, red is you know, no, you need to go start again, there is nothing really here, and it’s all constructive criticism. You may have the students that you know haven’t really put much of an effort in and they really to start again” (DE9)	Current ORedu Process

### 6.3.7 Iterative nature of the ORedu process

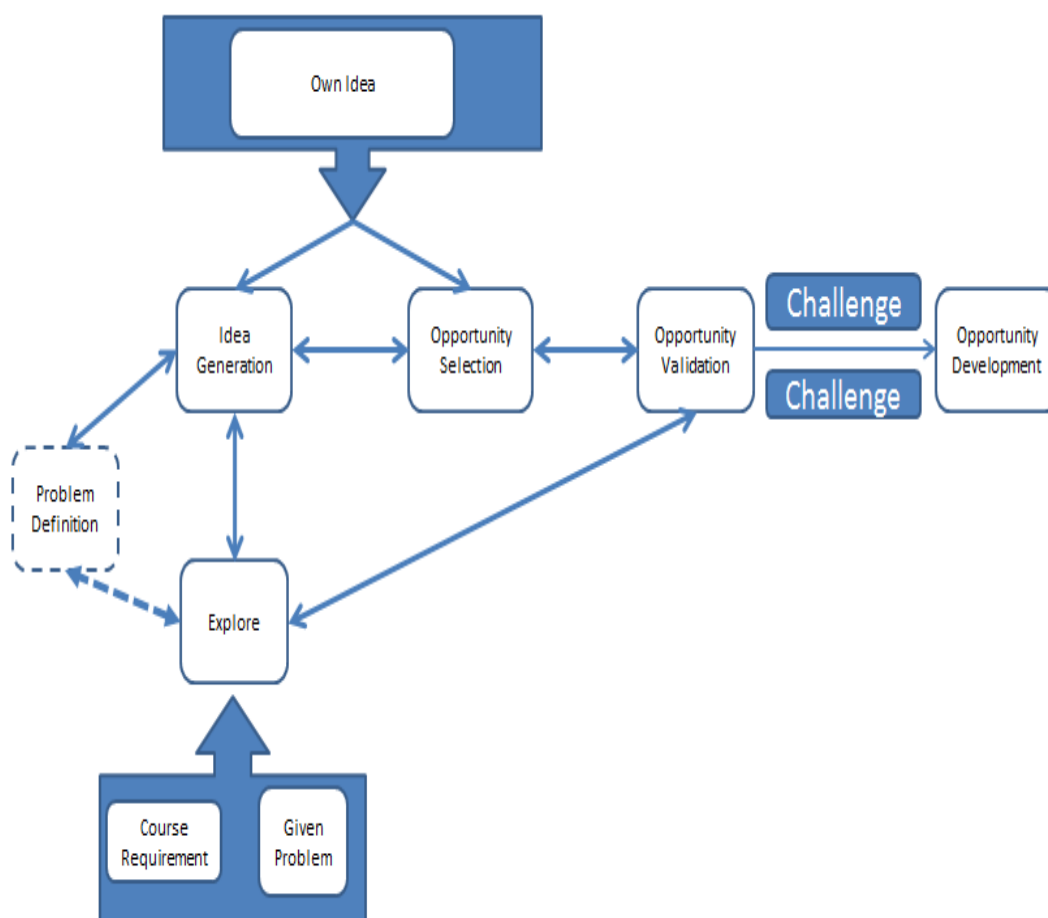
Half of the participants mentioned an iterative process which involves students re-visiting various stages such as problem definition, idea generation or opportunity validation, when required. These iterations resulted from challenges by educators at various stages: challenging students' ideas in terms of who they were, the problem they were solving, the distinctiveness of their idea or the appropriateness of the idea to a given context.

Node	Quote	Emergent Themes
Iterate	"People often have an idea of what they think will happen and they come with a fixed idea. So my role is to actually get them to go back on that and say, fundamentally what problem are you solving." (EE5)	Current ORedu Process
Iterate	"We're constantly challenging them to iterate, re-iterate and think about what their proposition actually is." (EE1)	Current ORedu Process
Challenge	Lecturer asks where, is there one in that location, who is the competition? Lecturer asks if it is considered a fad? What is its longevity? Is there life in this? (OB1EE)	Current ORedu Process

### 6.3.8 Summary of findings: The current ORedu process

Figure 6.3 draws the features of the process together in graphic form. Five distinct stages are denoted in the process. Of note are the different starting points in the process, suggesting that steps in the process, such as explore and problem definition, can be bypassed. In addition, the iterative nature of the process and the existence of stage gates at the end of the process, prior to engaging with opportunity development are important. Iteration is indicated by the arrows, indicating that it can occur at any time prior to, or as a result of, the stage gates.

**Figure 6.3: Current ORedu process**



The first three stages of the process are most frequently undertaken by students in their own time, outside of the learning environment. The research indicates that EE educators actively enable creative thinking by introducing students to tools and techniques. However, two educators criticised the current ORedu process, suggesting that educators currently do not allow students to really explore. Reasons included: processes driven by business planning, lack of visibility of OR in the process, lack of time, educator training, lack of tools and the constraints imposed by assessment.

Node	Quote	Emergent Themes
Iterate	“A huge part of OR is to explore, but we don’t allow people to do that. And that to me is a huge critical factor.” (EE5)	Current ORedu Process
Iterate	“If, you know, we expose them to different tools that are out there to help them, you know, come up with ideas and even to explore ideas or to share ideas. We don’t look at that” (EE7)	Current ORedu Process

## 6.4 Theme 3: Features of current OR education

This section of the findings chapter will begin by looking at the participants understanding of OR in the context of EE education.

### 6.4.1 Definition of opportunity recognition

OR was described by EE educators in both personal and market terms. Half of the EE educators emphasised the personal dimension of OR: for students' choice of career, that fit with their interests, to make changes in their life and to develop life skills.

The definition of OR from a market perspective was shared by eight EE educators. The focus at the market level was recognising an opportunity: to set up a business, providing goods and services that the market wants, that adds value and that will generate revenue.

Node	Quote	Emergent Themes
OR Defn EE	"Psychiatric nursing is not just for a psychiatric nurse it opens up many other doors and your qualification will open, gives you many different avenues to explore, not the traditional one of working in a hospital maybe or working in community centre." (EE3)	Current ORedu
OR Defn EE	"But I see the role of OR and in the context of EE for them if they can recognise this as an opportunity for them to develop life skills." (EE9)	Current ORedu
OR Defn EE	"Well it's only an opportunity if you can convert it into something that people are willing to engage with you on it em, and that there is enough of those people." (EE1)	Current ORedu

Interestingly, EE educators view opportunities in different ways. Half of the participants spoke of students seeing opportunities in the marketplace. The ability to see was associated with family background, past work experience, motivation to see, exposure to role models and examples or travel experiences. One educator also described opportunities as happening. In this case it was suggested that opportunities can arise at any time, that they can happen and that students need to be ready to act on them when they do.

Similarly, half of the EE educators described creating opportunities. In this context creating opportunities was seen to be associated with: the individual (in terms of their interests, passions and goals), some knowledge of the area, a problem solving orientation or 'a variation on a theme'. The latter was described as being more manageable for students.

Interestingly, some educators described both seeing and creating opportunities. This could suggest that for some educators they consider creativity necessary both to create new opportunities and when opportunities are seen, to enable something different or unique to be done with them.

Node	Quote	Emergent Themes
Nature of Opportunities	“Sometimes the very entrepreneurial are .. they’re constantly seeing opportunities, they’re just constantly staying that’s a great idea”. (EE1)	Current ORedu
Nature of Opportunities	“And em, the ones who literally come through secondary school I find them, they just don’t see so you have to encourage them to see. “ (EE6)	Current ORedu
Nature of Opportunities	“I’d always be encouraging them to see, that at any time an opportunity can arise.” (EE6)	Current ORedu

EE6 made a clear distinction between OR and acting on an opportunity. Acting on an opportunity was described as taking that final step of starting a business, or taking steps to avail of personal opportunities. In most instances EE educators explained that only a minority of students actually take the step of acting on the opportunity to turn it into a reality.

One particular programme provided the exception to the rule. This programme was an example of learning *through* entrepreneurship, where all first year undergraduate students were expected to set up and trade, in a low risk context. Action, in this instance, was described as a declaration of assuming responsibility. However, the EE educator suggested that action in this situation was something that had to be monitored and that students had to be protected against, particularly with regard to risk exposure.

Node	Quote	Emergent Themes
Action	“Well you see spotting and identifying it are different to doing something with it. So for me to say they are good at identifying it, any of us are good at doing it in hindsight, but it’s not just to identify the opportunity, it’s to do something with it. “ (EE6)	OR Defn in EE
Action	“ I’ve no doubt a couple of them will start a business ... not all of them will, some of them will disband their idea and that will be the learning for them” (EE1)	OR Defn in EE
Action	“Absolutely I get them to action but I also try and hold them back from being so actionable that they jeopardise some of their, their money.” (EE2)	OR Defn in EE

#### **6.4.1.1 Perspectives in ORedu**

EE educators’ perspectives on opportunities revealed some interesting insights. One educator clearly held a market driven view of opportunities and, in this instance, the educator did not view creativity as an essential skill for OR but rather considered it to be all about planning and information acquisition. This perspective clearly influenced the way in which the educator addressed OR, placing a greater emphasis on planning and more analytical approaches. This research indicates that this educator began with theory building after which students were presented

with a specific problem. Opportunity validation and implementation were found to be the focus of assessment.

On the other hand, where EE educators held a creativity driven perspective of OR, opportunities were viewed as resulting from problem solving and idea generation, with the role of the individual considered central to creating the opportunity. This perspective was also reflected in their approach to OR, with a greater emphasis being placed on the individual, problem definition and idea generation. The starting point for these educators was found to be exploration, resulting in the identification of a problem. Interestingly, the data suggested that when it came to assessment, educators with this perspective identified OR as an assessable component of the module. Future research may wish to explore this link in greater detail.

Node	Quote	Emergent Themes
Market Opportunities	“Well OR is all about being aware about what is happening in the marketplace. And ... what I try to get them to see is that knowledge is power, so they have to be very market aware.” (EE6)	Current ORedu
Personal Opportunities	“It is the development of opportunities that maybe students have come up with, business opportunities, em and maybe encouraging students to develop their own opportunities “ (EE8)	Current ORedu

#### 6.4.2 OR attributes

Attributes associated with OR were mentioned by the participants as per Figure 6.4 below. These attributes included: alertness, confidence (in themselves, in their creativity), curiosity (desire to know more because they want to know rather than they have to know), intent (constantly thinking about opportunities), openness (open to new ideas, learning new knowledge and new possibilities) and risk taking.

**Figure 6.4: OR Attributes as coded in NVivo 10**

Name	Sources
Attributes for OR	9
Alertness	7
Confidence	4
Curiosity	3
Intent	3
Openness	5

Seven EE educators mentioned alertness in conjunction with OR. From an educators’ perspective this was recognised as students who were looking around and seeing what opportunities others had found, students who were constantly looking for new opportunities that were relevant to them and students who were

looking at their workplace as a source of opportunities. Alertness was something that educators appeared to actively develop in students, through exercises such as: getting the students to look at every day products to critique them, using relevant case studies, developing an awareness of current business practice and encouraging students to read and report on newspaper articles.

Openness was mentioned by half of EE educators in the context of students being open to ideas, or open to the fact that their idea might not be the best idea. Educators described students being open to the way a problem can be solved, open to explore possibilities and being open to new ideas and new experiences. Openness was enabled by encouraging students and challenging ideas that students presented.

Confidence was described by four participants with reference to students coming up with, sharing and communicating potential opportunities. Educators described their role as nurturing student confidence and encouraging risk taking in revealing or selecting opportunities that they wished to work on.

Curiosity was mentioned by three EE educators as an attribute which enhanced OR, however they were critical of the degree to which student curiosity was developed in current ORedu practice. One educator suggested that the rigidity of assessment and traditional perspectives of EE were limiting factors in this regard.

Node	Quote	Emergent Themes
Intent	"The typical undergrad, the ones that come in .... with that intent can often be constantly be thinking about opportunity, whereas I think part of what we do with others is encourage them." (EE1)	Current ORedu
Curiosity	"The skills that are not developed are creativity and opportunity recognition skills. How do we develop curiosity? By opening things up to other ideas, having an opinion. So we don't. The whole notion of assessment is destroying it." (EE5)	Current ORedu

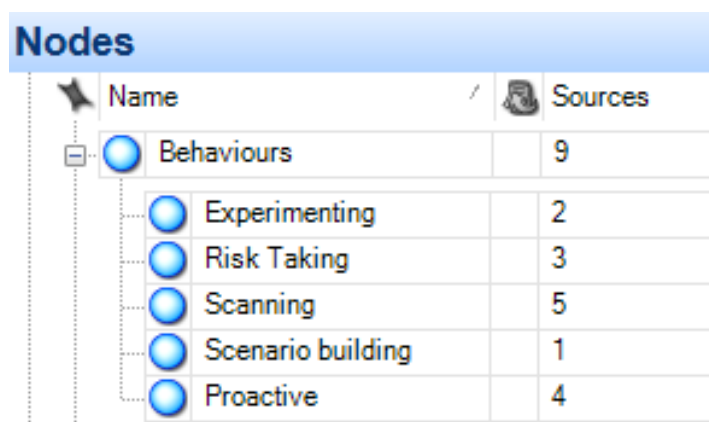
Three EE educators mentioned intent, in terms of students constantly thinking about an opportunity and this was associated with the individual themselves. Educators noted that these students displayed clear intentions of identifying opportunities, although they observed that intent did not always equate with action. One educator explained that some students come in with clear intent, whereas it is something that needs to be encouraged in others.



### 6.4.3 OR behaviours

EE educators described behaviours they associated with OR, based on their observations of their own students. The behaviours as coded to the node are illustrated in Figure 6.5.

**Figure 6.5: OR Behaviours as coded in NVivo 10**



Nodes		
Name		Sources
Behaviours		9
Experimenting		2
Risk Taking		3
Scanning		5
Scenario building		1
Proactive		4

Student behaviours such as scanning the environment and being proactive were most frequently described by EE educators. Experimenting was mentioned with regard to ideas, possibilities and solutions, whilst scanning was described as actively scanning the environment for what is currently on offer, how things are currently being done and gaining an awareness of people’s preferences.

Being pro-active and doing things on their own initiative was recognised in ‘keen’ or ‘passionate’ students. Proactive students were described as those who identified resources without assistance, undertook additional research, approached others without prompting and who dedicated extra time and effort to tease out the opportunity. Scenario building was also mentioned by one educator who observed students mentally working out scenarios before committing to anything, thereby attempting to manage risk.

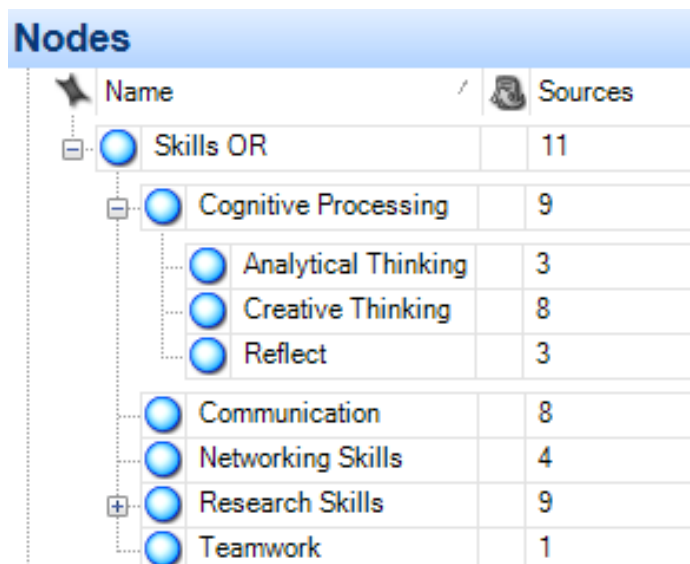
Risk taking was particularly interesting in this context as it emerged in a variety of forms, all of which were related to creativity. These included taking a risk to: engage in creativity (if it was outside the students’ comfort zone), selecting a risky opportunity, sharing their idea in front of their peers and ultimately taking decisions related to acting on the opportunity.

Node	Quote	Emergent Themes
Scanning	“I had a student who brought in 120 cartons of chocolate milk to the second week because he thought ‘you know what, this class they bought breakfast stuff, they bought stuff you would have at breakfast” (EE2)	Current ORedu

#### 6.4.4 OR skills

The skills associated with OR were difficult for educators to identify and the majority hesitated when answering this question. Skills that were described by educators included: cognitive processing, networking, communication, reflection, research skills and teamwork, as illustrated in Figure 6.6.

**Figure 6.6: OR Skills as coded in NVivo 10**



Name	Sources
Skills OR	11
Cognitive Processing	9
Analytical Thinking	3
Creative Thinking	8
Reflect	3
Communication	8
Networking Skills	4
Research Skills	9
Teamwork	1

##### 6.4.4.1 Cognitive processing

Cognitive processing skills were mentioned by nine EE educators. Cognitive processing included analytical thinking, creative thinking and problem solving. Creative thinking was mentioned eight EE educators and it was considered important to encourage students to think creatively to enable them to come up with new ideas, to help them link concepts together in novel ways and ultimately to solve problems. Three EE educators also described the need for students to be able to question, to critique or apply analytical thinking to problems and solutions that they have developed. However, one educator, while recognising it as a skill, did not believe it was a 'critical' skill.

Three EE educators mentioned reflective thinking skills in the context of OR. Reflection, in this context, described students' skill in reflecting on their learning and the use of learning logs and learning journals to capture such reflection was noted.

##### 6.4.4.2 Communication

Eight EE participants identified communication as an important skill. This emphasis was reflected in the learning outcomes, where the communication of ideas in the form of pitches or presentations was mentioned by six of the educators. Participants described communication as a way of sharing information with others. Communication skills were considered important: to enable students to learn from each-others' ideas, to develop confidence in taking risks, to share ideas, to facilitate peer to peer input and to develop skills of idea verbalisation.

The observation (OB2EE) supported claims of skill building in this area, where students were observed presenting in front of their peers. Students appeared comfortable presenting their ideas, and openly shared experiences with the class. The focus of the presentations was the opportunity, where students spoke of their experiences and how they came up with and modified these ideas. Students spoke about positive and negative experiences in coming up with and teasing out their opportunities. It was noted that students did not give feedback to each other on the opportunities identified.

Node	Quote	Emergent Themes
Communication	“You know it’s about just being able to present your idea and that can be presenting your idea to somebody sitting beside you on the train, it’s how you can actually verbalise what it is that you want to say, so oral skills are important.” (EE5)	Current ORedu
Creative Thinking	“I suppose you’re trying to say to students every problem leads to an opportunity, so that they don’t, that they look at something and they start using lateral thinking skills you know.” (EE10)	Current ORedu
Creative Thinking	“I think creativity is a part of OR, but creativity generally is looking at new. And most of the enterprise development opportunities that we see happening around us are not brand new. Ok, so while creativity is an awareness skill I don’t think that it has to be the critical skill.” (EE6)	Current ORedu
Networking	“So I think that whole notion of helping and encouraging students to build up relationships is critical for the whole area of OR because you have to go .. you won’t have all the answers. You’ll have to go and ask other people”. (EE5)	Current ORedu

#### **6.4.4.3 Research skills**

Four EE educators specifically associated research skills with OR. However, closer analysis of the data showed that nine educators mentioned students undertaking research in relation to their opportunity. Interestingly the data revealed that the focus of this research was on validating the opportunity and the research stage was considered to begin in earnest once the opportunity had been identified. For two EE educators the focus was on visual research, looking at businesses, observing what works and how businesses grab customers’ attention.

#### **6.4.4.4 Networking skills**

Networking skills were mentioned by four EE participants who recognised that students cannot have all the answers. EE educators recognised their role in encouraging students to build relationships with others in order to gather knowledge and skills which could help them recognise opportunities. In some instances EE educators brought in guest speakers, sign-posted relevant contacts or encouraged students seek out their own contacts where relevant, particularly when developing their opportunity.

### 6.4.5 Tools and techniques

EE educators employed a variety of methods in ORedu. These included: creativity techniques, scenarios, case studies, presenting students with problems, guest speakers, storytelling, role play and reviewing prior students' work. The most popular of these was the use of creativity techniques, regardless of EE educators taking a market or a creativity view of OR.

Creativity tools and techniques included: brainstorming, mind-mapping, morphological analysis, fishbone analysis and making. Support tools that were used included: text books on creative thinking, interactive brainstorming and video technology. Scenarios emerged as a popular tool, used by over half of the EE educators. These scenarios tended to be based on real life situations, scenarios that were of interest to the students and relevant to their discipline, scenarios that challenged them to think and to problem solve in order to identify opportunities.

Case studies were mentioned by seven EE educators. Case studies allowed educators to illustrate OR in addition to allowing students to critique, acquire basic skills and practice OR themselves in the context of the cases being studied.

Node	Quote	Emergent Themes
OR Tools and Techniques	"Well we go through all the regular techniques that we have and then it's up to themselves to use them after that. So gallery techniques, morphological analysis, analogies ... em gallery technique, brain writing." (EE3)	Current ORedu
OR Tools and Techniques	"I always try to help to bring in scenarios that are either connected to their discipline or their age group." (EE5)	Current ORedu
OR Tools and Techniques	"I'd have quite a lot of exercises to let them see opportunities and how they happen. So, like we would go through a lot of examples where companies took advantage of opportunities, and then we would spend a lot of time looking and then we would give them exercises for themselves to come up with opportunities." (EE6)	Current ORedu

Four EE educators described exposing students to sample problems as a catalyst for OR. Problems were either identified by the students or presented to the students with the aim of finding a solution. One educator described sometimes starting with the existing solutions to enable students to identify the original problem. Other, less popular methods were role play, personal story telling and the demonstration of previous samples of student work to students. However, the interviews and observations showed that educators do bring in other role models to tell their stories to students.

Node	Quote	Emergent Themes
Problems	“So to start with we would give them a couple of opportunity games, type of things, where I’d ask them to find a solution to a problem, or to come up with a new way of doing something.” (EE6)	Current ORedu
Problems	“I ask them to identify everyday problems, products and services and to work back and ask, what was the problem, how was it a compelling problem that created an opportunity.” (EE9)	Current ORedu
Story Telling	“Em and I suppose again it’s back to the whole area of telling stories and I think that’s a very important area and a lot of educators don’t have a lot of stories to tell.” (EE5)	Current ORedu
Expose to relevant examples	The guest student explains that they had to come up with an idea and then goes on to explain what the idea was and he outlined what he had to do and how certain values were important to him in developing his idea. (OB1DE)	Current ORedu
Expose to relevant examples	Students are then taken to a start-up which involves four past students who had recently graduated. One explained what he studied and his secret passion which he did in his spare time. This is where the idea came from and he explained the challenges that he faced convincing others that he had the knowledge needed even though his qualification was in another area (OB3DE).	Current ORedu

#### 6.4.6 Educator roles in OR education

EE educators described their role as being multifaceted. Nine EE educators described themselves as facilitators, explaining how they challenged, encouraged, guided, monitored, motivated and supported students through OR and on into opportunity development. They saw their role in terms of facilitating learning, facilitating progress through the process, facilitating student thinking and facilitating the learning climate. An important part of their role was described as linking students to theory, by drawing on multiple sources for relevant information, familiarising students with appropriate tools and selecting case studies that illustrate theory in action for students.

Their role in providing ongoing feedback to students, both formally and informally, was considered important by the majority of participants, in terms of shaping student ideas or enabling them to progress through to opportunity development. The observations revealed that educator feedback included a degree of challenge in relation to student ideas. Similarly, educators were observed making suggestions to students on possible problems or opportunities that they could consider and recommending ways that students’ could develop their ideas.

All EE educators saw their role as providing support to students on: completion of deliverables, meeting performance standards, developing their knowledge and skills, accessing other support structures, confidence building and assuming responsibility for their own work. Educators did this by making themselves available outside timetabled hours, making introductions, acknowledging student difficulties and signposting relevant information, events and services.

A unique perspective was provided by one educator who described his role as finding opportunities for students. In this context, the educator viewed opportunities as networking opportunities and he had crafted a self-made role for himself in introducing students to contacts outside of his organisation.

Node	Quote	Emergent Themes
Educator Role	"So I guess it's a bit of 'facilitator' em where I'm trying to pull out of them what's inside them ... so it's very much facilitating that and unearthing the process." (EE5)	Current ORedu
Educator Role	"Em sometimes it's quite noisy, because there's a lot of discussion, we have to, they can't be, you have to facilitate that." (EE9)	Current ORedu
Educator Role	"My self-developed role would be presenting opportunities to the students and then it's up to them to see whether whatever way they want to link it." (EE4)	Current ORedu
Educator Role	"I'd put them into groups and for each group then I'd go around and spend 5 or 10 minutes talking to them about their idea." (EE7)	Current ORedu

Four educators described having a monitoring role. Two aspects of monitoring were evident: monitoring the learning environment and monitoring student work. A number of aspects of the learning environment were monitored, such as student engagement and student interaction. Monitoring student work included both the quality of the work and student progress with the work.

#### 6.4.7 OR learning environment

Eight EE educators described a learning environment which was interactive, competitive and fun for this part of their module, with one educator signalling that it became more structured as the module progressed. This environment was described as being informal, messy and empowering. Although the environment was considered informal and messy, educators described the need to provide some form of scaffolding for students to ensure a safe, structured and supportive learning environment. The creation of a safe learning environment in particular was described by eight of the EE educators. Safe was described in terms of providing an environment where risk taking was encouraged and personal exposure was protected.

In contrast however, the EE classes observed were more formal in nature, with students sitting in traditional classroom layouts. In most instances the rooms were stark, with bare walls, clean rows of desks all facing towards the front. Students were passive for most of the classes observed, unless they were presenting themselves, or the educator directly engaged with them. However, a transfer of control and ownership was observed on one occasion where students decided for themselves when they were ready to present and how they wanted to do it. Students also determined who was in their project group and if they wanted to re-group, they had the freedom to do so. This was evidenced with one group of five splitting into one group of two and a group of three, resulting in two separate opportunities, rather than the one they had all begun with.

Peer to peer learning formed an important feature of the learning environment observed, with student guest speakers, students looking at past projects or students volunteering peer to peer support. However, during those observations peers did not question or provide feedback on each-others' ideas.

Node	Quote	Emergent Themes
Learning environment	"It can be very chaotic and messy, it's not your traditional lecture fare" (EE1)	Current ORedu
Learning environment	"Interactive. Yeah em ... I also try to bring a bit of fun in and em maybe bring in some problem solving games just to be able to get back to that feeling as to what it was like as a child." (EE5)	Current ORedu
Learning environment	"You try and make it fun, you try and keep it fairly safe" (EE1)	Current ORedu
Physical environment	The session takes place in a dark computer lab. The student is at the front. The lecturer and I sit in the next row and the students take up the remaining five rows in the lab. There is a total of 18 students, all sitting in front of computers, but in this instance they do not need to use them. The students are completely passive in this particular workshop. When asked questions they remain silent. (The lecturer later explains that this is normally where student workshops for this subject take place). The atmosphere is hushed. One person speaking and the others listening.(OB3EE)	Current ORedu

#### 6.4.8 Summary of findings

The findings from this section of the research show that educators can hold different perspectives on opportunities. These perspectives include looking at opportunities from a market and an individual perspective and viewing opportunities as existing, happening or being created by students. These findings suggest that such perspectives can influence the way educators approach ORedu, in terms of it being a creative process or a purely analytical one.

This research has identified a number of attributes, behaviours and skills associated with OR. Of these, OR skills were the most challenging for educators to specifically identify. EE educators described actively developing student alertness and student confidence to engage in creativity while intent was considered an 'individual' thing. They observed behaviours which they associated with OR, such as scanning, being proactive and, to a more limited extent, experimentation. EE educators described actively developing creative thinking skills using tools and techniques, enabling communication skills through presentations and pitches and encouraging networking by signposting. Networking and research skills however, were more frequently associated with opportunity development.

## 6.5 Theme 4: Creativity in opportunity recognition education

Half of the EE educators identified some support for the role of creativity in OR with eight of them describing creativity in process terms, such as ‘thinking’, ‘practice’, ‘following things sequentially’, ‘looking at things differently’, ‘capacity to think things through’, ‘ideas can evolve’ and ‘stages’. The remaining two educators described creativity in terms of the output from the process which is ‘brand new’, ‘artistic’, ‘something that isn’t out there’. Ideas were seen to emerge from and be refined by the use of creative exercises, through a process of self-exploration and through a series of iterations.

Of note was the emphasis on creativity in the module learning outcomes. Five EE educators referred to problem solving and a further seven mentioned creativity in the form of idea generation. Creativity related learning outcomes, associated with problem solving and idea generation were the most frequently cited learning outcomes by participants.

### 6.5.1 The role of creativity in OR

Creativity was described as being very important for OR but four EE educators described creativity in a conflicting manner. On one hand, one educator suggested that creativity had a role in OR, where creativity was attributed to students coming up with ‘brilliant’ ideas rather than ‘the usual stuff’. However, the educator then went on to describe an alternative view of the role of creativity by associating it with awareness rather than considering it essential for OR. Similarly, for another it was considered to have a ‘big role’ in solving problems, yet she later suggested that the ideas themselves don’t matter, it’s having the skills to know what to do with ideas that counts.

The research indicates that for two EE educators creativity was seen as being haphazard and somewhat unmanageable, and they considered the role of planning to be more relevant for OR. One educator also suggested that the role of creativity in communicating the idea was considered more important than the actual idea itself.

Node	Quote	Emergent Themes
Role of Creativity	“It can be quite psychological in the sense that you are looking at their creative process and their creative person.” (EE8)	Creativity in ORedu
Role of Creativity	“So in terms of ability to come at a particular problem, I think creativity would be very important.” (EE10)	Creativity in ORedu
Role of Creativity	“The creative side of it tends to be a little bit more hap hazard, so you have to put, in my view you have to put a kind of a structure on it to allow them to see that its ALL about planning, where do you want to go, how do you want to get there and how do you get in the middle.“ (EE6)	Creativity in ORedu
Importance	“So whereas we are trying to say to students, look I don’t care what ideas that you come up with, what I want you to have is when you leave here you have a set of skills so that at some time in the future when you come across the right idea you can do something with it or have the confidence to do something with it.” (EE10)	Creativity in ORedu



### 6.5.2 Creative thinking

Seven EE educators described the need for creative thinking in relation to OR. Creative thinking was seen to influence the way students looked at things and in two instances educators associated it with convergent and divergent thinking. An interesting perspective was added by EE8, who associated willingness to engage in creative thinking with a students' background being musical or artistic.

Two particular aspects of creative thinking emerged, and these were the generation of multiple ideas and linking information. Linking information was described by four EE educators as having an influence on the creativity of the ideas generated and such linkages included linking people with a potential opportunity, linking knowledge from other areas to identify the opportunity and linking developments in other areas that could enhance their opportunity.

Node	Quote	Emergent Themes
Creative Thinking	"Any students who had a musical background, artistic background em they tended to have a little more use of their right brain skills so less logical less analytical, perhaps, more willing to go for an unstructured lecture."(EE8)	Creativity in ORedu
Linking Information	"They'd seen the Aloe Vera plants being grown in in Africa, they had taken pictures, they used them as part of one of their assignments. And it really worked, you know they were able to link the two" (EE4).	Creativity in ORedu

The generation of multiple ideas was also mentioned. Generating multiple ideas was explained as being less difficult for students than coming up with one idea, while the generation of a greater number of ideas was associated with better quality ideas. Interestingly, the data also revealed that some educators have adopted practices that they have observed working, but in some instances they were not clear why those approaches worked. In a similar vein, words such as 'amazed' were used to describe the output from creative challenges.

Node	Quote	Emergent Themes
Multiple ideas	"If you send them off to do one they can't come up with one (laughing) they keep rejecting each idea for ... I just came up with four and four seems to work." (EE3)	Creativity in ORedu
Role of Creativity	"Every part of the business plan you always, you always em, requires creativity as such." (EE7).	Creativity in ORedu

### 6.5.3 Opportunity development

Educators recognised creativity as having a role in opportunity development. This was described by five EE educators interviewed in terms of the ongoing use of creativity techniques at various stages in opportunity development, fleshing out ideas based on feedback from others, encouraging iteration and re-thinking of ideas right through business model development and the use of creativity to

communicate potential ideas effectively to others using the business plan or pitches.

#### 6.5.4 Student experiences of OR

All EE educators described students experiencing some level of difficulty with OR, whereas six suggested that students did not find OR difficult. Sometimes EE educators reflected both positions in their descriptions. The reasons for difficulty varied but they included: misconceptions as to what was involved in OR, lack of students' exposure to OR, the unpredictable and unstructured nature of OR and the impact of it on their grades, lack of skills in the area, the need to be accountable for their ideas, time pressure and students rushing in to identify an opportunity too quickly.

Where EE educators described situations where students did not have any difficulty with OR, in four instances this was associated with the individual themselves. However, whilst EE8 spoke about students' ability to recognise opportunities, she felt that they placed limits on themselves in terms of developing those opportunities in real life, due to their age or their own expectations. EE9 recognised initial challenges in OR, particularly with first year undergraduate students, but she explained that training in creative thinking at an early stage in their EE education allows students to apply it when required.

Node	Quote	Emergent Themes
Student experience OR	"I have always found that getting them in to .. through that idea generation and OR that can be the hardest part that's where there's a bit of blockage." (EE1)	Creativity in ORedu
Student experience OR	"Some students rush into it and then they realise that they haven't got the right problem and they beg and ask you can they change." (EE8)	Creativity in ORedu
Student experience OR	"Some of them are brilliant" (EE1)	Creativity in ORedu
Student experience OR	"I find that they're quite good at recognising the opportunities, but they keep saying well, I'm too young or I'm em ... young is a major thing " (EE8)	Creativity in ORedu
Student experience OR	"I think they find it hard you know, unless it's in them" (EE10)	Creativity in ORedu

##### 6.5.4.1 Influence of background

The influence of students' background was described by six of the educators as having an impact on their ability to recognise opportunities. Being from an entrepreneurial family, their educational field, their experience and their cultural background were all described as contributing to students' ability to recognise opportunities. However, family background was also considered to have a limiting effect on some students' ability to recognise opportunities due to a perceived lack of motivation to do better, particularly where their only experience was of success.

Node	Quote	Emergent Themes
Students Background	"I think that they are not comfortable with OR unless it's in their background or in their experience if they are from a family of entrepreneurs." (EE2)	Creativity in ORedu
Students Background	"I'd have to say that there are particular countries that would be particularly strong at idea generation and innovation." (EE6)	Creativity in ORedu
Students Background	"The students I'm thinking about, would have come from entrepreneurial em homes, where their parents were entrepreneurs." (EE8)	Creativity in ORedu

### 6.5.5 Student challenges in ORedu

EE educators perceived that students face challenges in relation to OR. Educators described resistance, the influence of second level education and student pre-conceptions as the greatest challenges for students in ORedu. Nine educators identified fear as the most common source of resistance, while seven described students being challenged by being outside their comfort zone. Similarly, six EE educators identified lack confidence as a particular challenge in OR. Other sources of resistance included lack of student motivation to engage in OR, particularly where students demonstrated resistance to the commercial connotations associated with EE education.

Node	Quote	Emergent Themes
Student Challenges	"I suppose for some of them they wouldn't have the confidence to come up with an idea." (EE7)	Creativity in ORedu
Student Challenges	"I think that there is a huge confidence required to get to the stage where they feel its ok to come up with a mad idea, wild and whacky can work wonderfully well." (EE9)	Creativity in ORedu
Student Challenges	"Because for most students still say to us they are not creative. So em ... and that I think, that's kind of in grained in them from secondary school and maybe through here as well sometimes that they are not allowed to be creative." (EE7)	Creativity in ORedu
Student Challenges	"So sometimes I think ... they have a conception of it being about invention or innovation being something that is you know outside your skill set in terms of maybe technology" (EE1)	Creativity in ORedu
Student Challenges	"And I would say, yes, but you can be accounting students and be entrepreneurial or you can be creative and eh it's trying to get rid of these ideas that they have in their heads as to pre-defined roles that they are supposed to have." (EE8)	Creativity in ORedu

The influence of second level education was described as a challenge by six of the EE educators interviewed. This was seen to pose challenges to: creative thinking, their ability to recognise opportunities and their ability to think independently. This influence was considered to stifle the ability of students to engage in the creative thinking needed for OR. In addition to this student, preconceptions were also identified as presenting a challenge to OR. Such preconceptions related to that of

their role as a student and their roles in the future and preconceptions as to the nature of opportunities themselves. As such, educators felt that students put limits on their creative thinking.

### 6.5.6 Student emotions

A range of student emotions were identified from the educators' descriptions of student experiences and challenges. These were grouped into positive and negative emotions. Positive emotions were identified by six EE educators and these emotions included bravery, enjoyment, enthusiasm and passion. Enjoyment was described by educators as students having fun, loving it, thriving on it and experiencing eureka highs, whilst passion was described when students identified ideas that they were genuinely interested in. Enthusiasm was referred to in the context of students following their passion and this was associated with students 'coming alive' and wanting to assume ownership of their idea.

Negative emotions were mentioned by five EE educators and these were more commonly associated with the challenges creativity posed to the students. Students openly resisted having to engage in OR. Words such as fear, hate, stress, worry or resentment were used in this regard. Some students were described as being in awe of the creativity required for OR as they can assume that they have to 'invent' something completely new.

Node	Quote	Emergent Themes
Positive Emotion	"If it's something, if it's their opportunity it's their baby, they're going to be more probably possessive about it but also more willing and they'll want to make it work." (EE7)	Creativity in ORedu
Negative Emotion	"I know some of our very eh .. more traditionally, academically minded students are really hating it." (EE1)	Creativity in ORedu
Negative Emotion	"Frustrating at times eh but hugely exciting as well." (EE5)	Creativity in ORedu

### 6.5.7 Developing students' competence in creativity

Seven EE educators identified that they had a role in developing students' competence in creativity. Skill development in creativity was described as being enabled through practice, using creativity techniques and exercises to encourage idea generation and creative risk taking. Seven EE educators recognised that they have a role in student confidence building by providing constant positive reinforcement, regular feedback and encouraging student reflection.

Node	Quote	Emergent Themes
Practice	"But em I think you can help break that down, you can help to facilitate to break that down by just activities, a lot of eh, in class activities, examples, brainstorming, lots you know all the standard enough techniques that we all, that we all draw on at various points in time." (EE1)	Creativity in ORedu
Developing Creative Competence	"You are just encouraging them .. you are encouraging the student to see what they've done that's really of merit .. like .. 'you're really good at this' .. did, you know ... and you'll often get 'no .... I'm not'."(EE2)	Creativity in ORedu
Developing Creative Competence	"I'm a very strong believer of letting them really believe it is possible and until they've actually decided this is definitely not a runner, only then is that idea quashed." (EE5)	Creativity in ORedu
Practice	"So creativity I mention it in class we might do one or two activities but when you are not doing it on an ongoing basis for most students it just becomes something over there because I think it's something that you need to practice, you know?" (EE10)	Creativity in ORedu

Four EE educators mentioned aspects of a creative culture, such as the atmosphere, the visibility of creativity and engaging with it on a regular basis, as being important for OR. EE5 for example described engineers and scientists being particularly suited to creative thinking due to their normal working environment.

Node	Quote	Emergent Themes
Stand Alone Module	"We deliver it across the college and it's fantastic to see scientists, or health and leisure students or business students approach a problem in a different way." (EE8).	Creativity in ORedu
Stand Alone Module	"I mean if you think that we have a creative media programme, but they don't see the connection between the critical thinking module and the other modules on the course." (EE7)	Creativity in ORedu

This research shows that, in some instances, creativity is commonly taught as a separate, stand-alone module across a range of disciplines. Such modules focus on skill development and the use of creativity techniques for problem identification and idea generation. However, two EE educators were critical of the development of students' creativity skills in EE education. EE7 in particular felt that having tools to enable students to explore would be useful. Similarly some educators suggested that the current curriculum does not allow space for the development of such skills, in addition to the fact that assessment is seen to constrain the development of creativity as a specific competence.

Node	Quote	Emergent Themes
Explore	“That’s a huge part of OR, is to explore, but we don’t allow people to do that. And that to me is a huge critical factor”. (EE5)	Creativity in ORedu
Creativity in OR	“I suppose for me if, you know ‘we expose them to different tools that are out there to help them you know come up with ideas and even to explore ideas or to share ideas. We don’t look at that.” (EE7)	Creativity in ORedu
Practice	“Even failing, you know that approaching a problem, not getting it right and tackling it again you know, there’s not a lot of space for that type of activity.” (EE10)	Creativity in ORedu
Assessment	“Because the assessment says how can you stand over giving them that mark for that process.” (EE5)	Creativity in ORedu

### 6.5.8 Educator challenges in ORedu

A number of ORedu challenges for educators were identified in this research. The culture of the organisation emerged as a particular concern for three educators. These educators described the challenge of engaging in creative aspects of EE, where there is a negative culture and disrespect for creative approaches in formal education. While this was mentioned by just three of the participants, for them it was considered a significant challenge.

Lack of time, due to the confines of semesterisation, was mentioned by five EE educators. Similarly, the incorporation of EE into other modules across disciplines in itself created time challenges for educators, as this frequently resulted in a small proportion of an existing module being dedicated to EE. In some instances this was the only time students would encounter EE in their undergraduate education. Therefore, educators felt that there simply was not enough time to address OR in greater detail, even though they may wish to do so.

Four EE educators identified their ability to teach creativity as a challenge. Arguments included whether creativity can be taught or not, and in particular the self-observed lack of expertise by EE educators in teaching or developing student creativity. At another level, educators mentioned the fact that within EE there is not the time nor resources available to develop the required educator expertise in creativity, in the current economic climate, within HE in Ireland.

Challenges were posed by class size. This was raised by half of the EE educators in the context of smaller class sizes being considered more intimate, more suitable for giving regular feedback to students and more manageable. Class sizes ranged from as few as seventeen students on some programmes to over eighty students on others. Coupled with this was the fact that the physical environment in which EE educators worked was considered unsuitable for moving between large groups of students.

It was observed that EE educators delivered classes in traditional classrooms, with rows of seats and desks facing the educator’s desk at the top of the classroom. Educators did explain that, depending on what students were doing, they re-arrange the furniture, but return it as found at the end of class time. Rooms were typically neutral in terms of decoration, seating and organisation. In two cases computer labs were used. Half of the EE educators mentioned that they found the classrooms restrictive and expressed wishes that they could work in alternative spaces. On two occasions educators expressed that they had requested alternative less traditional facilities but that such requests had been turned down. Desired physical environments included items such as round tables, space and casual seating such as bean-bags.

Node	Quote	Emergent Themes
Culture	“There is an unhealthy disrespect towards the creative field in a lot of academic institutions, I feel. They don’t em, a lot of my peers eh don’t like the perhaps the required informality or the lack of structure you would need for creative space.” (EE8)	Creativity in ORedu
Time	“Some of it, some of it is just more time. I mean time is a very, very often and creating the, the, the space to fully develop it to the point where you are happy with it.” (EE1)	Creativity in ORedu
Lack of expertise	“Maybe because I’m not creative myself, and that could be part of it as well.” (EE6)	Creativity in ORedu
Lack of expertise	“I’m not very comfortable in the creativity space, it’s not my forte” (EE10)	Creativity in ORedu
Class Size	“So because of the class sizes you might do a little bit of it in class em but when you have, it can get out of control a bit too so if you have got 60 or 80 and it’s too noisy and you are not getting to quant, to try and keep students focused” (EE10)	Creativity in ORedu
Class Size	“We still have the linear, you know lecture theatre, you know I have rooms where I find I can be assigned in a big theatre, with 80 students to do this, so having to fit what I want to do with those groups is often a challenge. I may have 20 students, it’s very different, it’s much easier to apply because I like to go around” (EE9)	Creativity in ORedu

However, educators themselves demonstrated their passion for EE education where they described it being thrilling, exciting, risky and rewarding. This passion enabled them to work around the perceived constraints and three educators described creative ways in which they dealt with the challenges they faced, such as moving location or climbing over furniture. Similarly, four EE educators made reference to their entrepreneurial backgrounds in explaining this passion and their own approach to OR.

Node	Quote	Emergent Themes
Physical environment EE	"The space is not ideal, I might as well add, so again it's about compromising, it is about doing the best with the space that you have." (EE1)	Features current ORedu
Physical Environment EE	"Em, I put them into different groups then, so I find that students tend to sit in the same place, so we went to different environments, we sat outside one day, just did it on the steps outside the building." (EE8)	Features current ORedu

### 6.5.8.1 Application of design thinking to EE education

EE educators expressed limited awareness of design or design thinking as applied to EE education. Where educators were aware of it, they considered it as tool that could be used but one that was not currently a priority. Time constraints in learning new approaches and cultural issues with regard to the use of creative approaches were mentioned as potential barriers for educators in adopting more design based approaches.

Node	Quote	Emergent Themes
Design Thinking in EE	"I'm not an expert in design thinking eh but I can, I mean I read about it and I can pick bits from it ... it's a tool, it's a great tool, it's a tool to get people thinking and iterating." (EE1)	Broader Application of Design
Design Thinking in EE	"I have come across Design Thinking but ... I think here there isn't a big focus on it." (EE7)	Broader Application of Design
Structural Processes	"And I also believe another barrier is lack of time to go on training, lack of funds to go on some of the training" (EE5)	Broader Application of Design
Institute Culture	"In terms of the educators, I don't think that they are very comfortable with the whole area of creativity, they don't, they don't see it as something that's very important." (EE7)	Broader Application of Design

### 6.5.9 Summary of creativity in OR

This research finds that educators recognise creativity as having a role in OR. The role of creativity in OR was described in terms of generating and refining ideas and coming up with novel ideas. Students' experience of OR was frequently described as difficult and these difficulties were attributed to student resistance lead by fear, the influence of second level education and student pre-conceptions.

Educators identified that they have a role in developing students' creativity skills. While evidence from this study suggests that educators frequently use creativity techniques and tools to enable student creativity, educators themselves were critical that current practices do not go far enough in this regard. However, EE educators face a number of challenges in enabling students' creativity in ORedu, in particular the degree to which the prevailing culture supports creative education practices, the lack of time within existing modules due to modularisation, their own perceived lack of creativity and the lack of resources available for training in this domain.



## **6.6 Overall summary of findings on ORedu**

This research study finds that whilst EE educators consider OR to be an important aspect of EE education, it does not feature prominently in it. This is reflected in the assessment practices relating to OR within existing EE modules and the difficulty experienced by educators in describing student competency in OR.

The findings have revealed a process for ORedu in the context of HE in Ireland. This process has a number of different starting points, which facilitate entry into different stages of the process. The process itself is iterative in nature, and process iterations are frequently initiated through successive challenges by educators. Of note, was the existence of multiple potential entry points into this process which could result in students by-passing some of the earlier stages in the process.

These findings suggest that an educator's perception of opportunities influences how ORedu is delivered and the subsequent emphasis placed on analytical or creative thinking. The research revealed a range of student attributes, behaviours and skills associated with OR. While ORedu appears to enable creative thinking there are indications from this research that this is an area that some educators do not quite understand while more are not comfortable with it, at an individual level.

Finally, creativity is recognised by most educators as having a role in OR in terms of generating novel ideas. However, educators describe student experiences of OR which are mixed, with many perceiving students encountering difficulties. EE educators recognise their role in developing student competence in creativity, yet there are criticisms around the ability of current ORedu to achieve this.



# Chapter 7 Design Education Findings

## 7.1 Introduction

This chapter is the second of two findings chapters in which the research findings in relation to Design Education (DE) are presented. This chapter presents the findings specifically related to DE, while the previous chapter dealt with the findings related to opportunity recognition education (ORedu).

The findings from this chapter were obtained from interviews with, and observation of, design educators and these findings serve to address the fourth research question of this study (section 5.5).

Four key themes emerged from analysis of the DE interview and observation data.

- How designerly ways of thinking are developed in DE (section 7.2 and section 7.3)
- Explore as a feature of DE (section 7.4)
- The role of challenge in DE (section 7.5)
- Exposing students to risk in DE (section 7.6)

This chapter will begin by illustrating how DE develops 'designerly ways of thinking' that are considered distinctive and versatile. The chapter then continues by presenting findings from this research on distinguishing features of DE: explore, challenge and risk. The chapter concludes with a consideration of educator perspectives on the broader application of design in other disciplines (section 7.7).

### 7.1.1. DE participant demographics

To facilitate interpretation of the findings, coding Table 7.1 provides some background information on the participants involved in this research.. DE educators came from the Visual Communications and Product Design sectors. All had prior experience as designers in industry and a total of seven DE educators are still currently running their own design businesses. The average number of years lecturing is 10.4 years which ranged from a maximum of 24 to a minimum of 3.5 years.

**Table 7.1: Coding table for DE interviews**

Interviewee	Discipline	Experience	Years lecturing
DE1	Product Design	Director exhibition design company, industrial designer for retail, industrial designer for development aid, furniture and lighting director	7
DE2	Visual Communications	Runs own practice, design for print and screen. Senior designer in studios in Rotterdam, Glasgow and Dublin.	10
DE3	Product Design	Industrial designer equipment for children with special needs, design researcher.	2.5
DE4	Product Design	Own practice (20 years), design practice and consultancy	27
DE5	Visual Communications	Owner design consultancy. In-house consultancy in several international companies.	6
DE6	Visual Communications	Freelance commissions, worked in 2 studios in UK	11.5
DE7	Visual Communications	Freelance commissions	15
DE8	Visual Media	8 years design and art direction	15
DE9	Commercial Design	8 years experience as product designer in Industry. 6 years as design researcher and lecturer.	3.5
DE10	Visual Communications	Full time designer for 10 years and currently designs as requested.	6.5

Three opportunities for observation were offered by the DE participants in this study. This involved six hours of observation of DE educators engaging with students in different aspects of DE.

**Table 7.2: Coding table for DE observations**

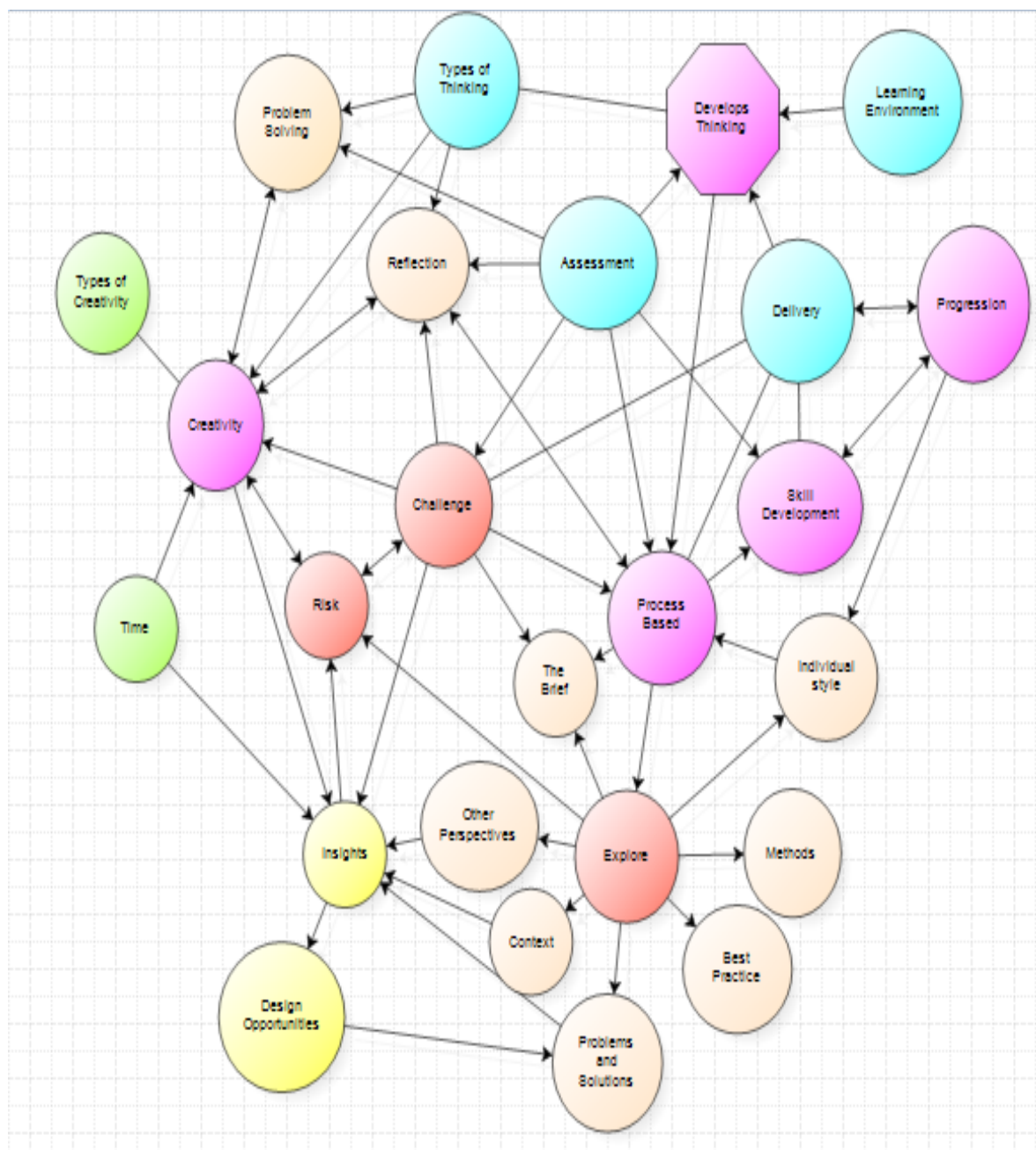
Observation	Activity	Duration	Participants	Location
OB1DE	Observation of interim student reviews	1.5 hours	12	Breakout Room
OB2DE	Observation of student tutorials	1.5 hours	12	Design Studio
OB3DE	Observation of group crit / feedback session	3 hours	15	Design Studio

The findings presented in this chapter are descriptive in nature and the same approach has been adopted in presenting them, to that taken in Chapter 6 (section 6.1).

## 7.2 The Nature of design education

The findings from this research show that DE develops ways of thinking which leads students to problem solve in creative ways. To distinguish these ways of thinking from the popular term 'design thinking', the phrase 'designerly ways of thinking' will be used. Modelling, derived from analysis of these findings show that DE enables designerly ways of thinking in a number of ways, as illustrated by Figure 7.1 below. These themes will be explained in the sections that follow.

**Figure 7.1: Emerging themes DE**



### 7.2.1 Ways of thinking

DE educators unanimously described DE as developing ways of thinking, which allow students to consider a variety of possibilities that lead them to workable solutions to problems. As such, all educators described designers as problem solvers. The data showed that a fine balance must be achieved between different types of thinking, which requires students to exercise their creativity, analytical and synthesis skills. They described students engaging in different types of thinking, such as abductive and deductive reasoning. It is this, one educator suggested, that “sets them apart as designers” (DE3).

One DE educator described student creativity as being a way of thinking requiring the ability to jump between both right and left brain. Yet participants explained that these types of reasoning were not explicitly ‘taught’ in DE, they develop. One educator described it more as a ‘journey’ which is undertaken over a number of years, which leads you to a way of thinking that you cannot move back from. This way of thinking can be applied to work out complex problems in a variety of situations and therefore DE educators suggest it is ‘valuable’.

The thinking that is inherent in DE should lead students toward solutions that are forward looking, rather than being historically based. This was evidenced in descriptions of it being ‘opportunity focused’, ‘projective’ and ‘future focused’ and instrumental in ‘building the future’. However this projective thinking was also found to be tempered by the reflective nature of design, which also requires students to engage in reflective thinking. Students were required to reflect on a number of levels: reflection on their learning from engaging in design processes; reflection on the design itself in the context of the original brief and personal reflection, where students reflect on who they are and how they design.

Node	Quote	Emergent Themes
Types of thinking	“It’s maybe like you just have this eureka moment but it’s actually well no, there’s different types of thought processes going on ... We actually don’t have an abductive reasoning class , we don’ teach it at all” (DE3)	Way of Thinking
Problem solving	“Now, those problems can, be sort of , eh, multi-faceted, you know you can have, eh, technical problems, they can have aesthetic problems, you can have eh user problems, you can have all sorts of different problems, but essentially designers are problem solvers.” (DE5)	Ways of thinking
Inventing the future	“Everything is about building the, the future. So no one want’s you to develop something that has only an historical context. It has to be, for a company, it’s their next best, it’s the thing that’s going to keep them alive for the next 5 years.” (DE4)	Way of Thinking
Types of thinking	“I suppose the anecdote that I best use, eh, for it is that you have to be able to keep your head in the clouds and your feet on the ground.” (DE4)	Way of Thinking
Reflective thinking	Tutor invites reflection on workshops last week. Tutor directs them to take time to reflect on directions. (OB2DE)	Way of thinking

### 7.2.1.1 Student challenges

These findings suggested that these ways of thinking do not come easily to all students, although some difference of opinion was evident. One educator suggested that only a minority of students could do this naturally, and that it was particularly challenging in the early years of undergraduate education. Another suggested that most students coming into their course already have the ability to do it. Being creative yet practical, linking information and taking the leap in thinking, using abductive reasoning, were described as being difficult for students. Of note however, was that one design educator presented the ways of thinking as 'easy' for designers once they have been acquired.

Node	Quote	Emergent Themes
Types of thinking	"I think the skills are usually already there, if they're making leaps from what they see in the world to an idea they are kind of already doing that" (DE3)	Ways of thinking
Practical creativity	"People think its creative, it is creative, but its practical creativity, pragmatic creativity as opposed to self-expression" (DE2)	Forms of creativity
Structured creativity	"I suppose in terms of the abductive reasoning, giving them tools to sort through that information and look at it in a different way, you know synthesis and affinity diagrams and getting all their information up in post-its and pictures." (DE3)	Forms of creativity
Analysis and synthesis	"So it's very much about being a problem solver, being able to gather information and being able to analyse the information, and this for our students can be the big em trip up if you like." (DE7)	Ways of thinking

### 7.2.1.2 Types of creativity

Creativity was not presented as a uniform construct in DE, as educators described it in various forms such as emotional creativity, practical creativity, structured creativity and risky creativity. Emotional creativity was described in terms of being 'self-expressive', led by intuition and more aligned with artistic creativity. Practical creativity was described as being 'pragmatic' and 'applied' and focused on solving problems. It was referred to from the perspective of developing design solutions that were practical and which worked in a particular context. Structured creativity was referred to by seven of the DE educators in the context of using frameworks to facilitate creativity, or using tools such as drawing, making and building to express it. However, risky creativity suggested something altogether new and it was described by one educator as pushing the boundaries into new knowledge and being risky in terms of the degree to which it would be accepted within a culture or society.

The interviews suggested a number of factors which appear to enable the development of these ways of thinking in DE: the way in which DE is delivered, the learning environment and the way DE is assessed. These will now be explored in turn.

### 7.3 Delivery of design education

DE education was described by all of the DE educators as being process based. Half of them described taking students through standard design models, particularly in the earlier stages of their education, to provide a structure around learning how to design. All educators emphasised the fact that design process can be unique and in later stages of their education students need to develop a sense of their own process as they move towards the end of their degree. In addition, the DE educators referred to design processes changing, depending on the type of project that students are working on and in response to the complex nature of modern design.

Node	Quote	Emergent Themes
Design Models	"I mean the funny thing is we teach a particular process, and I think students need to know that as a starting point because you can't just say to them well design is whatever it needs to be." (DE1)	Process Based
Design Models	"So, now kind of as an assistance what I would have done is I would have given them a design process model that they could use" (DE7)	Process Based

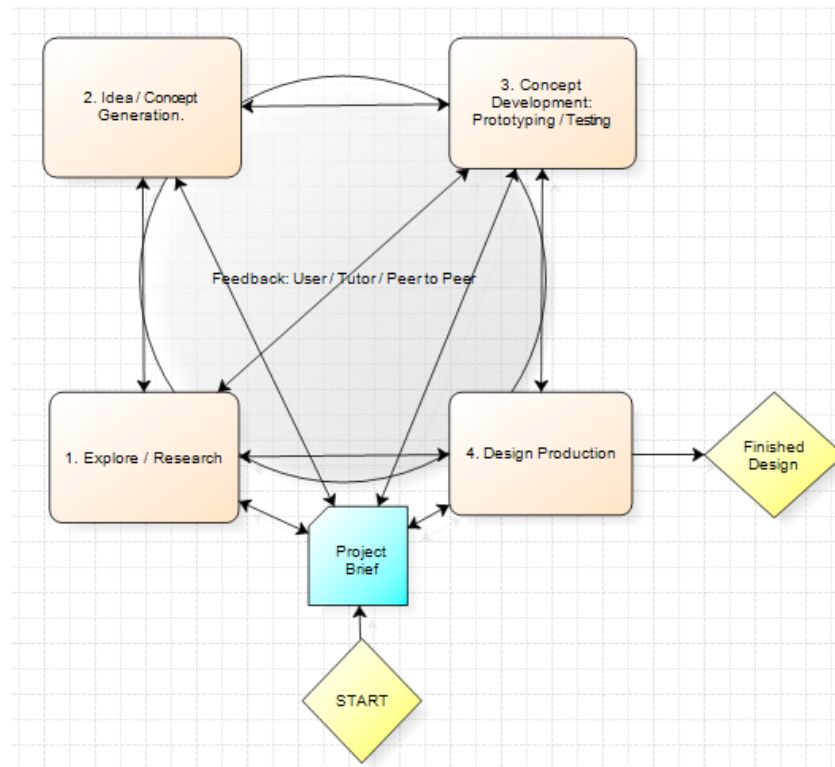
As much of DE is based around design processes a brief description of the process, as revealed in this study, now follows.

#### 7.3.1 Process based

Nine of the DE educators referred to design processes and these processes were found to have identifiable stages. A uniform process was not described by all educators but a number of similar stages were identifiable. These stages typically follow each other, but educators were keen to emphasise the complex and iterative nature of the processes and the importance of user engagement and feedback throughout. The process, as revealed from this data is depicted in Figure 7.2.



**Figure 7.2: Stages in a design process**



### **7.3.1.1 Starting points**

Design processes, as described by eight of DE educators, typically begins with students being given a project brief or a range of briefs. This is considered the trigger to ‘kick-start’ the process. A good brief was described as one that presents a ‘wicked’ problem, is sufficiently broad, challenging and most importantly, that doesn’t reveal the solution in its narrative. However, the data showed that students were encouraged not to simply accept the brief as it was but to challenge, clarify and question the brief to get to the core of the problem that needs to be solved. The majority of briefs have particular specifications or criteria built into them which the students must engage with in order to satisfy the brief.

### **7.3.1.2 Explore**

The brief should lead students into an explore stage where students undertake research. All DE educators described this phase as getting students to look outside themselves for information and to look at things from others’ perspectives. The user-centred nature of design was described as fundamental to this early exploration, where students are encouraged to engage with people ‘early and often’. The explore stage was described as starting ‘wide’ and using ‘blue sky thinking’ but that the process of exploration should allow students to focus and discover insights. Insights were described as ‘nuggets of information’ which are key to the development of creative solutions to problems. This explore stage is not just limited to this early phase in the process, as at later stages students explore production methods and techniques when experimenting with ideas and producing their designs for example.

Node	Quote	Emergent Themes
Project Brief	“So ways in which I do that is create a brief, whereby industrial design isn’t or product design isn’t just an endo-pipe activity, where they are styling something. It starts with understanding people in real situations in real context, and it also starts with the type of project that we give them.” (DE9)	Process Based
Project Brief	“Well I suppose from a design educators perspective I think, one of the most important things that you can do is get a brief right because what you are asking the students to do and how you ask them to do it.” (DE10)	Process Based
Challenge the brief	“You do that in industry as well, a client says we need this ... and its like, well do you really need that or do you need to look at this way.” (DE3)	Process Based
Gather Insights	“A creative thought that has not been, that kind of catches you unaware, you know, and that that is what you kind of build your solution off of and I think that that’s where some really good eh solutions come from.” (DE8)	Process Based
Tutor Role	A student then started talking about information that he had come across, revealed what he saw as an insight and tutor encourages him to ‘go along’ to investigate more. (OB2DE)	Delivery

### 7.3.1.3 Concept generation

Concept generation, involving the generation of a range of ideas, was described by all DE educators. This stage was described as being informed most frequently by the explore stage as students need to be able to feed their research into their ideas. At this point the process was described as being ‘iterative’, ‘loose’ and ‘messy’, requiring a lot of activity and reflection while students experiment with ideas. Allowing time for gestation of ideas and repeated iterations emerged as being important to the success of this stage of the process.

Node	Quote	Emergent Themes
Capturing Ideas	“I mean it’s really all about activity and that activity can be sketching it can be post-it notes, it can be mind-maps, whatever, and we don’t have a particular quantity except that the best projects always have a lot of sketching, or a lot of mind maps or a lot of concept generation of different types” (DE5)	Process Based
Concept Generation	“Then the ideation then sort of brainstorming, or we do a lot of different kind of ways of ideating em like kind of parallel worlds or em we do the hand storming and stuff” (DE3)	Process Based

### 7.3.1.4 Concept development

The third stage was described by eight DE educators as typically being a concept development stage, which requires students to narrow their focus down to a small number of ideas which they test and iteratively refine, based on feedback and reflection. At this stage, refinement frequently requires students to iterate back to exploring options and concept generation which is more focused on their area of

interest. Experimenting, modelling and prototyping are frequently associated with this stage.

Node	Quote	Emergent Themes
Concept Development	"You know they select one or two ideas and then they might just test them out so what if I use this font, what if I use that font what if I use the red what if I do it in this colour, what if I you know, so they literally go through iteration after iteration" (DE2)	Process Based
Concept Development	"After that it's kind of prototyping the idea and then kind of revising it again and again and hopefully testing it with people and getting reactions and stuff like that." (DE3)	Process Based
Concept Development	Student lays out 6 samples of their work, which are a variation of a theme, on a table. She explains the reasoning behind using the images and colours chosen. The educator suggests doing multiple posters rather than just one type for the final deliverable. (OB3DE)	Process Based

#### **7.3.1.5 Design production**

Design production was described by six DE educators as being the final stage in the process. This is where the selected design is worked up into its final form, for a client, a competition or a final presentation. Educators described the importance of maintaining the focus on the brief and the user, right into the final production. At this stage, students have to make their design work in terms of operationalising the design and also make it work in response to the brief. The iterative nature of the process is evident at this stage too, as the data suggests it can lead right back to the exploration stage, as students explore production methods or acquire the skills necessary to produce the final design. This phase is described as being a challenging and time consuming part of the process.

#### **7.3.1.6 Feedback**

Critique and feedback emerge as other important features of the DE education process. Critiques, or crits as they are most frequently called, were described as an occasion where a student has to justify their design decisions, their rationale and their response to the brief. This research shows that critiques are frequently carried out both informally for feedback purposes and formally for assessment purposes.

The most commonly mentioned form of crit was an informal presentation of students work, followed by a questions and answers session. Half of the educators emphasised the positive nature of the feedback provided in crits. However, moves towards modularisation, changes in course design and class size were seen to constrain the feasibility of undertaking regular crits. A more informal form of feedback was found to come from ongoing student / tutor tutorials and informal peer to peer feedback.

Node	Quote	Emergent Themes
Design Production	"The final end thing is kind of design production which is pretty much like, where you make it happen and you, you know, deal with the fine manufacturing processes or whatever." (DE2)	Process Based
Time	"The most important thing is that design is effectively a practice, and it's something that takes time, and it's about solving a problem, a problem, eh often through, it is done absolutely through a process but it's a process that takes time" (DE5)	Process Based
Time	"But I think in terms of being challenged creatively there has to be some type of an input so that you have that time to reflect through the process, you know?" (DE10)	Process Based
Critique	"So the crit is not necessarily an assessment em it's used to give feedback on the project really more than anything." (DE5)	Process Based

### 7.3.2 Project based

DE was described by all educators as being project based, with individuals working on both individual and group projects, which can vary in duration. These projects served a number of functions, such as allowing students to experience the design process and to facilitate teaching the technical aspects of design. Importantly, all DE educators emphasised that repetition of the design process, through a variety of projects, helps students to acquire the skills and thinking associated with design. In addition, educators explained that this project based practice of design enables students to develop their own style and processes for coming up with solutions to problems.

Node	Quote	Emergent Themes
Project Based	"And these projects could run from anything from a week long to anything up to 15 weeks long, depending on where you are in the degree." (DE1)	Delivery
Project Based	"That there's a cycle of projects, you're continuously doing that and honing those skills". (DE4)	Delivery

### 7.3.3 Practice based

This research finds that DE skills are progressively developed throughout a student's undergraduate education. Actively doing design and practice over time were mentioned by eight of the participants as key features of DE. The importance of time was mentioned by nine of the educators interviewed. Educators explained that creativity is not on tap and that time is necessary for gestation of the brief in relation to information gathered, time to identify insights, time to "to sit down, work it out, get it wrong, and try it again, get it wrong, try it again" (DE2), time to reflect and time to get the design into its finished state. However, one DE educator suggested that lack of time can result in students rushing the process and potentially limiting design opportunities.

Educators explained that repetition of the design process enables students to understand what is required, to reflect, to develop their skills and to help them refine their own design processes. The data revealed a distinction between early stage and late stage undergraduate DE in this respect.

### **7.3.3.1 Early stage design education**

Early stage DE was described as being more structured with an emphasis on understanding the context of design, learning design processes and skill acquisition through repetition and consolidation. DE educators explained that students undertake a series of short projects, which are commonly quite task based and which can be independent of each other. Similarly, contact with educators, in the form of tutorials or workshops, was described as being frequent at this stage. Educators spoke about the use of scaffolding and frameworks to guide students through stages of the process. In some instances, dedicated modules on creative thinking are delivered to students in the early stages of their education.

### **7.3.3.2 Later stage design education**

In later stages of DE the focus was described as becoming more strategic in enabling students to develop their independence, implementing design processes and polishing their skills as a designer. The approach was described as being somewhat less structured with students negotiating deliverables or operating with less direct intervention from educators within a broader set of parameters. The personalisation of design processes clearly emerged as important, as educators described the need for students to 'reflect their own voice' or their personal 'style'. One educator suggested that this is reflected in how students communicate with stakeholders with the emphasis shifting to the way they design rather than what they design. This stage was typically characterised by longer, self-determined projects and less structured intervention from educators.

Node	Quote	Emergent Themes
Practice	"And that's practice, that's a cycle so they would do that time and time again." (DE4)	Delivery
Progression Design Education	"I mean, the skills you need to learn that enables you to act out that thinking, and eh, those skills can take a lot of time as well, so you are building those along the way." (DE4)	Delivery
Progression Design Education	"DE is eh certainly in its early phases you are building an awful lot of kind of comprehension around, eh, what design means." (DE5)	Delivery
Progression Design Education	"I guess that the stuff at the first part of second year is very skills focused and then as you go on, it becomes, they are supposed to have those skills so it becomes less about the skills and more about polishing those skills and then its more about how they think about design how they develop their ideas, the depth of their ideas and finding out ideas." (DE3)	Delivery

### 7.3.4 Delivery formats

DE in this study was delivered in a variety of formats but it was found to be most frequently workshop and tutorial driven.

#### 7.3.4.1 Workshops

Workshops were described as being used to facilitate the more theoretical and practical elements of DE, to introduce students to new concepts, to enable peer to peer discussion or to focus students on some specific element of design. Nine DE educators described exposing students to examples of best practice to inform or enable their design work. Such best practice consisted of contemporary or seminal examples of design, industry specific examples and relevant frameworks that could be applied to the work at hand.

Observation of DE revealed that educators frequently draw on personal examples from their own experience, yet this was only mentioned by a small minority during the interviews. Also of interest, was that during the interviews many of the educators drew on their own experience to illustrate concepts, such as coming up with ideas in a commercial enterprise or empathising with students by recollecting their experience of DE when they were a student.

Lectures and workshops were used by all DE educators to introduce students to new concepts, techniques and skills, where some educators described demonstrating the skill and then working with students in perfecting that skill. DE educators engaged with students for 'blocks' of time ranging from three hours at a time to weeks, depending on the agreed timetabling protocol of each Institution. Interestingly, whilst DE educators work with dedicated techniques to encourage creative thinking, some educators were open to alternative approaches or ideas that might be suggested by students. In addition, some educators indicated that they customised aspects of DE to individual students in terms of students' interests, processes used or in accordance with students' drive and ability.

Node	Quote	Emergent Themes
Expose to Good Practice	"I'd go through some contemporary design books ... I really want them to be inspired by good contemporary product design" (DE1)	Delivery
Format	"We sometimes give them, you know, we give them workshops, we do sort of group crits, where you do sort of quick model making." (DE5)	Delivery
Demonstrate	"We might be delivering a workshop where eh the format of that I could be sketching with them" (DE1)	Delivery

#### 7.3.4.1 Tutorials

Half of DE educators interviewed emphasised the importance of tutorials in DE. These tutorials typically took place in the design studio or the classroom and tutorials tended to be quite frequent. Tutorials were described as being informal in nature and they were undertaken both one-to-one or at a group level. Educators considered that tutorials provided students with a valuable source of feedback and allowed educators to monitor student progress.

The tutorial format allowed educators to support students in navigating the process and to deal with areas of difficulty. Similarly, educators saw themselves as having a role in exploring ideas with students. This was supported by the observations of DE where educators actively encouraged students to think from multiple perspectives “think small, big, practical and impractical” and later “think mad, think sensible, think future, think now” (OB2DE). Students were also encouraged to use certain concepts to help with the development of their ideas and students were encouraged to get ideas out of their heads and into diagrams (OB2DE).

Node	Quote	Emergent Themes
Format	“But typically then students are coming to me with work, and eh I will look at it, we’ll discuss it on one to one basis” (DE5)	Delivery
Format	“OK well I suppose em, for me design education is typically studio based, that’s what we are used to.” (DE6)	Delivery

Four of the DE educators interviewed revealed that the challenge posed by increasing class size in DE is increasing the role being played by peer to peer learning and feedback. Increasing class numbers were perceived as being a challenge for DE educators, with regard to giving detailed feedback and getting around to all students. Challenges were expressed by one educator with a class size of 44, whilst an ideal of around 25 students was mentioned. This was considered a ‘concern’ in the development of DE, as it was perceived by educators as moving towards a more lecture-driven format.

Node	Quote	Emergent Themes
Class Size	“So when you’re faced eh with increased numbers you might as well use the resource that you have and in that sense peer to peer learning is becoming ever more central to what we would do and how we would help the students learn.” (EE1)	Delivery
Class size	“Technical things like group class size and all those things can, can kind of impede that eh so it can, it’s not always that easy to do.” (EE5)	Delivery
Class size	“Eh, we always used to have a cap on 25 students but at the minute I have 43, I’ll have 44 after Christmas. So something has to give and I’m all the time sort of conscious of the fact that I’ll be talking to one person and just, in my peripheral vision, I can see maybe, literally people queuing up to speak to me.” ( DE6)	Delivery

### 7.3.5 Collaboration

Collaboration featured strongly in DE in this research study. Seven of the DE educators described collaboration which, on further analysis, was seen to exist at two levels: inter-discipline and industry.

#### 7.3.5.1 Interdisciplinary collaboration

Interdisciplinary collaboration was described where students from different programmes or schools worked jointly together. Half of the DE educators described working with other departments on joint projects. For example, DE4 explained how the delivery of DE has changed over time, moving from the

traditional ‘apprentice/master’ model to a more interdisciplinary form of education, requiring different types of skills. The new model, he suggested, increasingly draws on knowledge from other disciplines to equip students to address the multi-faceted nature of design. Collaboration with experts in other fields was described as being important, to inform the development of working designs and to develop an understanding of the need and the vocabulary, to be able to draw on others for a design to materialise. Such collaboration was described as helping students to develop technical know-how and enabling students to develop versatility in applying their design skills in a variety of different contexts.

### **7.3.5.2 Industry collaboration**

Collaboration with industry was mentioned by seven of the participants, where companies presented design challenges to students as part of their ongoing project work. Analysis of the nature of this collaboration revealed that industry collaboration extended beyond this simple form of engagement, to industry representatives undertaking workshops on some of the more practical elements of design and providing feedback to students on their design work. Industry collaboration was considered important as it was seen to provide students with role models, simulate what students would need to do “in the real world and shows students what a career in design is really like” (DE3).

Node	Quote	Emergent Themes
Collaborate with others	“The way the programme works is that it’s by philosophy interdisciplinarity is a massive part of what we do.” (DE2)	Delivery
Collaborate with others	“You don’t necessarily have to be able to produce all of the stuff yourself, because the skill set has changed, there’s people who specialise in kind of core areas but you should be able to work together with them to, to kind of, to arrive at the finished solution.” (DE7)	Delivery
Collaborate with others	“On any given year we could have 20-25 different members from industry in speaking to the students. And they tend to speak to them across, across years.” (DE1)	Delivery

### **7.3.5.3 Peer to peer collaboration**

The collaborative nature of DE was also reflected in the emphasis on peer to peer engagement, which was mentioned by all interviewees. Such engagement was evident in both formal and informal ways. Formal peer to peer engagement was referred to in the context of group crits and group feedback sessions. Informal peer to peer engagement was described, and observed, where students voluntarily helped each other out and voluntarily offered suggestions to each other through casual interaction. This study revealed two dimensions to peer to peer engagement: giving and receiving feedback and shared learning by pooling research or collectively working things out. However, in some instances peer to peer feedback was considered problematic by educators from both a resource and quality perspective.



Node	Quote	Emergent Themes
Peer to Peer	“Peer to peer learning is becoming ever more central.” (DE1)	Delivery
Peer to Peer	“We do a Thursday session with the final years that is usually peer driven and its usually two hours and its more about me facilitating them talking about their projects but they are getting feedback from the other guys and they give each other really good feedback they see things with so much clarity in other peoples work.” (DE3)	Delivery

### 7.3.6 Assessment of DE

Formative and summative assessments are used in DE. Analysis of assessment showed that it focuses on the individual, the process and the output. Seven of the educators illustrated that the bulk of the assessment was undertaken throughout the semester, in a formative way. Most often, summative assessment was described as a student presentation, pitch / exhibition or a crit (see section 7.5.1.1).

At the end of defined stages in the design process six educators described formative assessment taking place. The focus of much formative assessment was on the students’ ability to negotiate the process, illustrate their thought processes throughout and to demonstrate their learning from their experience of the process. Two educators mentioned ‘explore’, ‘challenge’ and ‘reflect’ as specific learning outcomes of their programmes. Students were required to keep some form of record of their research and their thinking throughout the process. The ‘reflect’ learning outcome was in keeping with the greater sense of ‘self’ which a DE seeks to develop in students.

One educator explained that formative assessment allows students to recover from early mistakes that they have made, as they might have a slow start yet reach the desired learning outcomes over time. The final output, while considered important, was not found to contribute hugely to the final grade achieved. The final grade was described as being an amalgam of formative and summative assessment.

Node	Quote	Emergent Themes
Assessment	“Depending on the project that gets shifted around eh but they’re typically the things that we look at, research eh concept generation, concept development and then the presentation of the final project.” (DE5)	Delivery
Assessment	“Em, we would have deliverables at each stage, em at each of the gates and those would be eh assessed formatively and then they would have an exhibition of work at the end of the semester which would be the summative assessment point. “ (DE1)	Delivery
Assessment	“You can really do badly at the first bit, but you can really redeem yourself, I’ve seen students go from Ds to As in their learning outcomes because they have really pulled up their socks and you are like, have they really achieved those learning outcomes and yeah, well they didn’t do at the time that we said they should do it but they have actually done it.” (DE3)	Delivery
Summative Assessment	“The finished piece I think is only about 10% of the mark, a lot of the eh, marks are going for the research and the project realisation, so how you are working that process.” (DE7)	Delivery

### 7.3.7 Summary of how designerly ways of thinking are developed in DE

This research indicates that the development of designerly ways of thinking is facilitated by a number of specific features of DE. All educators described DE as being predominantly process based and this research suggests that it is repeated exposure to this process, coupled with the acquisition of skills that enables students to develop these ways of thinking.

The process nature of DE is delivered through practical experiential projects and repeated over time, as students progress through their education. The format of DE, combining workshops with frequent tutorials, enables students to learn and apply relevant design knowledge and skills, experiment, learn from their mistakes and refine their skills over time. DE is supportive of peer to peer engagement, reflecting the collaborative nature of design and facilitating shared learning. DE assesses ways of thinking through both formative and summative assessment in which students illustrate and justify the process of idea development.

Closer analysis of the interviews revealed interesting themes which, in the context of this research, require further explanation. These themes relate to the nature of explore, challenge and risk in DE each of which will now be presented in further detail.

## 7.4 Explore as a feature in design education

The explore stage in the process is of particular interest to this research, as DE educators suggest that it is by exploring that students discover insights which lead to design opportunities. This data suggests that insights are illusive constructs, difficult to precisely define, yet clearly identifiable by both educators and students when they occur. Educators used terms such as ‘nuggets of information’ or ‘a creative thought that catches you un-aware’ or ‘things that are naturally occurring’ to describe an insight. One educator explained that sometimes the insights can emerge from the small things that others simply do not recognise as being important.

This research suggests that creative design ideas were informed by insights gained during the explore stage of the process. Insights were described as being difficult to find, as educators explained it takes time to both gather the information that can lead to insights and time to learn how to recognise them. However, one educator suggested that insight can arise in different ways for different designers. She suggested that research can be the source of insight for designers who have a more structured approach, whilst it may be more intuitively based for emotionally-led designers.

### 7.4.1 Nature of explore in a DE context

This research suggests that explore, in the context of DE, exists at a number of levels and at different stages throughout a project which, one educator suggested, distinguishes it from other disciplines. Design was described as complex and therefore students are required to explore from the outset as they explore what is expected in the brief, explore user experiences, explore possible solutions to problems and explore and experiment with methods, materials and techniques to realise their designs. Similarly, students were expected to explore who they were as designers and where they wanted to go. The data suggested that repeatedly working through design processes, coupled with ongoing reflection over time allowed students to explore their preferences as designers, particularly towards the end of their undergraduate studies.

Node	Quote	Emergent Themes
Gather Insights	“An insight is something that, actually it requires, it requires em the discovery stage. Insights for, for, a, a student or for a designer aren’t necessarily something that you are going to get every time you go and try to discover something, you can’t just really just go and discover an insight. So that’s why we go through the stage of em exploration and divergence so that we can kind of just gather and hopefully grab an insight.” (DE9)	Design Processes
Gather Insights	“So for example the first one that I mentioned the more maybe structured approach, maybe insight comes more from research and knowledge but maybe with the second type of designer insight is maybe a more natural thing where its intuitively based, you know.” (DE10)	Design Processes
Gather Insights	Insight was explained from a quote they found and the students consider where they could take the project based on the insight gained. (OB2DE)	Process based

Educators described explore as starting ‘wide’, taking things from an ‘holistic’ perspective and looking at all possibilities from which insights and opportunities can be gained. This was emphasised as being particularly important for areas that are unfamiliar to students. The observation also revealed that educators knowingly intervene to prevent students arriving at a solution too quickly. Ideas for designs, particularly at final year, can also come from students own interests but educators cautioned on constraining options too soon, suggesting that it can limit the quality of proposed solutions.

Node	Quote	Emergent Themes
Concept Generation	“But the point I would always make is that there is a degree of bias in designing for a market you are very familiar with and em ... that can .. that can have a negative effect on the project as well.” (DE1)	Process Based
Explore Iteratively	“If you only pursue one area then you’re selection is going to be very limited and then your solution probably is going to be very limited.” (DE7)	Process Based
Explore Iteratively	The educator comments on areas that are lacking in the research and makes suggestions. “Need to explore more widely before you narrow your approach”. The educator suggests a shift in approach and encourages the student to broaden their focus. (OB3DE)	Process based

## 7.4.2 The role of research

All DE educators described research as a vehicle through which students explore. Educators considered that exploring enabled students to stand back a bit, to look at the bigger picture from the users’ perspective and to gain clarity on relevant design issues. One educator suggested that without research, a student is potentially working blind in relation to the problem at hand. A strong emphasis on user-centred design was expressed by six of the educators who explained that this requires students to draw information using ethnographic methods, relying less on the ego of the designer in designing but on their ability to empathise with users of their designs.

Educators clearly explained that it is the students who have the responsibility for coming up with insights, which requires them to engage with users and engage with the research they have gathered as they explore. Insights require reflection on the data gathered to give students a particular understanding of an area, upon which their creative ideas are based. Interestingly, the interviews showed that this narrowing down to an insight or opportunity is typically followed by further exploration as students explore possibilities in relation to that design opportunity or insight.

### 7.4.2.1 Types of research

The research required for exploring was described as being predominantly qualitative, a mix of primary and secondary research, with a particular emphasis on visual and user centred research. However, DE educators described a move towards more academic sources for secondary research in later years. Eight

educators described visual research as being important in a design context and this was described as looking at exemplars of good practice in the industry to become informed or inspired. Research skills such as interviewing, observation skills in addition to gathering relevant secondary research were described as being 'very important' at this stage.

The interview data revealed a different emphasis on research at different stages of a student's education. In the early stages of undergraduate education the educators described the research as being 'rapid' and leading to 'early insights' while in later years it is described as being more 'rigorous'.

Node	Quote	Emergent Themes
Research	"So basically with design education what we try and encourage our students to do is think, and there are ways to help that and aid that, and obviously one of the big things is research. Research is very important for us" (DE6)	Explore
Research	"What is the insight, what is the one thing that you think is really interesting about this and it will come out of observation, interviews and focus groups or maybe just a thought or recognising something or seeing something a little bit differently..." (DE8)	Explore
Gather insights	"But if you are in a position and you don't find out about the problem that you are trying to solve em it's like having a blindfold on you know and you're searching around for your solution you know just kind of with your hands moving around you know, em. " (DE10)	Process based
Explore Iteratively	"So in other words they start broad with the domain and the research narrows it down. And once they've got, discover that opportunity that's, that's viable and feasible in the sense that it is a real need ... it explodes open again." (DE4).	Process based

#### **7.4.2.2 Student challenges with explore**

The interviews revealed that explore, as an integral part of the design process itself, presents its own challenges to students. Explore was described as a 'new concept' for students at the start of their studies. The influence of secondary school education was seen to contribute to the challenges that students face, in being able to independently engage with the material and reflecting their own identity in their work.

Explore was described as being the part of the process that students either 'hate' or 'love'. Amongst the challenges described was information overload. Educators suggested that the first place students typically reach to for information is the internet, where they are faced with a huge volume of information. DE educators communicated that students can have difficulty filtering information or recognising boundaries around the use of publically available images. Additionally, not being able to link the research that they have found with the concept generation stage of the process and treating both in isolation was also considered challenging, resulting in students developing solutions that lack substance.

Node	Quote	Emergent Themes
Student Challenges	"I think that, believe it or not, one of the big challenges, even though I have spoken so much about research, there is so much stuff out there at the minute, and obviously with the internet there's not really much of a filtering system." (DE6)	Explore
Linking their research	"It's a really difficult process ... that bridge between finding an insight and designing is a really difficult one to jump over." (DE9)	Explore
Linking their research	"So, I suppose, that's an interesting one actually because I think sometimes early on the students maybe don't see the link you know." (DE10)	Explore
Linking their research	"Often students kind of ... well I've done the research around what this does, they park it and they just go and do their own thing." (DE7)	Explore
Explore Ideas	"The context that they are designing for, looking at things from other people's perspective and that can be tough if you are 19 years old you know but a lot of them, some of them are really good at it but some of them aren't good and hate this bit, and some of them love it". (DE3)	Explore

### 7.4.3 The role of curiosity

The research suggests that in this context the ability to explore and develop ideas requires students to be able to follow: their own curiosity, to find answers to questions, to be persistent, to listen to their intuition, to undertake research, to conceptually visualise the bigger picture and to have empathy to view things from the users' perspective. Curiosity was identified by four DE educators as a driver for exploration and it was suggested that having the confidence to follow their curiosity can equip students with the ability to be resourceful. This was considered as something that design students are particularly good at.

Node	Quote	Emergent Themes
Curiosity Led	"Just kind of curiosity and just finding things out that they need to find out, and just kind of thinking on their feet, being resourceful" (DE2)	Explore
Curiosity Led	"But I suppose the good think about design students is that you don't necessarily have to teach them how to shoot video. We do get people in for sessions but for a smaller project they will just go and do it". (DE3)	Explore

### 7.4.4 The educator role in explore

This research finds that DE educators have an important role to play at this stage of the process. All of the educators interviewed described their role as one of facilitation and this was supported by the observations undertaken, where the tutors directed, made suggestions, asked open questions and encouraged students to explain their thinking. Educators referred to 'bouncing ideas back and forth' and working with students to help them identify a focus in their work, enabling students to make shifts in their thinking.

In particular, DE educators described the importance of re-assuring students by equipping them with basic tools, drawing on insights possibly missed by students, signposting additional sources of information, re-directing students who have gone off on tangents and helping students to help themselves. Educators also motivated students through feedback by praising work already undertaken, indicating when they were on the verge of something, urging them to ‘keep going’ and indicating when students needed to improve their performance by voicing belief in the student’s capability. Seven educators indicated that they push students to take ownership of their own work early on, requiring students to self-manage. Interestingly, however educators described walking a fine line between supporting students enough and doing too much for them, in some instances getting ‘sucked in’ despite their best efforts.

Node	Quote	Emergent Themes
Tutor role	“We look maybe if we think they are going down a dead end we look back at what they have done so far and we’ll get them to re-think the idea completely and say, no, you need to go back to the start on this em and all of the students in design education typically get it, like they do get a lot of tutor time so eh and they get a lot of feedback” (DE5)	Explore Iteratively
Tutor role	“We try and give them the tools to explore and develop an idea but we kind of welcome different modes of work as well. (DE1)	Explore Iteratively
Tutor role	“Sometimes you end up being conscious that in some cases you’re doing too much some cases you feel that maybe you could do more.” (DE2)	Explore Iteratively
Tutor role	“But again, to try to reassure the students, I say to them often, even if you make a complete disaster of a project, you might still get rewarded, because I’m only interested in your learning, I’m not that interested in the final outcome.” (DE6)	Explore Iteratively
Tutor role	One educator encourages students to play around and to try something different. Challenges students to go further. Suggests the solution is at her fingertips. (OB3DE)	Explore Iteratively

#### 7.4.5 Assessment of explore

Three of the DE educators referred to explore as a desired learning outcome which was actively assessed. Assessment of explore considered the volume of sketches produced by a student or their iterations on a core concept. The best student projects were described as those which had a lot of sketches, drawings, mind-maps and evidence of concept generation in a variety of forms.

Educators described students keeping a record of the development of their work using blogs, logs, sketchbooks or diaries which were frequently consulted in discussions between students and tutors and as a form of formal assessment. These forms of assessment enabled educators to examine the depth and breadth of exploration and trace the development of ideas over time. DE educators mentioned the importance of a reflective piece, where students would consider learning from information gathered, experiments attempted, mistakes made and feedback.

This was particularly evident in one of the observations where the educators focused on: the thoroughness of students' investigation, the appropriateness of tools used, the degree to which students challenged their own thinking, their ability to link themes in their research, evidence of insight, students' ability to coherently explain how they arrived at their conclusions and the coherence of the work (OB1DE).

Node	Quote	Emergent Themes
Assessment	"They generally in later years do a blog of their progress so they record all their design process and we want that to be a sort of a eh .. critical piece rather than necessarily a documentation of practice em ... so we use that to assess a lot of their work." (DE1)	Explore
Assessment	"What we are looking for is that the idea em they can trace the origin of the idea and that they can coherently communicate that and that they .. that the idea has been put through several cycles of thinking and iteration, maybe bits have come off it that were there at the start, bits have added on to it, it has evolved basically and that basically seems to be a good idea." (DE3)	Delivery

#### 7.4.6 The learning environment

Nine DE educators described DE as being studio based but changes as a result of modularisation and resource constraints have in some instances moved DE away from this traditional format. Of note, was that students worked in these environments for blocked periods of time, ranging from a minimum of three hour blocks to more long term arrangements.

The observations and the interviews revealed that there is a lot going on in a design studio, with some educators explaining that they can be used as teaching spaces in some areas with something else going on in another part of the studio. As was observed and described by educators, the studio environment can be noisy, where some students thrive but others can find it challenging. Frequently, student groups from different stages in their undergraduate education occupied sections of the same studio space, which allowed students to freely move amongst each other and overhear discussions, workshops or other events taking place.

Features of the learning environment were found to enable students to explore. Eight DE educators described the environment as being a work environment, which was frequently described as a messy, open space. Four educators referred to it as being a relaxing, informal environment while three associated it with a sense of fun.

Freedom, in particular, was referred to in a number of ways, such as the freedom to move around to speak to others or get resources when needed, the freedom to work on any relevant aspect of their work and in later stages of their education, the freedom to decide what they are doing and how they will do it. Another noticeable feature of this environment is that it was described by six educators as being 'safe'



in terms of students being able to share and display what they had found in a way that would allow them to experiment and invite feedback.

Node	Quote	Emergent Themes
Physical Env DE	“A good studio I think is where there is vibrant discussion around design, vibrant discussion around work.” (DE1)	Learning Environment
Learning Environment	“I think they’re so used to brainstorming at that stage they’re talking ideas around, you know, throwing ideas around together and we feed back in to them and..... its, its kind of more conversational, I suppose.” (DE8)	Explore
Learning Environment	“Yeah, they use a lot of post-it notes to take notes. Yeah, they are a good mode for exploring and post-it notes are weirdly fashionable at the moment but they are kind of good for ... getting thoughts out there really quickly.” (DE1)	Explore
Working Env DE	“Open I suppose. It’s kind of their space. Em, there’s a, it’s quite social really em sometimes there’s quite an industrious hum. So last week and the week before it was like, oh yeah, you could feel the working vibe going on” (DE3)	Learning Environment
Learning Environment	“Safe places are very important em for, for, for learners to explore.” (DE9)	Explore

#### 7.4.7 Summary of explore

This research finds that explore is an important part of DE which leads to the identification of design opportunities. It allows students to look at the bigger picture in an attempt to understand it fully. Successful exploration was found to result in discovering an insight, which again leads to further exploration of possibilities in relation to that insight. Explore was described as being challenging for students and the educator, assessment and the learning environment are considered key influencers at this stage.

### 7.5 The role of challenge in design education

The second area of specific interest to this research is the role of challenge as a feature of educator feedback in DE. According to Collins Paperback English Dictionary 1999 the word challenge is defined as “to call into question” whereas critique is defined as “the act or art of criticising”. The researcher feels that the word challenge is a better representation of the interaction between students and educators, as observed and described by DE educators, than the word ‘critique’. It is this interaction that is the focus of this part of the findings chapter. In this context, ‘challenge’ is understood as the act of calling students thinking into question.

#### 7.5.1 The nature of challenge in DE

Challenge appeared to be undertaken on a number of levels, which was evident from the observations, such as: challenging the route to final conclusions, challenging students to figure things out, challenging the methods used or challenging the usefulness of the solution. Challenge was described as having an important role in DE itself, in helping students identify how their work can be

improved or pushing students to justify their design decisions and enabling students to question rather than accept things as they were. DE educators described using challenge to inject a sense of clarity into the process. Challenging students allowed them to: understand students thinking, pull students back from following a path they may have become overly attached to or to draw on links or ideas that require further development. This research revealed that challenge manifests itself in a number of ways, in the form of a formal critique or more subtly as a form of face to face feedback as in tutorials.

#### **7.5.1.1 Critique**

DE educators described exposing students to formal critiques (crits) of their work from the start of their undergraduate studies, although early crits were described as more 'show and tell' events. Crits were described by six DE participants as being informal in nature while five emphasised the positive nature of the feedback provided in crits over an emphasis on the negative.

In some instances, the crit was formally graded but other educators suggested that the crit had become more of a vehicle for feedback. DE educators commented that it does not always play a role in summative assessment, particularly in the early years of a students' education. DE educators described a greater emphasis being placed on the critical nature of the feedback as students progress through their studies. However, moves towards modularisation, changes in course design and class size were seen to constrain the feasibility of undertaking regular formalised crits in some instances. Eight educators described group crits as the norm, although they can take place on an individual basis depending on the project.

In the context of this study crits appeared to perform many functions. DE educators explained that they enabled strengths and weaknesses to be identified in students' work, with the objective of making the work better, they allowed others to give advice and they develop resilience in students to be able to handle critical challenges of their work, which was considered by one educator to be an 'essential part of being a designer' (DE4). Indeed, one educator suggested that students are generally not used to being told that they are not brilliant and they can find such feedback difficult to handle at the start. Some students were described as being 'bristly' in the early stages of doing crits, but one educator explained that being open to feedback and learning how to deal with and respond to it are important skills. Indeed, educators suggested that repeated exposure to crits builds confidence in students in both delivering and dealing with critique in a professional way. Educators mentioned that initially students are not comfortable critiquing each-others' work, so they saw their role as initially facilitating the critique to develop students' skills in this area. In some instances this was described in the form of using frameworks such as "two stars and a wish" (DE8).

Node	Quote	Emergent Themes
Design Critiques	"To communicate what it is that you are doing and why it is that you are doing it, it's kind of key em so students would often be encouraged to do this at key points through the project." (DE7)	Challenge
Design Critiques	"Here you do have to justify your design decision your rationale and your response to the brief would be embedded in pretty much every project." (DE1)	Challenge
Design Critiques	"That's an essential, that's how you learn to get beaten up, eh, on a regular basis, without showing the bruises! (DE4)	Challenge
Design Critiques	"You find that a lot of them might be a bit bristly and then they go off and they'll actually reflect on it and go yeah you were right or actually I don't think you were right." (DE3)	Challenge
Design Critiques	"So I suppose pulling them back to what they initially set out to do, but then, if they came back week after week and they were still pushing the same idea I would still say, ok well that's one way of doing it, park it and let's look at other ways." (DE7)	Challenge
Design Critiques	"When they present we always say well ok, tell me what the project is about, tell me and the class what the project is about, em tell me where the strengths are and tell me where its weaknesses are and tell me what you would do better next time." (DE2)	Challenge

### **7.5.1.2 Feedback**

This research suggests that feedback allows educators to perform an important role in challenging students thinking and this was clearly supported in the observations that were undertaken. This feedback was provided both formally and informally and all of the DE educators described feedback as an important part of their role. A more informal form of feedback tended to come from ongoing student / tutor tutorials and informal peer to peer feedback, during which the form of critique was observed to be quite subtle. Educators described delivering informal feedback in the studio or classroom setting, during casual conversation or tutorials. Informal feedback was described as being frequent, thereby enabling educators to monitor student progress.

Feedback was varied, but the data revealed it regularly included some form of challenge, commenting on: work processes, the approach towards research, strengths and weaknesses in the work, the use of research tools, the steps taken or missing, idea development and project management. Feedback was found to be provided by the educators, their peers or external third parties such as guest speakers, industry links or end users.

During the crits and tutorials observed, design students were required to defend their design decisions, which were drawn out by educators through the process of challenge. Students were required to justify their rationale in the context of: the brief, the insights gained, the development of their design ideas, their choice of production materials right through to their final presentation of the design. This focus on the individual was particularly evident in the observations, where the

educators focused on the degree to which: students challenged their own thinking, the relevance of their focus, their reaction to what they were finding, their ability to link themes in their research and the students' ability to coherently explain how they arrived at their conclusions. Such challenge was observed as being delivered as a form of facilitation, where educators gently questioned and probed students rather than 'tell' them solutions. Educators also expressed an openness to being challenged themselves, where students could demonstrate the relevance of their thinking in the context of the project at hand.

Node	Quote	Emergent Themes
Justify Decisions	"I am prepared to be corrected in terms of if students can identify, go back to the brief, identify it, provide a clear rationale I'm willing to be swayed and to be brought in that direction but I need to be able to see the connection." (DE7)	Challenge
Educator Role	"That if there is a brief around, create a piece of technology we will ask them well, does it need to be a piece of technology? Why are they saying technology, so I suppose asking them questions like that em builds up their ability to challenge." (DE3)	Challenge
Design Critiques	The educators challenge the students to think about how they can sell the benefit of the research to others. (OB1DE)	Challenge
Design Critiques	The educator questions the students reasoning and asks what is the 'because' which is based on their insight from their learning. (OB2DE)	Challenge
Educator Role	Educator questions the message conveyed by the imagery chosen. Asks students to comment on two images. The educator stays noticeably quiet allowing the student time to think. The educator asks how it would work, what is going on in the picture? (OB3DE)	Challenge

### 7.5.2 Collaborative relationships

The collaborative relationship between the educator and the student was evident in some situations where DE educator challenge was observed. In most instances students did not appear defensive but rather they seemed to welcome what came out of these feedback sessions. This was evident in the eagerness with which students would take down notes, comments or suggestions. The atmosphere in these sessions was noted, on reflection, as being 'informal yet serious'. In the interviews, educators emphasised the need to develop trust between themselves and the students, and that this takes time.

Node	Quote	Emergent Themes
Supportive	Educator gave feedback which was positive, reassuring and helpful. Students commented on lecturer feedback and what they could do with it. (OB1DE)	Challenge
Rel DE	"I think the longer you are working with a group the more they get to know you and the more they trust you." (DE2)	Challenge
Rel DE	"You get to know them over the years you'd know, like you'd know everybody really and you'd know a bit about them, so I suppose you have to be a bit more nurturing than kind of like 'that looks terrible!'"(DE3)	Challenge

### 7.5.3 Reflection

The data revealed challenge as having an important role in developing students' ability to reflect. One educator suggested that this was the tutors' main role in performing tutorials and that if students don't reflect on what is being said, then conducting tutorials is pointless. Educators explained that the focus was not on what is right or wrong, but rather on students' ability to reflect on what was done. Mistakes were described as being an important part of DE and reflecting on these mistakes was described by one educator as being vital. This view was supported by another educator, who suggested that the skill lies in recognising the value of what was said, considering how this might impact what they do next and then being resilient enough to do it.

Node	Quote	Emergent Themes
Design Critiques	"So it's not necessarily about whether they have the right answer for right now it's about reflecting on what they have done." (DE9)	Challenge
Design Critiques	"It's really important em and I think another skill is being open to feedback and learning how to filter it and deal with it cos, you know, recognising that that person's given me that feedback about that idea but that's where they are coming from so I need to actually talk to somebody else or you know and then be able to be big enough to say ok I take on board what you said." (DE3)	Challenge
Design Critiques	"Em but that reflection in the process and that they can articulate, that reflection of their personal experience, through a crit that as an educator you're not, you are giving them <b>critical feedback</b> , you are not criticising them but you allow them to reflect." (DE9)	Challenge
Design Critiques	"In terms of reflection I think it's a huge part and I think it's, it's, it's something that they have to do after, if they are not reflecting on what you said there is no point in having the tutorial you know and there is no point in us tutoring them as well either (chuckling) you know." (DE10)	Challenge

### 7.5.4 Skill development

This research suggests that the process of challenge as delivered through feedback contributes to the development of both communication and negotiation skills in students. The research reveals that students are required to challenge the brief, to communicate the value of their work, to expect to be challenged themselves and ultimately to effectively respond to such challenge. Challenge, in this context was described as pushing students towards clarity, develops flexibility and it drives students to seek out design opportunities that meet both the users' and the designers' requirements.

DE educators described the importance of designers being capable of negotiating and communicating effectively with others, in the context of "being able to talk about how to design and why the design" (DE3) or liaising effectively with others to ensure the design is successfully produced. Negotiations in particular were mentioned by five DE participants in the context of agreeing deliverables with

clients. DE educators explained that designing in complex environments requires students to be capable of negotiating with other parties involved in producing designs.

Node	Quote	Emergent Themes
Educator Role	"You want them to challenge as well, and like when a student come to me and says 'I don't think I should do it this way .. I should do it', I'll say ok like why 'n they'll say 'this is why' and we're like, 'ok, yeah'." (DE3)	Challenge
Communication	"I think it's a really important part of it, eh not only that its peer review but its peer presentation, and that you have to be able to present your concept clearly, and talk about it to a group of people and accept what they say, or defend what you, what eh what's important to you. But most importantly hear what they say, and we often find that the initial response is to be defensive, em, and while it's good to defend your idea, you also have to take on board what people are saying." (DE6)	Challenge
Communication	"They assume that because they know it the person they are showing it to will know it and kind of super clarity is what we talk about a lot of the time, you have to make it ridiculously, you spoon feed the clarity to them because if you don't, crap." (DE2)	Challenge

### 7.5.5 Assessment processes

This research shows that assessment processes reflect the importance of challenge in DE. The interviews revealed that challenge was described as a specific learning outcome by three DE educators and it was described as feature of formal assessment in most instances. The data suggested that challenge is examined by considering the degree to which students have challenged themselves and their thinking, the critical nature of the work they produce and the way in which the student communicates and justifies their work.

Node	Quote	Emergent Themes
Assessment	"Basically in terms of the knowledge acquisition around the subject but also how the knowledge is, relates to the project and that they've identified the relevance of the material." (DE7)	Challenge
Assessment	"What we are looking for is that the idea em they can trace the origin of the idea and that they can coherently communicate that." (DE3)	Challenge
Assessment	"So the crit is not necessarily an assessment em it's used to give feedback on the project really more than anything " (DE6)	Challenge

### **7.5.6 Summary of challenge in DE**

This research finds that challenge is an integral part of the way in which DE is delivered. It pushes students to justify their thinking and communicate effectively, in line with industry practice. The data suggests that challenge builds resilience, flexibility, reflexivity and openness to others' ideas in design students. In this environment educators see themselves as facilitators who enable students to develop, challenge and express their thinking in design form. The role of feedback is considered central to enabling students to reflect on and refine their design skills. Challenge is supported in the assessment process where students are required to communicate and justify the rationale underpinning their thinking.

## **7.6 Exposing students to risk in design education**

Risk was found to arise in a variety of different ways, many of which appear to be inherent in the creative nature of DE. This section examines the nature of risk in this context.

### **7.6.1 Creativity as a risk**

The data suggested that engaging in creativity itself can be considered risky, as creativity was shown to exist in many forms, one of which was described as risky creativity. This type of creativity was described as pushing the boundaries into new knowledge and being risky in terms of the degree to which it would be accepted within a culture or society. One educator explained that by engaging in this type of creativity students can feel exposed to public criticism, particularly at the outset of their DE. In addition, the pragmatic nature of creativity in design can also present risks to students where they have to walk that fine line between self-expression and practicality.

### **7.6.2 Design process risk**

The research indicates that design processes by their nature can expose students to risk. For example, 'explore' was described by DE educators as being inherently risky, as it requires students to get out and engage with users at an early stage and some can be hesitant to take this step. Educators explained that the explore stage requires students to find their own path, which can naturally result in students following leads or generating multiple options, many of which may not have potential. This, DE educators suggested, results in students following dead ends which, although considered risky, is recognised as being a normal part of the process. This was clearly evidenced in OB3DE when a student sighed with relief following a review session with educators where he declared "what a relief, I was sure you'd tell me I had gone off on a tangent". The design process was described as being 'ambiguous' and this can result in students staying too loose in the brief and not finding a focus at all.

Node	Quote	Emergent Themes
Risky creativity	"Em so sometimes you can have students proposing eh new concepts or new knowledge that are kind of maybe culturally risky, society risky and that's hard to do when you are in first or second year" (DE1)	Forms of creativity
Explore Iteratively	"If you like em you know, particularly like some students, they get really frustrated when they go down and they go down this road and they have pursued it and then they come to a dead end and I would say, well actually that's probably more beneficial to you because the things you've learnt getting to that dead end will be useful to you coming back."(DE7)	Risk
Explore Iteratively	"And so, that might be enough to focus them in because the danger is that they kind of stay a bit loose in a brief and they don't move in quickly to a particular area." (DE1)	Risk
Risk	"Em, the design process I'm bringing back the word ambiguity, the design process is rife, its full of ambiguity as well, em ,eh and using design to design your way out of ambiguity." (DE9)	Risk

### 7.6.3 Communication risks

Openly sharing or expressing their ideas can be risky for students, as DE educators described students being initially too afraid to share their ideas with others. This fear was described as being a fear of failure which can result in dampening down their creativity or at worst stifling creativity altogether. Fear was evidenced by educators in students procrastinating or being 'frozen', 'curating' their sketch books, or not being brave enough to incorporate certain ideas that they have generated into the work that they share publically with others.

Interestingly, one educator suggested that insight is in fact 'the risk' in design and that educators have a role in helping students draw out insights from their work. Educators explained that students' may lack the experience or have insufficient knowledge of the domain to recognise such insights themselves, or they might lack confidence to share or explore such insights. Insights may be considered risky by students, as educators explained there is no right or wrong answer and students must be able to defend any insight they propose.

### 7.6.4 Attachment risks

Once insights have been identified educators suggested that there is also a risk that students may become too attached to their ideas. DE educators suggested that student attachment causes students to resist sharing their ideas with others, letting go of their ideas or from exploring other alternatives which may lead to better solutions. Letting go of ideas was described as being particularly difficult for students to do and one educator suggested that it is only with experience that people learn to do this. Educators explained that it is through feedback, the power of suggestion or simply not engaging with the student on their pet idea that directs students to begin to explore other avenues. However, it was explained that some students don't take advice and then the risk is greater, as they ultimately learn



through failure. However, failing in this context was recognised by educators as being a valuable source of learning.

Node	Quote	Emergent Themes
Insight	“Insight is, is the risk, is the creative, it’s like ‘oh that’s really interesting’, you know?” (DE8)	Risk
Risk	“It is difficult for them to give up on an idea. As I say, some people can just become fixated and it’s really, really difficult. So in that situation, if they are not kind of responsive to your advice, just let them fail. You know, because ... they can hopefully they see themselves whether it’s good or whether it’s bad and they’ll realise you know, that maybe they should have abandoned the idea.” (DE6)	Risk
Student Challenges Creativity	“So proposing their idea and having a willingness to share that with the class is a real challenge.” (DE1)	Risk

### 7.6.5 The risk of challenge

The process of challenge also poses risks to students by revealing shortcomings in their existing thinking or work to date. Educators explained that in the early stages of their education students need confidence in their knowledge, in addition to knowledge of the process, in order to challenge others’ work. As a result, students can resist openly critiquing the work of their peers, requiring educators to lead by example. Observation revealed that students looked ‘apprehensive’ in laying out their work and in presenting their work to date. Often, the outcome of such reviews resulted in the vast majority of students being asked to ‘explore’ further or ‘re-think’ or to ‘come at it a different way’. Educators described students as being emotionally involved in the work that they present and challenges to this work can sometimes be difficult for them to accept.

### 7.6.6 Self-directed nature of DE

There are risks posed by the self-directed nature of DE. All DE educators described students having to take responsibility for their own work, developing their own ideas, acquiring knowledge and skills that they deemed necessary for their projects. However, by being self-directed this work runs the risk of students going off on tangents and having to re-think ideas completely. This risk could be considered to intensify towards the latter stages of undergraduate education, where the self-directed nature of the work increasingly becomes important. At this stage less direct supervision, managing multi-faceted projects and the need to personalise design processes was described as a ‘confusing’ time and where students frequently ‘wobble’. Educators also described expressing their individuality and personalisation of design as difficult for students, and in some instances students can become over reliant on the tutor for guidance. This suggests that the move towards greater independence is considered a risky endeavour for students. Coupled with this is the fact that at this stage of their education the output from the process itself also assumes greater significance, thereby compounding the seriousness of failure at this point.

Node	Quote	Emergent Themes
Self-directed	"Obviously you will help them if they get stuck but it is better if they go and kind of .. talk to other people, or find out how to do it or google it or whatever..." (DE3)	Risk
Self-directed	"Eh well they have to do I guess a lot of eh the work on their own, they have to select a path and move it forward and then they come back and they get some feedback from us and we look maybe if we think they are going down a dead end we look back at what they have done so far and we'll get them to re-think the idea completely and say, no, you need to go back to the start on this em and all of the students in design education typically get it " (DE5)	Risk
Emotion	"They do get really really involved, there will be tears at different presentations and things like that." (DE3)	Risk
Developing Their Identity	"Around this time there's a lot of confusion, I've reasonably regular meetings with students coming into my office going "I don't know what I want to do" and it's quite a big thing because this project is generally their number one portfolio piece." (DE1)	Risk

## 7.6.7 Enabling risk taking

### 7.6.7.1 The learning environment

Creating a safe learning environment and the nature of the relationship between the tutor and the student was mentioned by six DE educators as being important influencers of student risk taking. A supportive, nurturing and non-threatening environment that encourages risk taking, accepts failure as a natural part of the process and that limits the negative consequences associated with making mistakes were mentioned in this regard. An environment that encourages action and gets people moving from the start was considered important, as early action was described as reducing initial fear and anxiety. One educator explained that over time students gradually lose their inhibitions, as they get used to the environment and the processes at play. This was illustrated by another in a story about playing music in front of peers, where music choice in the classroom potentially opened students up to criticism. Over time, simply listening to the choices of others and actually getting up and changing the music signalled growing confidence and the students' willingness to take a small risk.

### 7.6.7.2 Educator / student relationship

The relationship between students and educators, which emerged from the data, was one that was collaborative, open, supportive and built on trust over time. Emotional intelligence was considered a valuable skill for educators, to enable them to respond effectively to students emotional needs and to know when to be supportive or encouraging and when to push students further. In some instances this encouragement was described as a form of 'nurturing'. The nature of the process can leave students feeling 'disillusioned' or 'disheartened' and educators emphasised the need to encourage students to just 'stick with it' and to persevere. Trust was again mentioned in relation to risk taking in the context of students having trust in themselves, trust in the process and trust in the relationship

between student and educator. This trust was recognised during the observations, where educators were helpful and clearly non-judgemental in their feedback to students, even when students acknowledged that they had made mistakes or had not done enough (OB2DE).

The collaborative nature of DE was reflected in the shared sense of risk expressed by seven DE educators. Risk was found to exist for educators in relation to the nature of the problems that they give to students. Educators explained that they don't have all the answers to problems given, so risk also exists for the educators in the form of releasing control. This requires the educator to trust the student and to trust the process. The educator acts as facilitator in this situation and the fact that the educator doesn't always know the answer was also described as having a motivating impact on students.

Node	Quote	Emergent Themes
Learning Environment	"I mean if people are terrified that they are going to get hammered for doing something wrong then they are not going to take a risk so you've got to encourage risk at the beginning." (DE2)	Risk
Learning Environment	"Yeah you do I suppose. You have to kind of reassure them a lot that em to trust what they are doing and to trust the process and to say you know all is not lost if they have gone down a rabbit hole." (DE3)	Risk
Risk	"To be honest when you go in first you, you're afraid to play your music taste ... oh it's not going to be cool, or it's this, or whatever, and then you start to like and start to talk about .. but they get up now and they play some music and I think that's good, I think it's good, it develops confidence in them to say, oh, I like this or whatever" (DE8)	Risk
Risk	"What I try to do is push design now or try to push complex problems onto students in ways that if I find it challenging or I don't have the answer to, em, that really allows the student to kind of say, well, [name] doesn't know the answer so I'm going to have to find it for him. He finds it challenging ergo the challenges that I have eh are real." (DE9).	Risk

### 7.6.8 Summary of risk taking in DE

This research finds that exposure to risk is inherent in DE, both in the processes that students engage in and in aspects of its delivery. These risks change as students' progress through their undergraduate education, suggesting that it is a 'managed' approach to risk. This is facilitated by the existence of a safe learning environment, where educators and students trust each other and the design processes. The role of the tutor in reassuring and nurturing student confidence is considered central to enabling student risk taking in this context.

The findings thus far have focused on the application of DE in the design domain. As this research is looking at DE in the context of ORedu, the final section of this chapter examines DE educator's views on the broader application of design methodologies across other disciplines.

## 7.7 Educator perceptions on the broader application of design

Seven DE educators in this study recognised opportunities for the broader application of design in other disciplines. In particular, they identified the way in which designers think in order to solve problems as something that could be applied to other areas. A designer's ability to 'understand a problem and crystallise their thinking' in solving that problem was considered particularly transferrable. One educator described this process as 'opportunity mining' and that when designerly ways of thinking are developed then this can be easy to do. However, he cautioned that learning those ways of thinking takes time and that the process of learning how to think like a designer can be challenging. Agile thinking, resulting in quick reactions, throwing ideas away and making changes early was also considered valuable to other disciplines.

Node	Quote	Emergent Themes
Transferrable Aspects of DE	"I certainly think eh, being able to react quickly and to make changes at an early stage. Now that, that is part of other industry practice and there is a recognition that you know if you make a change early it will cost you a lot less than making a change late but I suppose as a design student we would really encourage that process of, em being able to throw away ideas, being able to test ideas very quickly." (DE1)	Broader Application of Design
Transferrable Aspects of DE	"That is you know, about, the quality of the thinking and how that can be applied in any situation. So, I think it's that ability to eh, to find and identify gaps and opportunities. So you know, when you talk about opportunities, that in a strange kind of sense, that is so easy to do, if you've spent time building the various things to get to that point where it is easy to do." (DE4)	Broader Application of Design
Transferrable Aspects of DE	"So I think, like a designers ability to understand a problem and crystallise their thinking in solving that problem, I think that is transferrable for em, for other industries." (DE6)	Broader Application of Design
Transferrable Aspects of DE	"Design can be used in various parts of eh of trying to understand what a given problem is and again eh the stages of I think eh insight, going out, understanding what people do and say, understanding the ambiguity between it, so understanding like em behaviours or cultures." (DE9)	Broader Application of Design

### 7.7.1 Value and context of design

However, three DE educators also expressed the need for other disciplines to understand the value and context of design as it might relate to their discipline and indeed why design is of value to everyone. One DE educator explained that organisations are now beginning to realise that design "is not a luxury optional extra, it is essential for growing" (DE2). However, the feeling was that design is not well understood in other disciplines, with words like 'fluffy' being used to describe it. For example, one educator emphasised the need for people to understand that design is not confined to one process, but rather that these processes enable designers and they should be played around with and customised.

Node	Quote	Emergent Themes
Value of Design	"I do think that learning to be an advocate for the value, the genuine value as to why design is good for everyone is a massively underplayed part of the design industry." (DE2)	Broader Application of Design
Transferrable Aspects of DE	"You are not to take it as gospel that you are supposed to play with it." (DE3)	Broader Application of Design
Value of Design	"I think education, in terms of business education, you know it's really basic, but people in business eh, sort of had a better understanding of the value of what design can add, em that would be I think be beneficial, because some of them don't, they think it's very fluffy, they can't grasp it." (DE5)	Broader Application of Design

### 7.7.2 Design thinking

DE educators can understand why 'design thinking' has become popular and they shared balanced perspectives in this regard. Six DE educators indicated positive support for aspects of design thinking. Support for DE was described in terms of it: providing a common language for designers to engage with others on design, its current high profile contributing to the establishment of design as a specific discipline, enabling designers to sell what they do to other disciplines and elevating design to more strategic levels in organisations. In addition, design thinking was considered valuable in terms of enabling the democratisation of design.

Node	Quote	Emergent Themes
Support for Design Thinking	"I guess design thinking has without going on a rant has become something that's accessible by eh broader industry so em, and it's also something that you can sell." (DE1)	Broader Application of Design
Support for Design Thinking	"It used to be that design used to be the back end, or is it end of .. but now its throughout and you see designers on boards of directors and things like that, where when I was in college that wouldn't have happened ... it's a strategic move by a lot of those design companies." (DE3)	Broader Application of Design
Support for Design Thinking	"One of them is that eh, finally design thinking is becoming more eh, recognised as eh, you know a field of endeavour." (DE4)	Broader Application of Design
Support for Design Thinking	"Em, design thinking, em, I value it and eh, it's, it's close to my heart because it's going back to what we have mentioned already about em about design mixing with other disciplines and the democratisation of eh democratisation of design and eh that's where interesting intersects happen." (DE9)	Broader Application of Design

However such support was also tempered with criticism. Criticisms of design thinking were expressed by six DE participants, who explained that people don't necessarily understand what design is, relating back to the value argument.

Educators were critical of the prevailing assumption that it can be learned in a one day workshop combined with the fact that it is perceived as frequently being delivered by poorly trained individuals. Design thinking was considered transient, oversimplified and commodified. Educators criticised the fact that it frequently ignores key features of design such as: the collaborative nature of design, the time required to do design well and the amount of work that needs to happen to finalise designs.

Node	Quote	Emergent Themes
Criticisms of Design Thinking	"Design thinking has started making its way into business and I think a lot of designers don't understand what that means and a lot of business people don't understand it but they realise they must have it." (DE2)	Broader Application of Design
Criticisms of Design Thinking	"You know, you can have the set of slides, it doesn't mean that you understand, what are the processes" (DE4)	Broader Application of Design
Criticisms of Design Thinking	"It's not necessarily something you can just eh, learn in a one day work shop." (DE5)	Broader Application of Design
Criticisms of Design Thinking	"The idea of design thinking being very much THE term of THE moment. And even in education the idea of design style education of problem based learning coming into other parts of education, that it's all very of the moment, you know." (DE10)	Broader Application of Design

## **7.8 Summary of findings from analysis of DE**

This research finds that DE delivery and assessment at HE in Ireland enables students to develop designerly ways of thinking. In addition, the role of explore, challenge and risk emerged as important features of DE. The data suggests that explore leads to the identification of design insights, which in themselves require further exploration and from which creative ideas can be generated. Explore enables students to respond to their curiosity, to be resourceful, to actively engage with others and to reflect upon what they have found. Challenge emerged from the data as an ongoing process and not just one which is reserved for assessment. It is considered a natural part of DE delivery which seeks to develop students who are articulate, resilient, flexible, skilful and reflexive. Challenge emerged as instrumental in focusing student thinking at all stages of DE.

This research reveals that engaging in design processes themselves and features of the delivery of DE expose both students and educators to risk. The creative, exploratory and challenging nature of design are all considered inherently risky and require students to engage in risk-taking in various contexts. The learning environment, the role of the educator and assessment are seen as significant influencers in enabling students to acquire these skills. Finally, DE educators see opportunities for the broader application of DE across other disciplines but such application, they suggest, needs to be tempered with an understanding of the value of design and an appreciation that developing designerly ways of thinking as a skill, takes time. This view contrasts with DE educator perceptions of the popularisation of 'design thinking' as a methodology that can be easily learned and applied.





# Chapter 8 Discussion

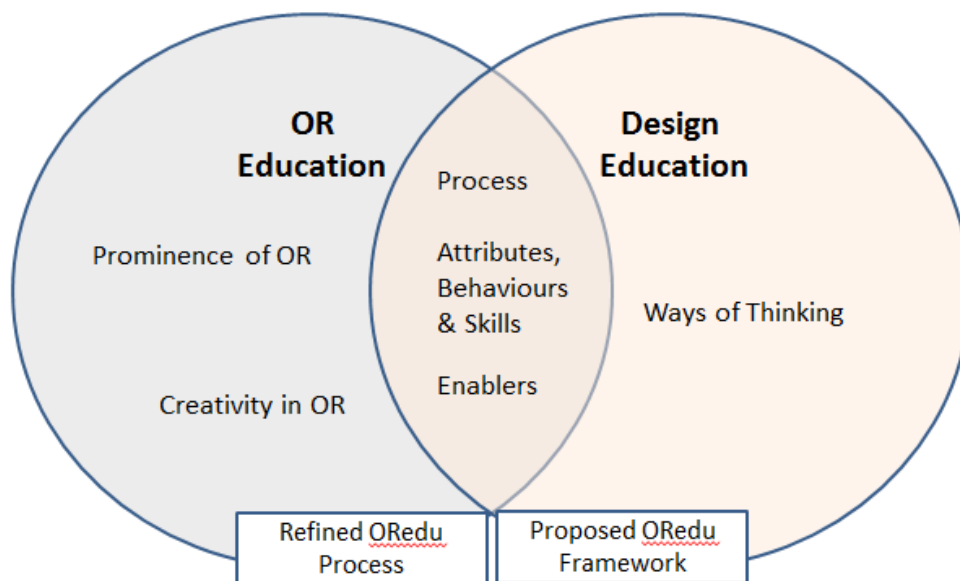
## 8.1 Introduction

This chapter discusses and synthesises the research findings presented in the previous two chapters and addresses the final research objective of this study:

- How suitable are design education approaches to opportunity recognition education at HE in Ireland?

The chapter opens with a discussion of current ORedu as revealed in the context of this research. In particular, the discussion focuses on the prominence of ORedu as a subset of EE education and the role of creativity in ORedu, as revealed in this research. This is followed by a discussion of how ‘designerly ways of thinking’ are developed through DE in HE in Ireland. Areas of overlap between ORedu and DE, revealed in their processes, attributes, behaviours, skills and enablers are discussed in an integrated way, as illustrated in Figure 8.1 below. The chapter concludes by drawing on key findings to propose refinements to the ORedu process leading to the development of a framework for ORedu.

**Figure 8.1: Outline structure of discussion chapter**



## 8.2 Summary of main findings

The main findings from chapters 6 and 7 are summarised in Table 8.1 below. The table outlines the key themes and the corresponding section of the discussion chapter that deals with these themes. Themes 1, 2 and 3 are dealt with first, allowing for a discussion of current OR education in practice and a consideration of the nature of DE, as revealed by this research. Themes 4 and 5 are process and skills oriented and lead to a more comprehensive discussion which was facilitated by dealing with these themes in a more integrated way. The findings from ORedu and DE are deliberately synthesised at this point.

**Table 8.1: Summary of key findings**

Theme	Key findings	Section
<b>1. The prominence of OR in EE education</b>	• OR does not appear to be a prominent feature of EE education at the HE level in Ireland.	8.3
	• There seems to be an emphasis on opportunity validation over OR.	8.3.1
	• Competency in OR appears difficult for educators to recognise.	8.3.2
	• OR tends not to be assessed.	8.3.3
	• OR skills development does not appear to be progressively developed over time.	8.3.4
<b>2. Factors influencing creative approaches to ORedu</b>	• Educators recognise creativity as having a role in OR.	8.4
	• Educators' perspectives on OR appears to influence how they approach ORedu.	8.4.1
	• Students' experience of OR is frequently described as difficult.	8.4.2
	• Educators identify that they have a role in developing students' skills.	8.8.1.1
<b>3. How designerly ways of thinking are developed in design education</b>	• DE skill development was described as being progressively developed over time.	8.5.2
	• DE was shown to be practice based.	8.5.3
	• DE was found to be process based.	8.5.4
	• Explore emerged as a distinctive feature of the DE process.	8.6.5
	• Challenge and risk emerged as distinctive features of DE.	8.8
	• The development of designerly ways of thinking appeared to be facilitated by its delivery, learning environment and assessment practices.	8.8
<b>4. The current ORedu process</b>	• A five stage iterative process was identified.	8.6
	• Similar stages exist in ORedu and DE processes.	8.6.3
	• Different starting points exist in the process suggesting that key steps in the process can be bypassed.	8.6.4
<b>5. OR Attributes, Behaviours and Skills</b>	• Attributes, behaviours and skills that EE educators associate with OR were identified.	8.7

### **8.3 The prominence of OR in EE education.**

EE educators unanimously considered OR an important feature of EE education (section 6.2). However, while OR was assumed to be important, this sense of importance was not reflected in practice. This finding contrasts with Fletcher (2006) and Hills and Lumpkin (1997) who suggest that OR should play an important part in EE education.

The findings from this current study suggest that the perceived value of OR was found to extend beyond its centrality in the entrepreneurship process itself. ORedu was perceived by EE educators to benefit students at a personal level, equipping them with the skills and confidence to enable them to identify opportunities for their future careers, either as self-employed or as employees in others' businesses. Such views echo the findings of Penaluna *et al.* (2012) who found that educators placed an equal focus on new venture start-up and personal development and Sorensen and Davidsen (2016) who claim that EE education also needs to develop students' ability to recognise and create opportunities in their own personal lives and their surroundings.

#### **8.3.1 Lack of visibility**

There is a lack of visibility of OR in EE education, according to these research findings, where ORedu was considered an implicit part of what is done (section 6.2.1). The EE educators explained that they did not feel the need to explicitly focus on OR, nor did they have enough time to dedicate to OR in the curriculum. This echoes other research which has found that in practice OR appears to be an area that is frequently overlooked (Krueger, 2009; Nixdorff and Solomon, 2007; Kellet, 2006; Hills and Lumpkin, 1997).

Opportunity validation, such as checking the customer value offering and verifying the feasibility of opportunities, was considered more important (by six out of ten EE educators in this study) than the initial recognition of the opportunity (section 6.2.2). This research therefore confirms Saks and Gaglio's (2002) assertion that opportunity evaluation may be considered more important, in educational terms, than other parts of the OR process. This position was reflected by one EE educator who saw the point at which the opportunity was identified as being the start of the process. Of note however, was that just three EE educators in this current study mentioned learning outcomes related to opportunity validation. These findings support Krueger (2009) in demonstrating that there is still insufficient momentum to make teaching OR a priority and it provides weight behind Neck and Greene's (2011) contention that little is done to train students in discovering opportunities.

#### **8.3.2 OR Competency**

This research found that nine out of ten EE educators had difficulty objectively determining student competency in OR (section 6.2). The findings revealed that EE educators considered competency in tacit ways: through student interaction, by observing student behaviour and through student assignments. Indicators of

perceived poor OR competency were more easily identified by EE educators in this regard.

These findings therefore suggest that OR was not specifically addressed as a competency in EE education and this was supported by the lack of reference to OR in learning outcomes and the frequent omission of OR as an assessable component of EE modules. This research therefore supports Nixdorff and Solomon (2007) who assert that despite OR being frequently mentioned as a competency in EE education, there is little effort to teach it as such. Such lack of clarity or focus contributes to the muddiness of the debate on the success or failure of EE education in developing student competency in this area. This is reflected in claims by the All-Party Parliamentary Group for Micro Businesses (2014:76), which reflects conclusions from the 2010 UK GEM data that suggests that entrepreneurship training *appears* 'to be poor at enhancing OR'.

Four of the EE educators interviewed associated perceived competency in OR with the individual themselves. Indeed six of the EE educators associated willingness to engage in creative thinking and their ability to recognise opportunities, with students' backgrounds in particular. Being from an entrepreneurial family, their educational field, their experience and their cultural background were all described as contributing to students' ability to recognise opportunities. These findings echo the environment view of creativity which acknowledges that creativity can be influenced by external factors such as an individual's background, community and culture (Padget, 2013). Similarly, it aligns with views of individual creativity which consider characteristics of the individual in making creativity possible (Puhakka, 2011). These views are also evident in the OR literature where opportunities can be viewed as being inseparable from the individual themselves (McMullen *et al.*, 2007; Eckhardt and Shane, 2003).

### **8.3.3 Assessment of OR**

Pittaway and Edwards (2012:779) define assessment as "the means through which educators can gauge the link between desired educational outcomes and actual student achievement". All EE educators in this current study considered OR as being important in EE education, yet in seven cases OR was not explicitly assessed (section 6.2.3). Where OR was explicitly assessed marks allocated for ideas were typically limited to the uniqueness and originality of the ideas proposed. As assessment must align learning outcomes and assessment tasks (Pittaway *et al.*, 2009) perhaps a contributory factor is that OR was only explicitly identified as a learning outcome by one EE educator. However, this current research has demonstrated an indirect focus on OR with seven educators referring to learning outcomes relating to creativity (problem solving and idea generation) (section 6.2.3).

Reasons for not assessing OR included: educators being able to stand over the assessment of students' work and being able to justify it to external examiners. Assessment rubrics were also seen to constrain the degree to which OR could be

assessed. Lack of educator expertise in assessing the creativeness of student opportunities was also a concern, thereby supporting Jones and Penaluna (2013) who contend that these areas are relatively ignored in current assessment practices. However, two participants did describe allocating marks for problem definition and solution generation processes as part of the assessment and these tended to occur where introductory creativity modules formed part of the EE curriculum.

EE educators considered OR as being 'part of the process' or not being 'isolated'. Four educators emphasised that it was the opportunity development process, rather than OR itself, that was being assessed. Educators focused on: how developed the opportunity was, evidence that supported the existence of an opportunity and how students proposed to move forward with the opportunity. These findings provide support to Saks and Gaglio (2002) who suggest that EE education emphasises opportunity evaluation over OR.

Assessment typically included presentations / pitching, the submission of a written piece such as a feasibility study, business plan or a business model canvas or the development of a prototype. This reflects Pittaway and Edwards' (2012) findings that despite a recognised desire by EE educators to use more innovative assessment approaches, current assessment practice remains quite traditional. The findings suggest that EE educators do have criteria that they apply to OR, albeit not explicitly assessed. These included evaluating ideas based on the uniqueness and originality of the ideas proposed, how actionable or how realistic they were.

#### **8.3.4 Progression**

The findings suggest that OR competency does not appear to be developed progressively throughout a students' undergraduate studies in EE (section 6.2.5). Progression was described by EE educators in terms of programme evolution, the incorporation of EE modules in the formal curriculum across disciplines, or the exposure of students to follow-on programmes or supports as part of the wider eco-system. These descriptions of progression contrast with the EntreComp progression model as outlined by Bacigalupo *et al.* (2016) which envisages four levels of progression from foundation level to expert. In this model students' competencies are initially developed with the help of support, but move towards more independent learning over time (section 2.3.4).

This research found an emphasis on 'exposure' to EE over 'progression', particularly within the formal curriculum. Seven EE educators described programmes which had one or less modules of EE education. However, three EE educators did identify programmes where a small number of EE modules were progressively built into the curriculum. The focus on exposure is reflected at a policy level, where, for example the Thematic Working Group on Entrepreneurship Education (2014:8) cites the Rethinking Education policy (2012) which calls "for it to be embedded at a systemic level and for all learners to receive **at least one**

practical entrepreneurial experience during their compulsory education.” Eight EE educators described extra-curricular enterprise activities which supported the formal curriculum. However, relying too much on extra-curricular entrepreneurial initiatives has been criticised by Wilson (2012) who argues that such approaches de-contextualise entrepreneurial learning and may signal to students that a low value is being placed on entrepreneurial skill development.

## **8.4 The role of creativity in ORedu.**

Five EE educators in this study identified some support for the role of creativity in OR, but the nature of this link was not clear from the descriptions provided.

Another four EE educators described creativity in a conflicting manner (section 6.5), suggesting that creativity was important, yet later dismissing its role in OR. These findings support the work of other scholars who appear to agree that creativity is linked to entrepreneurship by the way entrepreneurs come up with new venture ideas, yet the nature of this link is a little understood phenomenon (Gielnik *et al.*, 2011).

Creativity was described as being very important for OR in the way that students looked at things. Eight EE educators saw creativity as a process with just two relating creativity to the end product itself. These process / product perspectives are echoed in the literature where some see OR as the output from a creative process (Gielnik *et al.*, 2011; Heionen *et al.*, 2011, Dimov, 2011; Puhakka, 2011) and others present it as being a creative process in itself (Hansen *et al.*, 2012; Dimov, 2007; Hills *et al.*, 1999). Interestingly, while this research suggests that creativity was considered as a process by the majority of EE educators in this study, where OR was considered for assessment purposes, it was typically the creativity of the output (product / service) which was taken into account i.e. its uniqueness.

Four EE educators associated this uniqueness with creativity, supporting prior work which asserts that the concept of uniqueness or novelty as a characteristic of creativity is increasingly common (Padget, 2013; Puhakka, 2011; Treffinger *et al.*, 2007; Johnson and Carruthers, 2006; Boden, 2004; Csikszentmihalyi, 1996; Amabile, 1983). However, uniqueness alone was not considered enough for OR as eight of the EE educators expressed the need to also consider if the idea solves a problem or if there was a market for it. This echoes Amabile’s (1983) view which suggests that something is judged to be creative depending on if it is considered to be both novel and appropriate for the task at hand. Indeed, Mayer (1999 cited by Padget, 2013) identifies usefulness, utility, significance, value and appropriateness as other repeating components of creativity.

### **8.4.1 Educators’ perspectives on OR**

Educator perspectives on OR appears to influence how they approach ORedu (section 6.4.1.1). This research suggests that EE educators view OR in different ways. Half of the EE participants spoke of students seeing opportunities in the marketplace, while the other half described students creating opportunities. One

educator also described opportunities as happening where it was suggested that opportunities can arise at any time. These findings echo debates in the literature regarding the distinction between the discovery and creative approaches to OR (Dimov, 2011; Chelly, 2011; Puhakka, 2011; Hansen *et al.*, 2009; Alvarez and Barney, 2005; Dutta and Crossan, 2005).

This research study submits that these perspectives influence the way in which educators address OR in the context of EE education. For example, those with a discovery perspective were found to place greater emphasis on planning and using more analytical approaches, echoing the Kirtznerian tradition where the focus is on entrepreneurial alertness and information acquisition (Ashkelon, 2010; Dutta and Crossan, 2005; Shane, 2000). Those with a creativity driven perspective of OR were found to view exploration, problem solving, idea generation and the role of the individual as central to creating the opportunity, echoing the Schumpeterian view which considers personal attributes and skills, knowledge and antecedent conditions (Puhakka, 2011; Gielnik *et al.*, 2011; Dimov, 2007a; Ward, 2007; Dutta and Crossan, 2005). The present research provides support to the assertion made by Kyro *et al.* (2011), which suggests that how educators interpret the nature and process of OR can influence the way that OR is taught. While outside the scope of this current study, this is an area that warrants further investigation.

#### **8.4.2 Student experience of OR**

All EE educators described students experiencing some level of difficulty with OR, albeit six EE educators also recognised that some students did not find OR difficult. Difficulties were most often detected in the form of student resistance such as fear, students being outside their comfort zone, lack of confidence and lack of student motivation to engage in OR (section 6.5.3). The influence of such factors on an individual's creativity is recognised in the literature where Amabile (1983) identified the link between creativity and a person's expertise, creativity-relevant skills / processes and motivation in addition to other environmental factors. Similarly Nordin and Malik (2015) found that typical barriers to creativity for undergraduate students relate to task achievement, lack of self-confidence, risk taking and the physical environment.

## **8.5 How designerly ways of thinking are developed in design education**

This research suggests that design education (DE) develops ‘ways of thinking’ in its students (section 7.2.1). All DE educators described designers as problem solvers and DE was seen to develop ways of thinking which allow students to develop what they consider to be workable solutions to problems.

### **8.5.1 Types of thinking**

DE educators described students engaging in different types of thinking such as abductive and deductive reasoning, which are developed over time rather than being explicitly ‘taught’ in DE. Such thinking is widely recognised in prior studies (Dorst, 2011; Dew, 2007), while authors also draw attention to the use of convergent and divergent thinking, which results in the generation of more novel ideas and the selection of the most useful and viable ones (Geilnik *et al.*, 2011; Dorst, 2011; European Commission, 2009; Ashton-James and Chartrand, 2009; Dew, 2007; Csikszentmihalyi, 1996).

This research study revealed that DE also requires students to engage in reflective thinking (section 7.2.1), which aligns with the reflective nature of design and views of the designer as a ‘reflective practitioner’ (Csikszentmihalyi, 1996; Schön, 1983 as cited by Bousbaci, 2008). Such findings also concur with the Design Council’s (2005) conceptualisation of design as the double diamond, where periods of divergent thinking are followed by periods of convergent thinking, which require reflection on the part of the designer (section 4.3.1).

The literature makes a link between these ‘designerly ways of thinking’ and OR. For example, Penaluna *et al.* (2011) argue that OR is reliant upon divergent thinking whilst Geilnik *et al.* (2011) suggest that both divergent thinking (generating possibilities not ordinarily considered) and diversity of information enhances the creativity of new ideas in the initial stages of the opportunity identification process. Creative thinking was seen to influence the way students looked at things in ORedu but only two EE educators explicitly associated OR with convergent and divergent thinking. These findings support Penaluna and Penaluna (2008) who argue that how creative mindsets are developed is little understood in EE education.

### **8.5.2 Progression**

This study revealed that designerly ways of thinking are progressively developed throughout a student’s undergraduate education which contrasts sharply with OR competency development (section 7.3.3). One educator described DE as a ‘journey’ which is undertaken over a number of years. This progression allows students to develop both thinking and technical skills, which educators suggest students cannot move back from.

Early stages of DE were found to be more structured with DE educators taking students through standard design models as a means of acquiring basic design skills and learning how to design (section 7.3.3.1). This reflects Lawson’s (1990)



observation that at early stages of their studies students do not have a consistent way of approaching problems, but that this appears to be acquired throughout their DE. Similarly the findings support Dorst's (2003) observation that design methods tend to be interwoven into design assignments, particularly in the early stages of design studies.

In later stages of DE, more typical of the final years of undergraduate study, the focus was found to be more strategic in nature, enabling students to become more self-directed, developing their independence, implementing their own design processes and polishing their skills as a designer (section 7.3.3.2). At these stages DE educators described students negotiating deliverables or operating with less direct intervention from educators and within a broader set of parameters. This is reflected by Lyon (2011) who considers that such learning develops more than just technical skills as it encourages experimentation to develop student potential.

### **8.5.3 Project based**

DE was unanimously described as being project based where students undertake a series of short task based projects which can be independent of each other. Actively doing design and practice over time were mentioned by eight DE participants as important features of DE. These projects served a number of functions such as: allowing students to explore and experiment, experience design processes in action and to facilitate teaching the technical aspects of design. Such findings illustrate the importance of learning by doing through projects (Lyon, 2011; Carey and Matlay, 2010; Carey and Naudin, 2006) and echoes observations by the European Commission (2009) of DE being practice based and encouraging learning through experimentation.

### **8.5.4 Process based**

All DE educators described DE as being process based, supporting Penaluna *et al.* (2013) who explain that pedagogic approaches used in the design disciplines tend to emphasise the process rather than the output. DE educators explained that repetition of the design process enables students to understand what is required, to reflect, to develop their skills and to help them refine their own design processes, which supports the work of Penaluna *et al.* (2013; 2014). Similarly Dorst (2003) describes DE as 'design as learning' in which learning is achieved through a process of learning cycles (propose-experiment-learn). Design students are considered to become accustomed in these areas by repeated exposure, practice and feedback from assessment (Penaluna *et al.*, 2013).

### **8.5.5 Challenge and risk**

Both challenge and risk were identified as key features of DE. These will be addressed further in the chapter. Challenge is considered an enabler (section 8.8.1.2) while risk is considered in relation to behaviour (section 8.7.2.3).

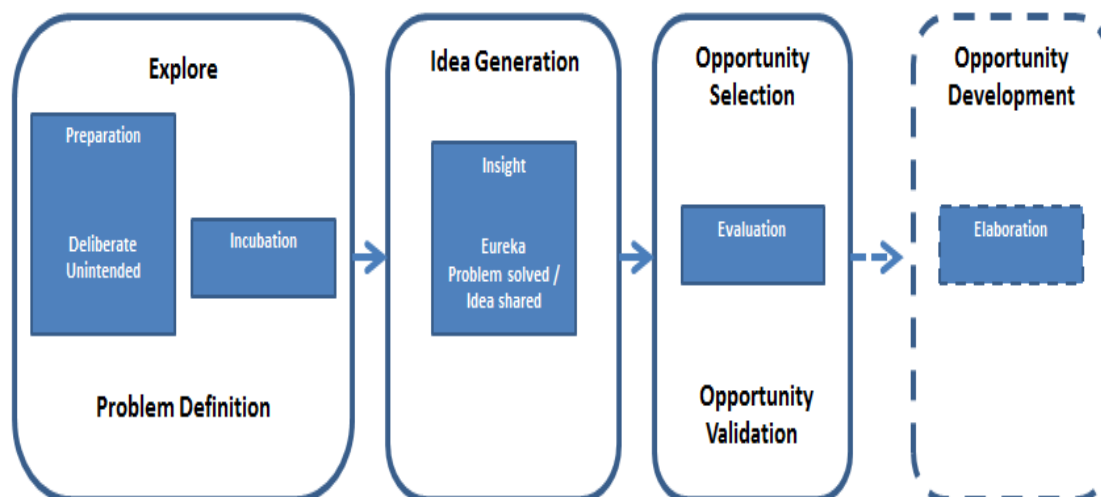
## 8.6. The nature of ORedu and DE processes

### 8.6.1 ORedu as a creative process

This research revealed the existence of an ORedu process (section 6.3) which typically involved the following stages: explore, problem definition, idea generation, opportunity selection, opportunity validation and opportunity development (figure 6.3). The ORedu process, this study revealed, is similar to the OR process itself as it is a staged, iterative process.

This process contains the stages of the OR process as proposed by Hills *et al.* (1999) and further developed by Hansen *et al.* (2011). In the aforementioned process, models opportunity is viewed as a creative process with five clearly identified stages: preparation, incubation, insight, evaluation and elaboration. Figure 8.2 illustrates the current ORedu process in conjunction with the Hills *et al.* (1999) model of OR, which reveals that educators address the key stages of the OR process, thereby also positioning ORedu as a creative process in itself.

**Figure 8.2: Stages of the OR and ORedu processes**



Source: Adapted from Hills *et al.* (1999)

The findings from this current study suggest that nine out of ten EE educators engage students in some form of preparation for OR, whilst the same number engage in idea generation activities to facilitate the generation of solutions to problems. Seven of the EE educators in this study also demonstrated the need for students to provide initial validation for their ideas before proceeding on to opportunity development. In their model Hansen *et al.* (2011) clearly distinguish evaluation as part of the opportunity formation stage and this they frequently associate with feasibility studies.

### 8.6.2 DE processes

Dorst (2003) acknowledges acceptance by design researchers that it is not possible to capture or model all design has to offer in one process model. However, nine out of ten DE educators specifically referred to design processes in DE and, while a uniform process was not described by all educators, analysis of

the findings revealed identifiable stages across these processes (section 7.3.1). These stages typically follow each other, but educators were keen to emphasise the complex and iterative nature of the processes and the importance of user engagement and feedback throughout. Figure 7.2 summarises the key stages of the DE process, which was found to be highly iterative in nature.

### **8.6.3 ORedu and DE process alignment**

ORedu processes and the DE processes share a number of similar stages, particularly at the early part of the process. Both begin with an explore stage, both have an idea / concept generation stage and both conclude with a design or opportunity development stage (section 6.3 and 7.3.1). As the focus of this study is on ORedu as a subset of EE, the first two stages of the DE process in particular are relevant. The concept development and design production stages of the DE process are considered to align with opportunity development and subsequent stages of the entrepreneurship process and are therefore not considered for this part of the analysis.

### **8.6.4 Process starting points**

The starting point for ORedu was found to vary, and this starting point was seen to influence the stage that students enter the ORedu process (section 6.3.1). Starting points were identified as a previously identified idea, a company problem or the requirement to identify an opportunity for the purpose of the course. The requirement to have an idea in advance supports the work of Neck and Greene (2011) who found that many entrepreneurship programmes assume that the opportunity has been identified in advance. Four EE educators described exposing students to problems as a catalyst for OR. Problems were either identified by the students or presented to the students with the aim of finding a solution. In ORedu half EE educators described students starting from a 'blank page' from which to identify opportunities, in what was seen to be their first (and sometimes only) experience of EE. Research suggests that when people feel 'obliged' to come up with ideas then their creativity can be constrained (Newton, 2012). In contrast, Amabile (1999) contends that problems posed by others tend not to be as intrinsically interesting as those identified by the individual themselves.

From a DE perspective starting with a 'blank page' was described as being more difficult for students, leading to greater levels of student confusion and stress. Indeed, this study found that, in contrast to ORedu, DE educators openly discouraged students from following their own interests too early on in their studies, as such focus was perceived as a constraint on the generation of possible solutions. Only in their final year were design students seen to be given free rein to determine their projects themselves, based on their personal preferences.

In further contrast, DE educators in this study described beginning the process with a brief (section 7.3.1.1), thereby supporting Green's (1974) observations. These briefs were frequently built in conjunction with industry contacts which reflects Lawson's (1990) assertion that in the majority of cases problems are 'brought' to designers by their clients. A good brief was described by DE educators as one that presented a 'wicked' problem, was sufficiently broad, challenging and

where the solution was not revealed in its narrative. The majority of briefs had particular specifications or criteria built into them which the students must engage with in order to satisfy the brief. This aligns closely with the literature on wicked problems where the true nature of a problem is not immediately known but needs to be discovered through exploration (Nielsen and Storvang, 2014; Dorst, 2011; Stewart, 2011; Cross, 2007; Dorst, 2003; Buchanan, 1992; Lawson, 1990). Wicked problems have built in constraints and contradictions, which makes them difficult to solve and for which there is not one predictable answer (Dorst, 2003; Lawson, 1990; Green, 1974). In addition, the findings from this research study showed that DE students were encouraged not to simply accept the brief as it was but to challenge, clarify and question the brief to get to the core of the problem that needs to be solved.

#### **8.6.4.1 Source of student ideas**

The source of student ideas in ORedu was most frequently described as things that were familiar to the student in everyday life, student interests and prior work experience [where relevant for students](section 6.3.1). Aligning student interests with ideas was considered by EE educators as being a good thing, as it can combine student interest with passion. The literature supports this view, as passion has been linked with intrinsic motivation and the ability to sustain interest in difficult tasks (Amabile, 1998; Csikszentmihalyi, 1996). This is important from an EE education perspective, as Lackeus (2013) provides evidence which demonstrates that such emotions play an important part in determining both entrepreneurial action and creative engagement.

#### **8.6.4.2 Pull / Push factors**

The findings suggest some overlap between those students who are faced with the requirement to identify an opportunity and push entrepreneurs who find themselves in circumstances requiring them to follow an entrepreneurial path (section 3.6.2.3). Building on Chelly's (2011) work, this current research suggests a similar approach could be considered appropriate for 'push' students in EE education as this study found that six EE educators described situations where students were 'required' to identify opportunities as part of their course.

Motivational differences between 'pull' and 'push' entrepreneurs are an important consideration. Research shows that it is negative motivation, as a reaction to the situation they find themselves in, which drives creativity for 'push' entrepreneurs, while 'pull' entrepreneurs are motivated by the positive prospects they perceive and may perceive many opportunities as a result (Chelly, 2011). Therefore, it is worth considering the limited nature of motivational drivers for 'push' students in EE education which may be driven by the successful completion of a module. Push students may be more prone to rush to identify opportunities simply to meet the criteria to complete their studies.

### **8.6.5 Explore**

An explore stage was revealed as a distinctive stage in both ORedu and DE processes. However, the nature of explore differed in both, particularly with regard to its importance, purpose, methods and focus. These differences are outlined in Table 8.2. Of note was that just four EE educators considered explore a part of the EE module architecture (section 7.3.2). In ORedu some form of exploration was encouraged, but it was described as being brief or omitted altogether, which is interesting in light of Csikszentmihalyi's (1996) argument that, to be able to change anything people first need to learn about it. In contrast explore was considered a very important stage by all DE educators interviewed in this research (section 7.3.1.2 and 7.4).

This research study revealed that the explore stage could be problematic for EE students who feel 'lost', which could result in them committing to unsuitable opportunities (section 6.3.2). In addition, some EE educators were found to distance themselves from students experiencing difficulty with this part of the process, seeing it as an individual thing. EE educators commented that students do not spend enough time exploring or that they rush into it and choose the wrong problem or a convenient one. This, the literature suggests, can lead to premature articulation in "bringing a solution to bear before it has been fully researched in the broadest possible way" (Penaluna *et al.*, 2013:7).

#### **8.6.5.1 Purpose of explore**

The perceived purpose of the 'explore' stage appeared narrow in ORedu where it was described as finding a problem or an idea that the student could work with. Half of the EE educators described the outcome from the explore stage of the ORedu process as problem definition. This is important, as proper problem definition is considered instrumental in developing creative outcomes (Ward, 2004 citing Mumford *et al.*, 1994). As problem definition was seen to be informed by the 'explore' stage of the ORedu process by only half of EE educators, then it stands that if the explore stage is rushed, skipped or ill-informed it could result in students selecting ill-informed problems or restricting the knowledge base from which ideas are subsequently generated, potentially leading to errors of commission, by jumping to conclusions too quickly (Kounios *et al.*, 2008) (section 3.6.2).

DE educators describe a broader purpose of the explore stage (section 7.4) as enabling students to understand context, to explore problems and to discover insights from which ideas can be generated, thus reflecting the insight-led view of problem solving (Salvi *et al.*, 2015; Kounios *et al.*, 2008; Bowden, 2005). Indeed Penaluna *et al.* (2011) claim creative thinking is at its best with insight-based thinking. The data from this study describes insights as illusive constructs which are difficult to precisely define, reflecting arguments from Bowden *et al.* (2005) who suggest that insight problem solvers find it difficult to describe the thinking associated with insight.

**Table 8.2: Contrasting ‘Explore’ in ORedu and DE processes**

Explore	ORedu	DE
Process	<ul style="list-style-type: none"> <li>• First stage</li> <li>• Brief stage which can be rapid</li> <li>• Can be omitted from process</li> <li>• Left up to the student</li> <li>• Considered more thinking and reflection based than ‘research-led’.</li> </ul>	<ul style="list-style-type: none"> <li>• First stage</li> <li>• Considered an important part of the process.</li> <li>• Iterative.</li> <li>• Early stages ‘rapid’ research</li> <li>• Later years more ‘rigorous’.</li> </ul>
Purpose	<ul style="list-style-type: none"> <li>• To find a problem</li> <li>• To find an idea</li> </ul>	<ul style="list-style-type: none"> <li>• To look outside themselves to discover the real problem.</li> <li>• To find an insight from which ideas can be generated.</li> </ul>
What	<ul style="list-style-type: none"> <li>• Explore Self</li> <li>• Personal Environment</li> <li>• Work Environment</li> <li>• Interests</li> <li>• Hobbies</li> <li>• Everyday problems</li> <li>• Industries</li> <li>• Products</li> <li>• A problem</li> <li>• An idea</li> </ul>	<ul style="list-style-type: none"> <li>• Explore the brief</li> <li>• Explore user experiences during different stages of a product / service lifecycle.</li> <li>• Explore possible solutions to problems.</li> <li>• Methods / materials &amp; techniques.</li> <li>• Explore self (latter years)</li> <li>• Explore who they are as designers and where they want to go.</li> </ul>
How	<ul style="list-style-type: none"> <li>• Read newspapers (Alertness)</li> <li>• See (Alertness)</li> <li>• Hear (Alertness)</li> <li>• Think &amp; Reflect</li> <li>• Research to <b>validate</b> the opportunity identified                             <ul style="list-style-type: none"> <li>• Secondary</li> <li>• Primary</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Engage with people early and often.</li> <li>• Predominantly qualitative, a mix of primary and secondary research, with a particular emphasis on visual and user centred research.</li> <li>• Ethnographic methods: interviewing, observation skills, gathering relevant secondary research were described as being ‘very important’.</li> </ul>
Concerns	<ul style="list-style-type: none"> <li>• Can be too brief.</li> <li>• Can be rushed.</li> <li>• Students have little experience to draw from.</li> <li>• Can be too broad and too fast.</li> <li>• Students can find the wrong problem / idea or a convenient problem or idea.</li> <li>• Students are not skilled in ‘reflecting’ or how to recognise opportunities.</li> <li>• Students get ‘lost’.</li> </ul>	<ul style="list-style-type: none"> <li>• Nature of challenge given can be subjective.</li> </ul>

Difference	<ul style="list-style-type: none"> <li>• <b>Structure:</b> Students faced with 'blank page' frequently at the <i>start</i>.</li> <li>• Students own interests are frequently the <i>driver</i> for the explore stage.</li> <li>• <b>Type of research:</b> Research is not firmly associated with early stages of the process beyond 'alertness'.</li> <li>• Research for the 'explore' stage is mainly personal and thinking based.</li> <li>• Academic, predominantly secondary research required to validate the opportunity once the idea is found.</li> <li>• <b>Assessment:</b> Frequently not assessed at this stage of the process.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Structure:</b> Blank page (free rein) frequently at the <i>end</i>.</li> <li>• Ideas can emerge from students own interests but <i>educators caution on constraining options too soon</i> suggesting that it can limit the quality of proposed solutions.</li> <li>• <b>Type of research:</b> visual research, primary research and secondary research.</li> <li>• <b>Assessment:</b> formatively assessed. Students keep a record of the development of their work using blogs, logs, sketchbooks or diaries which were frequently consulted in discussions between students and tutors and as a form of formal assessment. Staged presentations of work.</li> </ul>
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Source: Researcher's own work

#### 8.6.5.2 Focus of explore

The findings from this study suggest an internal focus on the explore stage in ORedu. Eight out of ten EE educators saw explore as a thinking or reflective exercise for students (section 6.3.2). Early exploration in ORedu was mostly encouraged through reflection. Previous studies provide much support between the link between prior knowledge and OR (Ko, 2012; Dimov, 2011; Chelly, 2011; Ko and Butler, 2007; Baron, 2006; Corbett, 2005a; Ward, 2004; Scott and Venkataraman, 2000; Shane, 2000). However, the literature also encourages caution, where Ward (2004) acknowledges the dual role of prior knowledge as both a 'bridge' or a 'fence' in generating new or novel ideas.

In four instances, EE educators in this study did encourage students to be more alert to what was happening around by reading, hearing and seeing, reflecting Ardichvili *et al.*'s (2003) argument that it is alertness rather than systematic search that is a more powerful determinant of OR. However, this study found that once the problem or idea was identified in ORedu then the focus of the research became more externally oriented towards gathering evidence to validate the opportunity.

Nine EE educators described the focus of the explore stage in the context of the present or the past, where students considered what they currently knew, what currently exists, what others are doing now, current products and current problems, as illustrated in Table 8.3. A focus on the present / past, the literature suggests, can be beneficial in developing frames of reference but it is also acknowledged to constrain creative thinking (Gielnik *et al.*, 2011; Baron and Ensley, 2006). Ward (2004) explains that when representations of prior knowledge are used as a starting point for new ideas these new ideas can result in a sense of familiarity and less originality. Indeed, by looking to the present / past

students gain hindsight knowledge about possible outcomes. Studies have shown that hindsight increases the likelihood of the re-occurrence of the same outcomes (Fischhoff, 2003) which can be perceived as a constraint in the development of future oriented solutions (section 3.6.1.1).

**Table 8.3: Focus ORedu and DE**

ORedu	DE
<ul style="list-style-type: none"> <li>• OR is considered a reflective exercise for students</li> <li>• The focus is in the context of the present: what students currently know, what currently exists, what others are doing now, current products and current problems.</li> <li>• Students are encouraged to actively scan the environment for what is currently on offer, how things are currently being done and gaining an awareness of people's preferences.</li> </ul>	<ul style="list-style-type: none"> <li>• DE is considered forward looking, rather than being historically based.</li> <li>• Described as 'projective', 'future focused' and instrumental in 'building the future'.</li> </ul>

Source: Researcher's own work

The predominantly internal focus of explore in ORedu contrasts sharply with the external focus of the initial explore stage in DE. DE exploration was found to exist at a number of levels, in this study. DE students engaged in 'explore' at different stages throughout a project (section 7.4.1). Due to the complex nature of design, DE educators explained that students were required to explore from a variety of perspectives (the brief, user experiences, possible solutions in addition to ways to realise their designs). DE educators described explore as starting 'wide' and looking at all possibilities from which insights and opportunities can be gained, thus supporting the Design Council (2007) view that this stage involves divergent thinking. This was emphasised as being particularly important in areas that are unfamiliar to students.

This research study found that design students were encouraged to look outside themselves for information at this stage. Explore was frequently encouraged through visual, user-centric and more formal primary and secondary research methods. This need to understand the user through anthropological methods such as observation is popularly reflected in the design literature (Nielsen and Storvang, 2014; Leavy, 2012; Martin, 2009; Dunne and Martin, 2006).

The findings reveal that the thinking that is inherent in DE leads students toward solutions that are forward looking (section 5.2.1) thus confirming Nielsen and Storvang's (2014) claim that design has a focus on what might be. This, the literature suggests requires abduction, which is considered to result in the creation of new ideas (Dunne and Martin, 2006) and to lead to the development of multiple possible options (Penaluna *et al.*, 2013; Dunne and Martin, 2006).



### **8.6.6 Idea generation**

The findings show that both ORedu processes and DE processes include an idea generation stage (section 6.3.4 and 7.3.1.3) which typically follows the explore stage. This contrasts somewhat with Gielnik *et al.* (2011) who consider the first step of the OR process to be the generation of multiple original ideas.

From a DE perspective, idea generation was described as being informed most frequently by the explore stage, as students need to be able to feed their research into their ideas (section 7.4.2). This is supported by Csikszentmihalyi (1996) who argues that insights come to those who have undertaken preparation and who have thought deeply about the problems they are trying to solve. The findings from this study indicate that in DE this stage was described as 'iterative', 'loose' and 'messy' requiring a lot of activity and reflection. DE educators explained that time was needed "to sit down, work it out, get it wrong, and try it again, get it wrong, try it again" (DE2). These findings support the work of Penaluna *et al.* (2013), who argue that students need to take time to assimilate information and to arrive at solutions in a non-linear way. Table 8.4 contrasts the idea generation stage of ORedu processes and DE processes along two dimensions, why it is undertaken and how it is undertaken.

**Table 8.4: Idea generation in ORedu and DE processes**

Idea / Concept Generation	OR	DE
Why	<ul style="list-style-type: none"> <li>• The focus at this stage is the generation of solutions to the problem.</li> <li>• In some instances idea generation can be the start of the process for some students.</li> </ul>	<ul style="list-style-type: none"> <li>• A concept generation stage was described by all DE educators in this study and it involves the generation of a range of ideas in response to the problem.</li> </ul>
How	<ul style="list-style-type: none"> <li>• Encouraged to generate multiple solutions or a limited number of solutions for specific problems.</li> <li>• Using a variety of tools and techniques to facilitate idea generation at this stage in the process.</li> <li>• Creativity techniques: brainstorming, mind-mapping, challenging assumptions, morphological analysis, bio-mimicry, fishbone analysis, mime, lateral thinking games.</li> <li>• Fleshing out ideas based on feedback from others, encouraging iteration and re-thinking of ideas.</li> <li>• Case studies to illustrate OR, acquire basic skills and practice OR themselves in the context of the cases being studied.</li> <li>• Students can be requested to undertake idea generation independently, in their own time.</li> </ul>	<ul style="list-style-type: none"> <li>• Informed most frequently by the explore stage as students need to be able to feed their research into their ideas.</li> <li>• Exposing students to contemporary design.</li> <li>• Giving students tools to sort through that information and look at it in a different way, synthesis and affinity diagrams and getting all their information up in post-its and pictures.</li> <li>• Using thinking techniques: brainstorming, sketching, word association games, creative idea generation games, narrative storytelling, mind mapping, stream of consciousness writing, parallel worlds, creative journals, brainstorming, making really quick models.</li> <li>• Encouraging students to generate multiple options.</li> <li>• Capturing evolving ideas using visual notation on notebooks or on sheets. Writing out or drawing ideas that pop into your head.</li> <li>• Giving students feedback from which more ideas can be generated.</li> <li>• Challenging students to justify their ideas.</li> <li>• Encouraging students to mix ideas.</li> <li>• Time for gestation of ideas and repeated iterations emerged from the data as being important to the success of this stage of the process.</li> </ul>

Source: Researcher's own work

#### **8.6.6.1 Creativity tools and techniques**

Idea generation in both instances focused on the generation of solutions to problems. Both EE educators and DE educators in this study described using a range of creativity tools and techniques to enable students to generate ideas (section 6.3.4 and 7.3.1.3).

The use of a variety of creative tools and techniques in ORedu (section 6.4.5) supports previous research, which asserts that the development of student creativity requires domain specific techniques and tools which should be complimented by knowledge about the creative process (Best and Thomas, 2013 citing Best and Thomas, 2007). In most instances, following exposure to some creativity techniques, this current study revealed that EE students engaged in idea generation in their own time. Of note is that the literature suggests that the use creativity techniques in the absence of the explore stage can have limited benefit as evidence suggests that those who come up with answers right away tend to come up with the worst answers (Penaluna *et al.*, 2014; Dorst, 2003).

DE educators in this study used other approaches in advance of using idea generation techniques such as exposing students to relevant examples, challenging their thinking and providing students with thinking frameworks / tools to help them work through the information gathered during the explore stage (section 7.3.4). This 'preparation' for creativity reflects Best and Thomas (2013:37) who suggest that creativity prospers in conditions where individuals acquire the cognitive skills [tools] needed to be creative; external conditions which promote experimentation, discovery and risk taking; and internal state which is described as "the readiness in the mind of pupils and teachers to be creative".

#### **8.6.6.2 Linking information**

Linking information was mentioned by four EE educators as having an influence on the creativity of the ideas generated (section 6.5.2). Evidence supports the view that pattern recognition is a key component in OR (Baron, 2006; Baron and Ensley, 2006). The literature suggests that it is possible to train students in pattern recognition (Barron, 2006) and that knowledge about how to link previously un-associated information to derive new combinations is potentially useful (Ko and Butler, 2007). However, Penaluna *et al.* (2014) are critical of occasional creativity sessions in developing such creativity skills and contend that it takes both time and practice to enable such linkages to develop.

#### **8.6.6.3 Generation of multiple ideas**

An interesting distinction towards idea generation in ORedu and DE was noticed regarding the output of the explore and idea generation stages. Over half of EE educators referred to 'the idea', 'a new business idea', 'a problem' or 'a solution'. In one instance EE educators described having more than one idea as problematic, as students struggled to choose between them (section 7.5.2).

In contrast, all DE educators referred to outputs (plural) using words such as 'volume' of sketches, 'key insights' and 'several options'. Generating multiple ideas was explained as being less difficult for students than coming up with one idea and

the generation of a greater number of ideas was associated with better quality ideas. This view is supported by Jones and Penaluna (2013) who argue that the development of multiple solutions is necessary for OR, both in the idea generation stage and when flexibility of thought is required.

### **8.6.7 Opportunity selection**

The ORedu process clearly described a distinct stage where students had to narrow down their choices to their selected opportunity (section 6.3.5). Half of the EE educators described assisting students in the filtering process, where required. This contrasts with DE, where this activity resulted from a constant process of feedback from DE educators and peers. In DE, when students reach the concept development stage, they need to have narrowed their focus and such filtering was described as occurring through the process of repeated challenge and reflection over time. Such filtering is typical of the convergent thinking associated with DE (Geilnik *et al.*, 2011; Dorst, 2011; Ashton-James and Chartrand, 2009; Dew, 2007; Csikszentmihalyi, 1996).

### **8.6.8 Iterative processes**

Both ORedu and DE process were found to be highly iterative in nature. The iterative nature of ORedu was noticed where failure to clearly define a problem or to provide evidence of validation resulted in students iterating back to previous stages (section 6.3.7). This supports earlier research which indicates strong agreement that OR is a multifaceted iterative process (Hansen *et al.*, 2012; Dimov, 2011; Hansen and Lumpkin, 2009; Dimov, 2007a; Dutta and Crossan, 2005; Ardichvili *et al.*, 2003; Hills *et al.*, 1999). Similarly, DE educators described students engaging with the 'explore' and 'idea generation' stages frequently throughout the development of a design solution (section 7.3.1). This supports claims that models of design are not straightforward, requiring them to be both malleable and iterative (Dorst, 2003; Lawson, 1990). In addition, Lawson (1990) argues that models of design must be flexible as there are many routes through them.

## **8.7 OR Attributes, Behaviours and Skills**

A number of student OR attributes, behaviours and skills were identified in the context of this research study. Tables 8.5, 8.6 and 8.7 illustrate in turn how these findings suggest these attributes, behaviours and skills are developed in both OR education and DE.

### **8.7.1 OR Attributes**

Attributes are defined by the Collins English Dictionary (2001:43) as being: a quality or feature representative of a person or thing. However, the literature suggests that educator conceptualisations of attributes differ and that the term 'attribute' does not have a consistent meaning (Barrie, 2006). Indeed the researcher in this current research discovered that there is little agreement in the literature as to what constitutes an agreed set of attributes and overlaps were evident between attributes, behaviours and skills. For example, the QAA (2012) identify innovation and creativity as an attribute and a skill, while problem solving

is categorised as a behaviour (section 2.3.2).

Attributes that EE educators in this research associate with OR are alertness, confidence, curiosity, intent and openness (section 6.4.2), as illustrated in Table 8.5.

**Table 8.5: Development of opportunity recognition attributes**

Opportunity Recognition	Developed in OR Education	Developed in DE
Attributes		
<ul style="list-style-type: none"> <li>• Alertness</li> <li>• Confidence</li> <li>• Curiosity</li> <li>• Intent</li> <li>• Openness</li> </ul>	Case studies and examples Feedback - - Feedback	Explore, exposure to best practice Repetition / feedback / challenge Explore, challenge - Challenge

Source: Researcher's own work

### **8.7.1.1 Alertness**

Alertness was mentioned by seven EE educators in this current study in describing students who were constantly looking out for new opportunities that were relevant to them (section 6.4.2). The Kirtznerian view of OR (section 3.3.1.1) identifies alertness and other cognitive skills amongst the key skills for an entrepreneur to have to recognise and realise opportunities (Chell, 2013). However, alertness as an attribute is supported in the literature where it has been associated with the probability of recognising an opportunity in the first place (Chelly, 2011; Puhakka, 2011) whilst Rae (2004) considers that those who are alert can learn to recognise opportunities.

EE educators appeared to actively encourage alertness in students through exercises such as getting students to look at every day products and critique them, using relevant case studies, developing an awareness of current business practice, getting students to read and report on newspaper articles. However, Ko and Butler (2007) suggest that in order to be alert in the first place, individuals must have enough information to know what to look for. This research has shown that the majority of EE educators saw the initial stages of ORedu process as being a reflective process, based on students' prior knowledge or experiences. This could suggest that students' alertness may be constrained by their existing knowledge base which may influence the probability of recognising an opportunity (Chelly, 2011; Puhakka, 2011) or their ability to recognise facts and make linkages (Ko, 2012; Baron, 2006).

Analysis of the literature did not identify alertness as an attribute associated with DE. However, this research revealed that exploring, through research, enabled students to stand back, to observe and to look at the bigger picture, enabling them to be alert to linkages and possible insights. This form of alertness was found to be framed in a problem context. This is supported by Dorst (2011) who suggests expert designers tend to take time to focus on issues surrounding the problem itself in an attempt to truly understand it. DE educators also exposed DE students to exemplars of other designers' work to raise their awareness of best practice.

### **8.7.1.2 Curiosity**

Curiosity was mentioned as an OR attribute by three EE educators, however these educators were critical of the degree to which student curiosity was developed in current ORedu in practice (section 6.4.2). This is an area in which DE appears to have a strength as curiosity was seen to be a driver for the explore stage and DE educators openly encouraged students to follow their intuition. Penaluna *et al.* (2013) assert that a strength of DE lies in its ability to develop student curiosity which in turn contributes to the development of students intellectual enquiry skills. Similarly, Csikszentmihalyi (1996) considers that curiosity and drive are necessary for creativity to develop.

This research study found that curiosity was seen to lead to resourcefulness where DE students acquired information or learned new skills based on their desire to find answers or understand how something works (section 7.4.3). These findings support Penaluna *et al.* (2013) who claim that curiosity influences students' internal motivation to learn as they seek to learn more in order to resolve the problem they have identified. The literature also shows that curiosity motivated interest in learning new information can intensify as individuals need to know rather than simply wanting to know (Litman, 2005).

Interestingly, half of EE educators in this study also associated student openness with OR, in this current research, where students were open to: new ideas, being wrong, learning new knowledge and to explore new possibilities. Therefore curiosity and openness could be perceived as being complimentary attributes of OR in this regard.

### **8.7.1.3 Confidence**

Confidence, in the context of this study, related to students having the confidence to come up with, reveal and select opportunity ideas with others (section 6.4.2). Lack of confidence with the creative aspects of OR was identified as a particular challenge for students. Confidence and willingness to take risks have been linked in the literature where Fazey and Fazey (2001) argue that students need to have confidence in their competency to complete a task to be prepared to undertake the risk associated with that task.

Studies have shown a link between entrepreneurial curiosity, confidence and self-efficacy (Jeraj and Marič, 2013; Kashdan *et al.*, 2004; Bandura, 1977). Gibbs (2009) found creative self-efficacy to have a positive impact on OR, while Boddington and Berg (2014) suggest that improving an entrepreneurs' belief in their own abilities to be creative will raise their self-efficacy in this area which might improve their ability to respond creatively to opportunities. Interestingly, this research study found that negative emotions were most frequently associated with ORedu and Bandura (1977) contends that emotions are considered to affect perceived efficacy, where fear emotions generate further fear.

Seven EE educators in this study recognised their role in building student confidence and enabling students' creative self-efficacy. The findings revealed that EE educators pro-actively try to build student confidence through positive

feedback mechanisms, practice, using creativity techniques and exercises to encourage idea generation and creative risk taking as they engage in OR. In contrast, in DE, student confidence was found to be built on trust: trust in themselves, in the process and in the educator, through repetition of the process and engaging in successive challenges to their work as it is developing. These findings support the views of Kelley and Kelley (2013) who suggest that repetition helps build creative confidence. Indeed, the Design Council (2016) reports that engaging students in design processes enhances their confidence in their perceived ability to apply design process to real world problems.

#### **8.7.1.4 Intent**

Intent was described by three EE educators in terms of students constantly thinking about an opportunity and this was associated with the individual themselves (section 6.4.2). While one educator recognised that some students present with intent, she suggested that educators have a role in encouraging it in others. While the literature shows a link between intent and acting on opportunities, little research links intent with OR. However, Jarvis (2016) contends that a person who identifies with the role of an entrepreneur will seek out occasions to recognise opportunities, thereby enhancing their entrepreneurial identity.

The development of the entrepreneurial identity is interesting in this regard. EE educators in this study used case studies, exercises and problems where students had to assume an entrepreneurial mind-set in relation to OR. Two educators described the need for students to act on their opportunities in their modules. However, the degree to which EE educators enable the development of students' entrepreneurial identity, while outside the remit of this research, warrants further investigation.

#### **8.7.1.5 Resilience**

Resilience was not mentioned as an attribute by any of the EE educators. The EE education literature on the other hand does identify resilience as a personality attribute (Chell, 2013), while the broader literature on resilience positions it as a personality trait, a response to environmental factors or a process. Regardless of the perspective taken, resilience is firmly linked to the ability to deal with the potential negative outcomes of risk. Risk therefore, is considered a necessary condition to develop resilience and certain attributes, such as competence, are also recognised as contributing to resilience (Windle, 2010). Interestingly however, this research found that DE develops resilience in students by exposing them to risk and engaging in challenge. One outcome of challenge was specifically identified as developing resilience in students in handling critical challenges of their work (section 7.5.1.1).

#### **8.7.2 OR Behaviours**

Behaviour is defined in the Collins English Dictionary (2001:63) as being: the manner of acting or functioning in a particular way. A limited number of behaviours were associated specifically with OR by EE educators in this research (Table 8.6) which included students being proactive, experimenting, risk-taking, scanning and

scenario building (section 6.4.3). Many of the above behaviours were also mentioned by the QAA (2012) but one, problem solving, is noticeable in its absence as a behaviour from this current study. Problem solving is considered a cognitive activity in the literature (Penaluna *et al.*, 2011; Badke-Schaub *et al.*, 2010; Dorst, 2003) and is more frequently associated with skills rather than behaviour.

Table 8.6 illustrates the OR behaviours as identified in current ORedu and DE. In ORedu these were found to be demonstrated by students in their approach to their projects, reflective logs, in-class activities and through involvement in extra-curricular activities. In DE they were demonstrated in the way students articulated their thinking, presented their work, developed options, provided feedback and negotiated design processes.

**Table 8.6: Development of OR Behaviours**

Opportunity Recognition	Developed in OR Education	Developed in DE
Behaviours <ul style="list-style-type: none"> <li>• Experimenting</li> <li>• Proactive</li> <li>• Risk Taking</li> <li>• Scanning</li> <li>• Scenario Building</li> </ul>	<ul style="list-style-type: none"> <li>• Projects, idea generation</li> <li>• Projects, reflective logs, extra-curricular</li> <li>• Engaging in creativity, selecting and communicating their opportunity.</li> <li>• Research, case studies, networking</li> <li>• Projects, networking, planning</li> </ul>	<ul style="list-style-type: none"> <li>• Explore, idea generation</li> <li>• Explore, curiosity-led</li> <li>• Explore / idea generation / Communication / challenge</li> <li>• Explore</li> <li>• Explore, idea generation, reflection.</li> </ul>

Source: Researcher's own work

### 8.7.2.1 Experimentation

Interestingly experimentation as a behaviour associated with initial OR was only mentioned by two EE educators (section 6.4.3). This lack of support for experimentation at this stage reflects the emphasis in the literature on experimentation in the opportunity development stage. For example, Hansen *et al.* (2012) describe opportunities as being developed through a process of fleshing out an idea such that they are reshaped and re-defined, over time.

Experimentation is also supported by the effectuation and an evolutionary perspectives of OR where opportunities are created through experimental processes or where they are seen to change over time and are selected or discarded (Breslin and Jones, 2014; Sarasvathy, 2001).

Experimentation behaviours also emerged from the DE findings in this study (section 7.3.1). These findings have shown that DE is by nature practice and project based with a strong emphasis on action and experimentation from the outset. DE educators in this research encourage students to produce, to experiment, to fail and to try again, from the earliest stages of DE, which Csikszentmihalyi (1996) contends is a normal practice in being creative. Coupled with this is the notion of risk taking which drives students to experiment with



different design options (Lyon, 2011). In this current research, experimentation was found to be a feature of all stages of the DE process, reflecting arguments in the literature that DE emphasises learning by doing, experimentation and divergent thinking (Lyon, 2011; European Commission, 2009).

#### **8.7.2.2 Proactive**

Behaviours such as being proactive and doing things on their own initiative were mentioned by four EE educators. They associated it with students they considered to be 'keen' or 'passionate' therefore revealing that educators linked it firmly with the individual. These students were observed following their own initiative by undertaking research, seeking out people, gathering information and willingly dedicating their own time to OR. This supports the literature, which suggests that 'passion' is a motivator for engaging in OR (Chelly, 2011). Engagement with students was the mechanism through which EE educators identified proactive behaviour.

Curiosity is seen to be linked with an openness to new ideas and new experiences, and self-determined tendencies to engage in activities for mere pleasure and challenge (Kashdan *et al.*, 2004). This was evidenced in this research where curiosity was identified by four DE educators as a driver for exploration and enabling students to be resourceful. Therefore, this research suggests that enabling student curiosity could potentially act as a driver for proactive student behaviour in OR.

#### **8.7.2.3 Risk taking**

Risk taking was identified as an OR behaviour by three EE educators. However, these findings revealed that EE students are exposed to limited risk taking in current ORedu. Risk in OR was associated with students engaging in creativity in the first instance and then sharing their opportunity with their peers. While EE educators firmly identify their role in developing student confidence and enabling them to progress from OR through to opportunity development, risk was not mentioned in this context. One EE educator did mention cautioning students or protecting students from being exposed to too much risk, but this was at the opportunity development stage.

Table 8.7 illustrates that the unpredictable nature of OR was considered risky, particularly where it could impact students' final grade (section 6.5.2). The literature suggests that students' perception of their competency and their creative self-efficacy influences their perception of risk associated with OR and their willingness to engage in risky activities (Gibbs, 2009; Fazey and Fazey, 2001). As risk-taking is associated with entrepreneurial behaviour (Chell, 2013; QAA, 2012; Zheng and Prislin, 2012; Gibb, 2002; Brockhaus, 1980), developing students' confidence in the creative aspects of OR could potentially be an important outcome of EE. Of interest is that Zheng and Prislin (2012) suggests that exposing students to longer evaluation periods and providing access to relevant information can increase risk taking propensity for EE students. The link identified in this research between confidence to come up with ideas and the confidence to share

ideas and students' perceived risk in revealing ideas is very interesting from an OR point of view, particularly with regard to developing student resilience as discussed earlier (section 8.7.1.5).

This research also revealed that DE exposes students to risk taking in a variety of ways and at various stages. While risk was associated with the creative aspects of DE, it also featured at the explore stage where 'insight' was considered THE risk in DE (section 7.6). This is supported by the literature where errors of omission are associated with insight-based thinking (Kounios *et al.*, 2008). In addition, this study suggests that the explore stage was perceived as posing even greater risk for students leading self-directed projects, where students can follow a path based on intuition coupled with incomplete information and get nowhere (Dorst, 2003).

The process of challenge was also considered to expose students to risk throughout their studies, as it required students to explain or defend their ideas, potentially exposing flaws in their thinking (section 7.6.5). These findings support claims by the European Commission (2009) that DE places learners in situations of uncertainty which forces them to make decisions and take risks.

Table 8.7 considers opportunities for risk taking, as revealed by this current research, in both ORedu and DE. The table illustrates that the process nature of DE appears to expose students to a greater degree of risk than current ORedu practices.

**Table 8.7: Risk Taking ORedu and DE**

Risk Taking ORedu	Risk Taking DE
<p><b>Students</b></p> <ul style="list-style-type: none"> <li>• Selecting a risky opportunity</li> <li>• The risk to engage in creativity at all</li> <li>• The risk to share your idea in front of your peers</li> <li>• The unpredictable and unstructured nature of OR.</li> <li>• The need to be accountable for their ideas.</li> <li>• Time pressure leading to identifying an opportunity too quickly.</li> </ul>	<ul style="list-style-type: none"> <li>• Engaging in creativity itself: risky creativity.</li> <li>• The explore stage:               <ul style="list-style-type: none"> <li>○ engaging with users at an early stage</li> <li>○ find their own path</li> <li>○ following dead ends</li> </ul> </li> <li>• ‘Ambiguous’ process: students risk staying too loose in the brief and not finding a focus at all.</li> <li>• Openly sharing or expressing their ideas</li> <li>• Insight is ‘the risk’ in design: there is no right or wrong answer and students must be able to defend any insight they propose.</li> <li>• Student attachment to ideas: resist sharing their ideas with others, letting go of their ideas or from exploring other alternatives which may lead to better solutions.</li> <li>• Some students don’t take advice, increasing the risk of learning through failure.</li> <li>• Challenge poses risks to students in revealing shortcomings in their existing thinking or work to date.</li> <li>• The self-directed nature of DE, expressing their individuality and personalisation of design.</li> </ul>

Source: Researcher’s own work

**8.7.2.4 Scanning and scenario building**

Scanning the environment was described as an OR behaviour by half of the EE educators in this study and this was actively encouraged by educators through experiential exercises and case study material. The literature suggests that being sensitive to information and cues in the environment could lead to new opportunities (Chelly, 2011; Puhakka, 2011; Ko and Butler, 2007) and this is very closely aligned with alertness as discussed earlier in the chapter (section 8.7.1.1).

Only one of the EE educators mentioned students engaging in scenario planning, Interestingly, this research revealed that current ORedu tends to emphasise OR in the singular e.g. identifying an idea, an opportunity, a problem or a solution (section 8.3.5.1), while DE was found to encourage multiple outputs. For example, one educator was observed encouraging students to do multiple posters for the final deliverable, rather than just one. Scenario planning is recognised as a valuable behaviour for entrepreneurs as Petrakis, Kostis and Kafka (2016, citing Godet, 2000) suggest it enables individuals to explore future situations and broaden their minds to possible outcomes. Similarly, Jones and Penaluna

(2013:808) argue that the development of multiple solutions is necessary for OR with singular answers offering limited insight. This research suggests that broadening the focus of OR beyond the singular output may be useful in this regard.

The findings from this research therefore suggest that DE approaches appear to enable OR behaviours which enable action, experimentation and risk taking in a managed way.

### **8.7.3 Skills**

Skills are defined by the Collins English Dictionary (2001) as a special ability or expertise enabling one to perform an activity very well. According to Chell (2013:8) a “skill is generally thought to encompass talents, abilities and capacities” and when acquired it is frequently taken for granted.

The skills associated with OR proved difficult for EE educators in this current study to identify (section 6.4.4). However, this is unsurprising as the EE literature reveals a certain ambiguity regarding the meaning of skills in EE education (Chell, 2013) and the distinction between attributes, behaviours and skills. Oftentimes, OR is identified as a skill in itself (Chell, 2013; Lackeus, 2013; QAA, 2012; NCEE, 2008), but the present research has shown that OR encompasses a range of cognitive, research and other skills. For example, research supports the view that pattern recognition is a key component in OR and a potentially useful skill that can be learned (Baron, 2006; Baron and Ensley, 2006). However, pattern recognition is only one of a number of cognitive skills that are associated with the broad categorisation of ‘creativity’ associated with OR (Breslin and Jones, 2014; Gundry *et al.*, 2014; Robinson and Stubberud, 2014; Schmidt *et al.*, 2012; Penaluna *et al.*, 2011). Thus, what is understood by OR skills appears ambiguous and this present research seeks to add clarity to this area.

#### **8.7.3.1 Cognitive processing skills**

Cognitive processing skills were associated with OR by nine EE educators in this study (section 6.4.4.1). Cognitive processing in this context included analytical thinking, creative thinking and problem solving. In particular, seven EE educators considered creative thinking an important skill to enable students to come up with and refine new ideas, to help them link concepts together in a novel way and ultimately to solve problems (section 6.5.2). This reflects creative perspectives on OR which considers that ideas require development in order to become opportunities and this requires creativity (Hansen *et al.*, 2012; Gielnik *et al.*, 2011; Dimov, 2011).

An emphasis on analytical thinking skills over creative thinking skills was evident in this research where students were encouraged to filter and validate proposed opportunities from an early stage in the ORedu process (section 6.2.2). This was recognised by two EE educators who were critical of the development of students’ creativity skills in EE education.

In contrast, DE was found to develop 'ways of thinking' (section 7.2.1), such as abductive and deductive reasoning, which enables students to consider multiple possible options. This supports the literature where creativity is recognised to fuel design and this involves specific ways of reasoning (Dorst 2011; Bruce and Bessant, 2002). DE educators, in this study, recognised that students need to achieve a fine balance between different types of thinking which requires students to exercise their creativity, analytical and synthesis skills. These ways of thinking were not considered to come easily to all students and that it takes time to develop. This research found that DE processes, educator challenge, the learning environment and assessment were all seen to contribute to cognitive skill development, particularly with regard to divergent thinking.

#### **8.7.3.1.1 Pragmatic approach to cognitive skill development**

Eight EE educators described using creativity tools and techniques in current OR education (section 6.4.5). Prior research also shows that EE educators have at their disposal a range of creative methods to facilitate idea generation. Similarly, this research found the DE educators also use divergent and convergent thinking techniques, but interestingly, there were open to suggestions on alternative approaches from students (section 7.3.4.1). The use of creativity techniques and tools is supported in the literature where Gundry *et al.* (2014) conclude that when students are taught appropriate creative methods and tools then innovative behaviour can emerge. Similarly evidence suggests that training in divergent thinking skills can improve both students ability and their confidence in their ability to recognise opportunities (Gundry *et al.*, 2014; Robinson and Stubberud, 2014; Schmidt *et al.*, 2012). Indeed the acquisition of creativity-relevant skills is considered by Amabile (1983) to be a necessary component in creativity but not sufficient in isolation. The literature suggests that an understanding of creativity and appropriate student instruction in creative thinking strategies must accompany the use of tools and techniques (Van de Kamp *et al.*, 2016).

In addition to creativity techniques, both EE and DE educators in this study described using case studies and exemplars to develop students' cognitive skills. These findings show that case studies were used by seven of the EE educators to illustrate OR in addition to allowing students to critique, acquire basic skills and practice OR themselves, in the context of the cases being studied. Indeed, from an OR perspective, Baron (2006) sees merit in exposure to a very broad range of examples of opportunities, as he argues this enables people to develop exemplars and mental models. Such frameworks are considered to play an important part in recognising emergent patterns which lead to OR (Baron, 2006).

#### **8.7.3.1.2 Developing reflective thinking skills**

While only three EE educators identified reflection as a skill required for OR, in DE student reflection was mentioned by seven educators as being central to students' ability to generate creative solutions. This study showed that DE requires students to reflect on a number of levels: reflection on their learning from engaging in design processes, reflection on the design itself in the context of the original brief and personal reflection, where students reflect on who they are and how they

design (section 7.2.1). The literature suggests that reflection draws attention to what has been and what needs to be learned, developing a students' design intuition in the process (Bousbaci, 2008; Quayle and Paterson, 1989).

The research findings from this study suggest that cognitive skill development is an area where DE can potentially contribute to ORedu. The data shows that creative thinking is initiated in the explore stage of DE where students start broad and follow their curiosity to discover insights. Students' thinking is continuously challenged, as they are encouraged to generate multiple options, to link the information they have found and to take time to reflect in order to identify possible insights. This supports recent findings from the Design Council (2016) who found that DE education processes do improve student creativity.

#### **8.7.3.2 Communication skills**

Communication skills were considered important by eight EE educators in terms of the verbalisation of ideas, facilitating co-learning, confidence building and peer engagement. These findings showed an emphasis on presentation and pitching skills from the outset, where students were encouraged to share their ideas with their peers (section 6.4.4.2). In the context of OR, communicating with people is recognised as necessary to secure information and to discuss ideas (de Koning, 1999).

However, this research suggests communication provides another area of potential overlap between ORedu and DE. The process of challenge in DE was found, in this research study, to contribute to the development of both communication and negotiation skills in students as DE requires design students to accurately communicate and justify the value of their work (section 7.5.4). These findings reflect design researchers' views that verbalisation is an important part of the design process where designers must put words around their designs and show a logic for how the designer arrived at the final outcome (Dorst, 2003; Dormer, 1999). Such skills are considered important as the literature shows that the ability of a designer to verbalise their design is considered necessary to evolve those designs (Dorst, 2003).

These findings suggest that the collaborative nature of peer to peer working and challenge, from peers and educators, contributes to the active development of both communication and negotiation skills in DE students. This supports the view that design is a social process which necessitates negotiation between stakeholders in determining the final design outcome as a considerable part of designing has to do with reconciling and integrating different perspectives into the design (Dorst, 2003).

#### **8.7.3.3 Networking skills**

The literature indicates that social networks play an important role in extending the knowledge base, enabling pattern recognition and providing sources of motivation necessary for identifying opportunities (Riquelme and Fatrouni, 2012; Dimov, 2007a; Ko and Butler, 2007; Baron, 2006; Rae, 2004; Sarasvathy, 2001; de Koning, 1999). In the context of this research, networking skills were associated

with OR by four EE participants. EE educators recognised their role in encouraging students to build relationships with others in order to gather knowledge and skills which could help them recognise opportunities. In some instances EE educators brought in guest speakers, signposted relevant contacts or encouraged students to seek out their own contacts where relevant (section 6.4.4.4). Interestingly, de Koning (1999:2) identified that “the structure of an entrepreneurs’ social context has significant effects on the quality and quantity of viable opportunities recognised”. This point however, could have implications for undergraduate students who may have underdeveloped or embryonic networks, particularly in the early stages of their undergraduate education.

Many of the projects that DE students engaged in were industry based, either originating from industry contacts or industry based competitions. In addition, the collaborative nature of DE was found to expose students to a range of industry contacts and individuals from other disciplines and enable open communication and shared-learning amongst peers (section 7.3.5). Collaboration was described by DE participants as being necessary for informing working designs, developing technical know-how and versatility. These findings are supported by previous research which acknowledges design as a collaborative, participative endeavour, where collaboration expands and promotes different perspectives and expands the range of ideas explored (Nielsen and Storvang, 2014; Leavy, 2012 citing Brown, 2008; Dunne and Martin, 2006).

#### **8.7.3.4 Research skills**

While only four educators associated research skills directly with OR, all EE educators described research skills being utilised once the opportunity had been identified. Research was more firmly associated with initial opportunity validation and development (section 6.4.4). However, where company problems were presented to students then educators described students engaging in some form of secondary research to provide a context for idea generation. The literature supports the link between knowledge acquisition and OR, recognising that while the process of acquiring knowledge is important, so too is its relevance to the problem context (Mumford *et al.*, 2012; Corbett, 2007).

This research study shows that research skills were actively developed from the early stages of DE (section 7.4.2). The research based nature of the explore stage was found to expose students to a variety of research skills early and often. These findings are supported in the literature where research is considered an important first step in determining the exact nature of a design problem (Leavy, 2012, citing Brown, 2008).

#### **8.7.4 Contrasting the development of OR and DE skills**

These findings illustrate that the skills which were identified from the literature (section 3.7) are touched on in current ORedu as illustrated in Table 8.8 below. A corresponding analysis of the DE data revealed that DE education enables the development of many of the same skills. However, this table illustrates that, in the context of this research, approaches adopted in DE potentially offer EE educators

opportunities to enhance OR attributes, behaviours and skills, particularly with respect to cognitive, information acquisition and social engagement skills.

**Table 8.8: OR skills enabled in current ORedu and DE**

Skill area	Opportunity Recognition Skills (Literature)	Opportunity Recognition Skills ORedu	Skills Developed DE
<ul style="list-style-type: none"> <li>Cognitive Processing</li> </ul>	<ul style="list-style-type: none"> <li>Link un-associated information</li> <li>Pattern recognition</li> <li>Creative problem solving</li> <li>Development of new mental schemas</li> <li>Assessment and solution development</li> <li>Divergent and convergent thinking</li> </ul>	<ul style="list-style-type: none"> <li>Creative thinking developed using creative thinking techniques.</li> <li>Analytical thinking driven by opportunity validation criteria from an early stage.</li> <li>Schemata development from exposure to case studies.</li> <li>Reflective thinking encouraged in some instances using reflective logs / journals.</li> </ul>	<ul style="list-style-type: none"> <li>Critical thinking through challenge.</li> <li>Linking information / pattern recognition through challenge.</li> <li>Divergent thinking / challenge / reflection.</li> <li>Analytical thinking in filtering information and verbalising thinking.</li> <li>Solution development using convergent and divergent thinking influenced by techniques / educator and peer critique.</li> <li>Schemata development from visual research and repeated experience of design processes</li> <li>Reflective thinking through reflective journals / educator challenge / critique.</li> </ul>
<ul style="list-style-type: none"> <li>Information</li> </ul>	<ul style="list-style-type: none"> <li>Creative information search strategies</li> <li>Information literacy skills</li> <li>Observation</li> </ul>	<ul style="list-style-type: none"> <li>Limited early stage research, generally secondary in nature.</li> </ul>	<ul style="list-style-type: none"> <li>Explore: Primary and secondary research</li> <li>Anthropological research methods</li> <li>Visual Research</li> </ul>
<ul style="list-style-type: none"> <li>Alertness / Context</li> </ul>	<ul style="list-style-type: none"> <li>Environmental scanning</li> <li>Analysis of market dynamics</li> <li>Identification of cues from the market</li> <li>Determining the value of information</li> <li>Prediction and anticipation of future problems</li> <li>Observation</li> </ul>	<ul style="list-style-type: none"> <li>Alertness: Reading, Looking, Listening through exposure to case studies, examples, newspaper articles.</li> <li>Industry research for company projects</li> <li>Focus on present / past</li> </ul>	<ul style="list-style-type: none"> <li>Exploration leading to understanding problem context from multiple perspectives.</li> <li>Observation and user engagement.</li> <li>Future focus orientation.</li> </ul>
<ul style="list-style-type: none"> <li>Social Network</li> </ul>	<ul style="list-style-type: none"> <li>Communication</li> <li>Network development</li> <li>Collaborative creativity</li> <li>Negotiating</li> <li>Storytelling</li> </ul>	<ul style="list-style-type: none"> <li>Communication sharing ideas with peers / pitching / presentations / written proposals</li> <li>Team based projects</li> <li>Limited examples of collaborative projects / events / exercises</li> </ul>	<ul style="list-style-type: none"> <li>Sharing ideas / defending work / critiquing others work / Presenting / Showcasing</li> <li>User engagement, industry engagement, peer to peer engagement, industry competitions.</li> <li>Collaboration with industry (client briefs).</li> <li>Team based projects, collaborative working</li> </ul>

Source: Researcher's own work



## 8.8 Enablers

The findings revealed a number of features which enable the development of creativity related attributes, behaviours and skills. These enablers were recognised in both ORedu and DE and identified as the learning environment, the role of the educator, delivery and assessment (Figure 8.3). While all four enablers are considered important in the context of ORedu, the educator is identified as being central.

**Figure 8.3: Enablers**

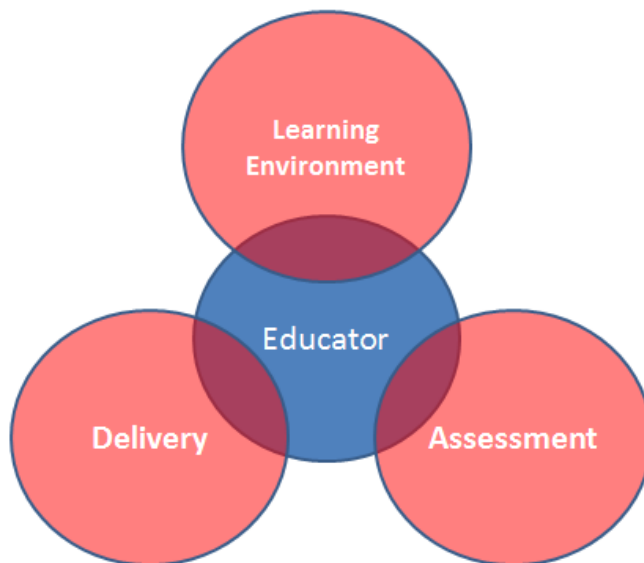


Table 8.9 summarises the important role that these enablers play in each domain. While potential overlap appears to exist in this area, the table illustrates differences in their application, suggesting potential opportunities to enhance these enablers in ORedu.

**Table 8.9: Key enablers**

Enablers	ORedu	DE Education
<b>Role of the Educators</b>	<ul style="list-style-type: none"> <li>• Facilitator.</li> <li>• Confidence enabled through practice (albeit this research shows limited opportunity for repetition and practice in a modularised system).</li> <li>• Confidence building was described in terms of providing constant positive reinforcement, regular feedback and encouraging student reflection.</li> <li>• Supporting students by signposting additional sources of information.</li> <li>• Exposing students to exemplars.</li> <li>• Motivating students through positive feedback.</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitator, guide.</li> <li>• Encourage students. In some instances this encouragement was described as a form of 'nurturing'.</li> <li>• Re-assuring students by equipping them with basic tools.</li> <li>• Exposing students to best practice.</li> <li>• Supporting students by signposting additional sources of information, re-directing students who have gone off on a tangent and helping students to help themselves.</li> <li>• Encouraging students to generate multiple options and to capture these evolving ideas using visual notation.</li> <li>• Challenging students to make linkages and clarify their thinking.</li> <li>• Motivating students through positive feedback.</li> </ul>
<b>Delivery</b>	<ul style="list-style-type: none"> <li>• Using creativity techniques and exercises to encourage idea generation and creative risk taking.</li> <li>• Idea generation frequently undertaken independently in their own time.</li> </ul>	<ul style="list-style-type: none"> <li>• Repeated exposure to crits builds confidence in students in both delivering and dealing with critique.</li> <li>• Lecturer-led at early stages in terms of critique and initial skill building.</li> <li>• Over time students gradually lose their inhibitions as they get used to the environment and the processes at play.</li> <li>• More self-directed in latter stages.</li> <li>• Emphasis on the positive nature of the feedback provided in crits over an emphasis on the negative.</li> </ul>
<b>Learning Environment</b>	<ul style="list-style-type: none"> <li>• The development of a safe working environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Non-threatening environment.</li> <li>• 'Safe' in terms of students being able to share and display information and ideas.</li> <li>• Develop trust between educators and the students, and that this takes time.</li> </ul>
<b>Assessment</b>	<ul style="list-style-type: none"> <li>• OR not directly assessed in EE</li> <li>• Creativity not assessed, but 'novelty' sometimes considered.</li> <li>• Formative and summative assessment practices used in EE.</li> <li>• Assessment in form of written submission, presentation or pitch.</li> </ul>	<ul style="list-style-type: none"> <li>• Formative and summative assessment practices.</li> <li>• Emphasis on the creative process over the creative product.</li> <li>• Assessment in the form of a 'crit', exhibition or presentation.</li> <li>• Formative assessment of process through learning logs, blogs or diaries.</li> <li>• Explore, challenge and reflect actively assessed as learning outcomes.</li> <li>• Formative assessment of ways of thinking.</li> </ul>

Source: Researcher's own work

## 8.8.1 The role of the educator

### 8.8.1.1 Facilitator

The findings show that both EE and DE educators see themselves as facilitators of student learning. Both play similar roles where they encourage, signpost, empower, motivate and equip students with relevant knowledge / tools / techniques. An important part of their role was described as linking students to theory and appropriate tools, providing support to students in areas such as completion of deliverables, confidence building and assuming responsibility for their own work. These findings support Padget (2013) who asserts the importance of the educators' role in embracing relevant strategies and techniques.

Ferrari *et al.* (2009) consider the educator key to encouraging or stifling student creativity in education. Prior studies have shown that the type of instruction that students get can influence their perception of a creative task, their behaviour during the task and the final solution developed (Ruscio and Amabile, 1999), thereby suggesting that educator expertise is an important enabler in this area. While EE educators suggested they had a role in fostering student creativity, descriptions revealed some limitations in practice. For example, one EE educator was observed suggesting solutions to students in an attempt to help them with OR (section 6.4.6), while another saw their role as identifying opportunities for students. These findings also revealed that some EE educators have adopted practices that they have observed working but that in some instances they are not clear why those approaches work. Some EE educators drew attention to their own lack of creativity and lack of expertise in teaching creativity, which they felt was juxtaposed with their perceived need to build confidence in students to engage with creativity (section 6.5.5).

In contrast, DE educators were found to knowingly intervene in creative processes by questioning students, to prevent them from identifying solutions too quickly (section 7.4.1). This is supported by Penaluna *et al.* (2013) who suggest that rushing in and identifying problems or solutions too early can be avoided. Similarly, Penaluna *et al.* (2014) suggest that educators need to help students to unlearn connections or habits that are unhelpful to the creative endeavour.

The findings from this research suggest a potential training requirement in this area for EE educators at HE in Ireland. This need was echoed by DE educators in this study who expressed their opinion that courses embracing design practices are best delivered by those who are trained in the area. These findings support the European Commission (2009) who consider educator training an important enabler in enhancing knowledge of creative process and their application in education. Similarly the literature indicates that having educators who understand and value creativity are important enablers in kindling student creativity (Penaluna *et al.*, 2014; Ferrari *et al.*, 2009; European Commission, 2009).

### **8.8.1.2 Challenge student thinking**

This research revealed that both EE and DE educators play an important role in challenging student thinking. For the purpose of this research 'challenge' is understood as the act of calling students thinking into question.

EE educators were found to engage in 'challenge' as they questioned and probed student thinking on opportunities albeit much of the questioning in OR was based around opportunity validation criteria (section 6.2.2). In EE, challenge was most frequently described as a form of 'discussion', although in a small minority of instances challenge by mentors or an external panel on conclusion of their project, was mentioned. Challenge in the form of questioning allowed EE educators to push students towards novelty or away from 'me too' type business opportunities.

Challenge was found to start early in the process as DE educators sought clarity on the problems that students were trying to solve. In DE challenge was undertaken in a number of ways, such as in the form of a formal critique or more subtly as a form of face to face feedback during regular tutorials or peer to peer feedback sessions. These findings support prior research which claim DE involves peer enabled, formative and discussion led approaches requiring students to present and defend their work in a public forum (Carey and Matlay, 2010; Penaluna and Penaluna, 2009).

DE educators described using challenge to inject a sense of clarity into design processes. Challenge in DE was described as enabling students to communicate their thinking, developing resilience in students to successfully handle critical challenges of their work and enabling students to reflect. This is supported by Penaluna *et al.* (2013) who argue that challenge, using the crit approach, is seen to enable students to manage and cope with risk over time. Similarly other studies acknowledge that in DE students must be prepared to 'defend' their work and its rigour (Penaluna *et al.*, 2013; Carey and Matlay, 2010; Penaluna and Penaluna, 2008) which, on reflection, helps students to understand their own work (Lyon, 2011). Indeed, Dorst (2003) contends that criticising student work when needed pushes students to reach their potential.

Interestingly, challenge also enabled DE educators to intervene and re-direct students from following a path they may have become overly attached to and encourage them to draw on links or ideas that required further development. One educator suggested that stimulating reflection was the tutors' main role in challenging students which Csikszentmihalyi (1996) suggests is necessary for making judgements and recognising linkages. Thus, challenge can be seen to enable DE educators to address the three dimensions of creative expression of ideational fluency, expressional fluency and divergent production (section 4.5.4). This research suggests that 'challenge', a recognised feature of DE, potentially offers EE educators opportunities to enhance students' creative confidence to engage with creative processes and build student resilience towards risk-taking, as illustrated in Table 8.10.

**Table 8.10: Role of challenge in DE and the skills developed**

<p><b>Role</b></p>	<ul style="list-style-type: none"> <li>• Inject a sense of clarity into the process</li> <li>• Helping students identify how their work can be improved</li> <li>• Pushing students to justify their design decisions</li> <li>• Enabling students to question rather than accept things as they are</li> <li>• Develop resilience in students to be able to handle critical challenges of their work</li> <li>• Builds confidence in students in both delivering and dealing with critique</li> <li>• Challenging students thinking             <ul style="list-style-type: none"> <li>○ the brief</li> <li>○ the relevance of their focus</li> <li>○ their reaction to what they were finding</li> <li>○ information that was absent</li> <li>○ the insights gained</li> <li>○ the development of their design ideas</li> <li>○ their ability to link themes in their research</li> <li>○ students' ability to coherently explain how they arrived at their conclusions</li> <li>○ their choice of production materials</li> <li>○ their final presentation of the design.</li> <li>○ the coherence of the work</li> </ul> </li> <li>• Such challenge was observed as being delivered as a form of facilitation, where educators question and probe students rather than 'tell'.</li> </ul>
<p><b>Skills Developed</b></p>	<ul style="list-style-type: none"> <li>• <b>Thinking</b> <ul style="list-style-type: none"> <li>○ Divergent / convergent thinking - challenges their thinking</li> <li>○ Analytical reasoning – justify their thinking</li> <li>○ Reflection – recognising the value of what was said and considering how this might impact what they do next.</li> </ul> </li> <li>• <b>Communication</b> <ul style="list-style-type: none"> <li>○ Pushes students towards clarity</li> <li>○ Develops openness to other ideas</li> <li>○ Listening skills</li> </ul> </li> <li>• <b>Negotiation skills</b> <ul style="list-style-type: none"> <li>○ Drives students to seek out opportunities that meet both the users' and the designers' requirements.</li> </ul> </li> <li>• <b>Resilience</b> <ul style="list-style-type: none"> <li>○ The ability to be able to handle and respond to critical feedback</li> </ul> </li> </ul>

Source: Researcher's own work

### **8.8.1.3 Building trust**

Trust did not feature as a specific issue from the EE educator interviews. However, it emerged as a noticeable feature of the relationships between DE educators and their students (section 7.6.8.2). DE educators saw themselves as being more 'nurturing' than 'scary', supporting the European Commission (2009) claim that DE nurtures creativity. A collaborative, open, working relationship built on trust was seen to underpin the rapport between the DE educator and the student. Trust and risk-taking were mentioned together where both educators and students needed to trust themselves, the process and the relationship. DE educators emphasised that such trust takes time to develop. This supports Phillip (2015), who identified 'mutual trust' as one of the key ingredients in a creative eco-system.

#### **8.8.1.4 Motivating students**

Researchers consider intrinsic motivation essential for a person to engage in creating novel ideas (Gilson and Shalley, 2004; Drazin *et al.*, 1999; Amabile, 1983). This study revealed that student motivation to engage in the creativity required for OR could be limited in the context of this study. EE educators encountered resistance from students to engage in creativity and, while both positive and negative student emotions were associated with OR, half of the EE educators encountered negative student emotions towards OR (section 8.4).

The literature suggests that negative emotions can stifle student creativity and that emotion is increasingly considered as central to creative motivation (Lakeus, 2013; Newton, 2012; Dew, 2007). Penaluna *et al.* (2014) argue that emotional constructs impact students' capacity to engage in creativity and therefore educators need to understand this to enable students to make creative linkages. Buchanan (2006 as cited by Lyon, 2011) considers wonder as the emotion that lies at the heart of creativity and that such emotion fuels motivation and skill development. In addition, Menses and Liy-Salmeron (2012) contend emotion also plays a key role in both learning and memory. Thus the impact of student emotions such as fear, anxiety and lack of confidence on motivation to engage in creativity in ORedu should be considered in this regard.

This draws attention to the potential value of curiosity-led approaches in engaging student creativity. Csikszentmihalyi (1996:11) argues "if too few opportunities for curiosity are available, if too many obstacles are placed in the way of risk and exploration, the motivation to engage in creative behaviour is easily extinguished". Penaluna *et al.* (2013) support curiosity based approaches which they contend allow students to tap into their internal motivation and to use their creativity to solve problems they are interested in solving (section 2.4.3.4). This suggests that EE educators have an important role in creating learning environments which stimulate students emotional response as a means of positively motivating students to engage in creativity.

#### **8.8.2 Safe learning environment**

Both EE and DE educators described the importance of having a safe, relaxed environment which encourages action, supports learning and enables risk taking. Safe was described in terms of providing an environment where risk taking was encouraged and personal exposure was protected. EE educators described the learning environment for OR as informal, messy and empowering, although this was not supported by the observations undertaken where the environments were found to be more traditional and passive in nature (section 6.4.7).

The literature suggests that the role of the tutor is important in a learning environment, to give encouragement, to propose alternative routes, to find a students' strength and to build upon it (Quayle and Paterson, 1989). Whilst EE educators identified their role as facilitating the learning climate, they also indicated a number of structural challenges such as semesterisation, unsuitable facilities and large class sizes which constrain them in this regard. However,

Penaluna (2011) contends that more needs to be done as EE educators, he suggests, have a role in building learning environments that support and encourage students to develop their curiosity, draw out information in response to their needs and in the order in which they need it.

This research also found that, in DE in particular, the physical layout and the climate of the learning environment encouraged experimentation, freedom and the open sharing of ideas between peers and tutors. The importance of having a non-threatening, open environment to enhance creative thinking, experimentation and risk taking is strongly supported in the literature (Padget, 2013; Schmidt *et al.*, 2012; European Commission, 2009; KEA, 2009; Amabile, 1998). In this research, these learning environments were described as being messy, fluid, relaxed and fun. The current findings support existing studies which suggest that environments which are supportive and relaxed, encourage imaginative freedom and experimentation can result in the development of creative behaviours (Penaluna *et al.*, 2014; Penaluna *et al.*, 2013; Newton, 2012; Puhakka, 2011; Penaluna, 2011). The literature suggests that these factors *alone* will not directly lead to creative outputs, but if handled incorrectly they can kill creativity (Puhakka, 2011). Newton (2012) also emphasises the role of the environment in developing creativity in a classroom context by giving more attention to student feelings.

#### **8.8.2.3 Visually stimulating environments**

In contrast with the formal anonymous nature of EE classrooms it was observed that some DE studio spaces displayed lots of visual artefacts which reflected students thinking processes and experimentation associated with stages of the process itself (section 7.6.8.1). These visual displays were considered important for enabling students to link their research with design work and helping students express their ideas quickly. Lawson (1990) explains that visualisation allows designers to externalise their thinking and such visuals also act as a form of memory for recording ideas and their evolution. Using visual displays to make their thinking and preferences explicit was also seen to reduce inhibitions and encourage risk taking over time.

The findings from this study clearly suggest that the learning environment is a key enabler in the development of student attributes, behaviours and skills. This confirms Schmidt *et al.*'s (2012:129) assertion that the classroom environment "could be an important factor in developing approaches to creativity".

#### **8.8.3 Delivery**

Delivery of ORedu was observed to take place in traditional classrooms for regular timetabled sessions. In all instances EE educators described actually taking students through stages, as represented in the ORedu process, in the form of action based delivery. This reflects arguments in the literature of the growing popularity of action based learning in EE education (Hoidn and Kärkkäinen, 2014; Kirketerp, 2012; Krueger, 2009; Cooney and Murray, 2008; Corbett, 2005b; Jones and English, 2004).

EE educators described students working on projects, typically in groups while they moved between them as a facilitator (section 6.4.6). EE educators were found to engage with a range of tools and techniques in enabling students to be alert to and to recognise opportunities. Starting with what was familiar to students, case studies and creativity tools and techniques were most frequently mentioned in this regard, reflecting pragmatic approaches in its delivery (Ferrari *et al.*, 2009).

In DE, designerly thinking was found to be facilitated through the delivery which was frequently workshop and tutorial driven (section 7.3.4). Workshops were used to facilitate the more theoretical and practical elements of DE, to introduce students to new concepts, to enable peer to peer discussion or to focus students on some specific element of design. An action oriented delivery was also evident in DE from the outset, which supports Ferrari *et al.* (2009) who claim that fostering creativity requires an active form of learning. In DE, learning by doing, through projects, is liberally accepted and research supports the view that the environment enables students to experience both formal and informal learning from lecturers and students alike (Lyon, 2011). This was evidenced in the liberal use of educator and group tutorials / group crits, where feedback was provided and peers were supported in openly critiquing each-others' work and sharing information.

#### **8.8.3.1 Scaffolding**

EE educators recognised the need to provide some form of scaffolding for students. This was mentioned in terms of providing a structured and supportive learning environment. ORedu was described as being interactive, competitive and fun for this part of their module, with one educator signalling that it became more structured as the module progressed to opportunity development.

The student-centered nature of ORedu delivery was evident, with students being encouraged to find their own problems and educators using case studies or bringing in guest speakers that they felt students could identify with (Krueger, 2009). The literature suggests that student-centered approaches should enable students to become self-directed (Krueger, 2009) and EE educators explained that students do undertake key parts of the ORedu process, such as exploration and idea generation in their own time, following some exposure to creativity tools and techniques (section 6.3). However, Dynan *et al.* (2008) contends that for students who are unprepared for self-directed learning, a more structured environment is more suitable at early stages.

In contrast, in DE scaffolding of the process was evident where delivery moved from more educator-led in the early skill building stages to more student-led in later stages, as students became more familiar with the processes and the learning environment itself. The way in which DE is delivered, at HE in Ireland, echoes the recommendation by Dynan *et al.* (2008), who suggest that self-directed learning skills can be developed by designing early coursework that is more structured in nature and increasing opportunities for self-directed learning as students move through the curriculum. Process scaffolding, as found in this



research, is recognised in the literature as enabling students to acquire both technical expertise and confidence in the process (McDonnell, 2016).

Scaffolding was also evident where students were exposed to risk during the DE process. Initial exposure to challenge was described as being educator led, or using simple frameworks such as ‘two stars and a wish’. Similarly, it was observed that students were provided with thinking frameworks and filtering frameworks to enable them to make sense of information they had found. This scaffolding is evident in the literature, where Penaluna and Penaluna (2009:729) point out that DE educators do not expect their students to “blindly go looking for new ideas, but train their students to employ a set of approaches that may lead to discovery”.

#### **8.8.4 Assessment**

This research has revealed that OR is not currently assessed as a feature of EE, at HE in Ireland (section 7.2.3). In contrast, assessment was shown to play an important role in the development of ways of thinking in DE (section 7.3.8). In this research DE was found to assess the process over the final deliverable. The focus of much formative assessment was on the students’ ability to negotiate the process, illustrate their thought processes throughout, to demonstrate that they had come at things from a variety of angles and to demonstrate their learning from their experience of the process. This supports Penaluna *et al.* (2013) who contend that DE assessment provides a mechanism for considering creative expression.

A crit, as defined by Penaluna *et al.* (2013) is where students present (and justify) their work and where they must be prepared to ‘defend’ their work and its rigour. The findings in this study contrasts somewhat with prior research which suggests that assessment in design tends to be performed in the form of a crit (Penaluna *et al.*, 2013; Carey and Matlay, 2010; Penaluna and Penaluna, 2008), whereas this research found that the crit was more of a vehicle for feedback and it does not always play a role in summative assessment, particularly in the early years of a students’ education.

The literature suggests that assessment is an area that DE could potentially contribute to OR. Carey and Matlay (2010) determined that, particularly in relation to the assessment of ideas in an academic framework then, aspects of design assessment were transferable to EE, such as giving rigorous consideration to multiple ideas and the justification of ideas to peers as part of their assessment. Penaluna *et al.* (2013: 8) assert that design based assessment strategies “align with the requirements of enterprise and entrepreneurship education, providing frameworks for ‘constructively aligned’ assessment and interdisciplinary endeavour”.

##### **8.8.4.1 Assessment of explore**

The explore stage in ORedu is typically not considered for assessment purposes in EE and in some instances the assessable part of the process is seen to begin after an opportunity has been identified (section 6.2.3). Similarly, it was found that explore is clearly formatively assessed in DE (section 7.3.6). Indeed, two DE

educators in this study identified 'explore', 'challenge' and 'reflect' as specific learning outcomes of their programmes. The process is examined through learning logs / diaries, where the explore stage is documented and reflected upon, and through interim presentations of their work. Student reflection was seen to play an important part in assessment which aligns with perspectives of entrepreneurial learning based on learning through doing, experimenting, solving problems, making mistakes and the importance of reflecting on these experiences (Pittaway *et al.*, 2009).

## **8.9 Refined ORedu process and proposed ORedu Framework**

This research suggests that elements of DE do appear to offer the potential to enhance student OR attributes, behaviours and skills. In particular aspects of the DE process, features of its delivery and elements of its assessment practices appear to offer opportunities to augment ORedu. However, the researcher is cognisant of the fact that the context within which ORedu and DE are delivered are not the same, as illustrated in Appendix 10.

### **8.9.1 Concerns with the current ORedu process**

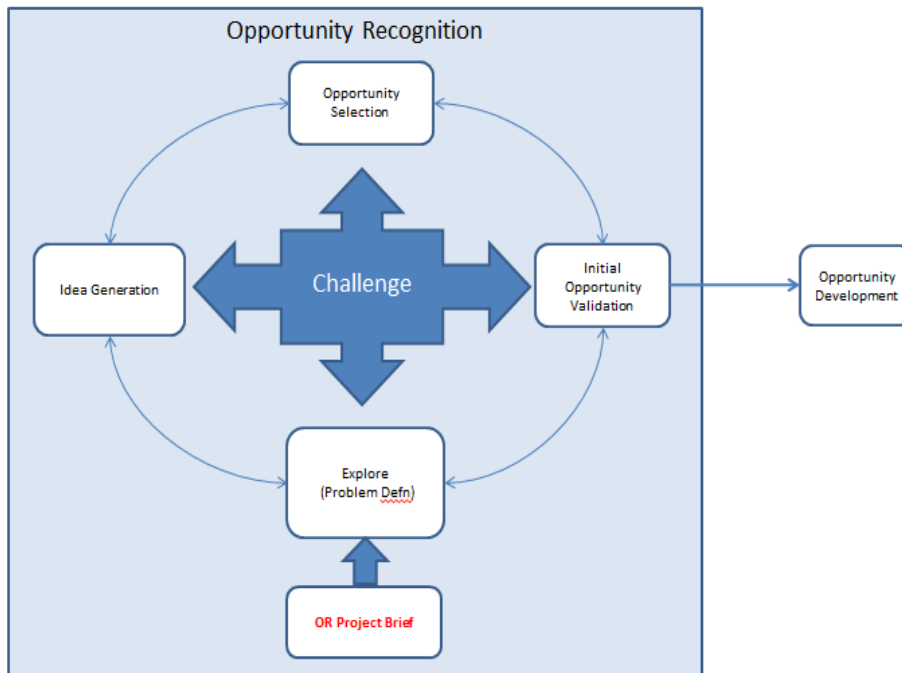
This research has shed light on the way ORedu currently takes place at HE in Ireland, by revealing the existence of an ORedu process which is iterative in nature (section 6.3). Of concern is that the current ORedu process has multiple entry points, suggesting that stages of the process can be omitted. In addition the obligation on students to come up with an opportunity as a course requirement, this research suggests, can have a de-motivating and potentially negative impact on students' creativity (Newton, 2012).

Within the current ORedu process explore was described as a brief and predominantly self-explorative activity, suggesting that students lean heavily on their own prior knowledge and prior (yet potentially limited) experience as a source of ideas for OR. While acknowledging that a reliance on prior knowledge is recognised as an enabler to OR (Baron and Ensley, 2006; Shane, 2000), this research has also shown that it can limit student creativity, particularly in generating novel, future focused ideas (Gielnik *et al.*, 2011; Ko and Butler, 2007; Dimov, 2007a; Ward, 2004). Two EE educators levelled criticisms at the current ORedu process for not allowing time for students to really explore. Similarly, problem definition was only mentioned by five EE participants yet, taking a creative perspective, proper problem definition is considered instrumental in developing creative outcomes (Ward, 2004 citing Mumford *et al.*, 1994).

The current study revealed that EE educators observed students having difficulty with generating ideas as part of the OR process and that they tend not to intervene. EE educators in this research described students as rushing into the OR process and identifying the wrong problem or convenient ones (section 6.5.4), potentially resulting in premature articulation (Penaluna *et al.*, 2013). The literature contends that this is avoidable if students take the time to explore and consider alternatives (Penaluna *et al.*, 2013).

In light of these findings the researcher proposes refinements to the current ORedu process, as previously identified by this research. The refined ORedu process is proposed in Figure 8.4.

**Figure 8.4: Refined ORedu process**



Source: Researcher's own work

#### **8.9.1.1 Single starting point**

The refined ORedu process, it is suggested, should have one entry point which could be an OR brief. This brief could be tailored to the module and carefully designed to accommodate situations where students may still present with their own ideas, or where a company problem is used. A carefully crafted project brief could provide the initial scaffolding required to enable students to engage in the OR process in the early stages of their EE education.

This research suggests that a good brief is one that is broad enough to pose problems which are not easily solvable and therefore require students to follow their curiosity. When students present with pre-determined ideas it is important such ideas are considered in light of the OR brief such that students are required to engage with explore to consider other alternatives prior to committing to any one opportunity. For example, one possible criteria of the brief might be the requirement to develop a number of possible solutions to the brief.

#### **8.9.1.2 Explore as first stage**

This research submits that the 'explore' stage should be recognised as the first stage of the ORedu process. These research findings have shown that the explore stage is considered necessary to facilitate idea generation as it enables students to consider multiple perspectives, look towards relevant exemplars, engage early with users and to understand the context in which they are recognising opportunities to solve problems. This stage pushes students to look beyond themselves and their prior knowledge and to seek out the knowledge and experiences of others. The explore stage enables students to experiment, take risks, reflect and try again, before they commit to developing those opportunities.

Thorough engagement with the explore stage should result in problem definition and the identification of insights from which idea generation can be framed.

#### **8.9.1.3 Idea Generation**

The explore and idea generation stages should not be seen as sequential in nature. The reality, as evidenced from DE educators descriptions of design processes, is that students may iterate to and from the explore and idea generation stages many times as they identify multiple problems and consider multiple ways to potentially solve them.

While this stage may be relatively brief, student thinking should not be rushed (Penaluna *et al.*, 2013). It is suggested that EE educators work closely with students, probing and questioning their thinking and pushing them to draw linkages from their research throughout the process. EE educators should try to refrain from getting 'sucked-in' and making those linkages themselves, as was observed.

While many EE educators mentioned the use of creativity techniques to facilitate idea generation, this research has shown that creativity techniques in the absence of the explore stage can be limited (Penaluna *et al.*, 2014; Dorst, 2003). However, the literature has shown the value of creative techniques when used in conjunction with preparation and an understanding of creative processes (Best and Thomas, 2013). The use of convergent thinking frameworks and tools in tandem with the criteria outlined in the OR Brief can, it is suggested, assist students in filtering the opportunities identified to the one(s) that most closely meet the requirements of the OR brief.

Following on from this stage students could then be encouraged to engage in initial opportunity validation to indicate the chosen opportunity's potential utility or value. Based on the outcome of this initial validation students may need to re-engage with explore, idea generation or opportunity selection, or proceed onto opportunity development.

#### **8.9.1.4 Challenge student thinking**

The role of challenge, as evidenced in DE, plays an important part at all stages of the ORedu process. These findings show that challenge permits the educator to: probe student thinking through a process of questioning, to intervene in the process where necessary, to stimulate reflective thinking in students at all stages and to push students to reach their potential. This, DE educators suggested, injects clarity into the process and supports students in successfully negotiating their way through it.

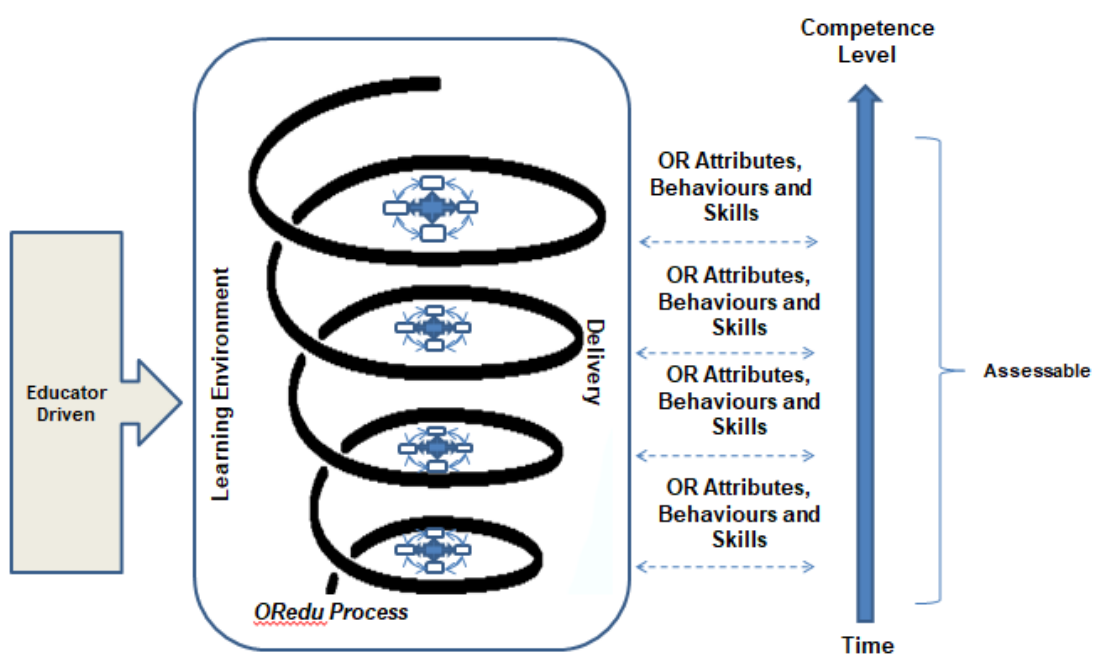
In addition, this study suggested that challenge enables the development of a range of skills such as resilience, critical thinking, communication and negotiation in students. It also requires students to demonstrate their active engagement with the process, in presenting their work in progress and demonstrating that they have reflected on what they have learned.

Challenge, as revealed by this research, is considered a vehicle for feedback and tends to be constructive in nature. This research showed that challenge as a process can be undertaken in a variety of ways, such as in face to face discussions with students or as formal presentations to their peers and others.

### 8.9.2 ORedu framework

Synthesis of the totality of these findings, in the context of this research, has led the researcher to propose an ORedu Framework (Figure 8.5). The proposed ORedu Framework posits that OR attributes, behaviours and skills can be enabled by engaging students in the refined ORedu process supported by a suitable learning environment, appropriate delivery, focused assessment and proactive educator involvement in each of the aforementioned areas.

**Figure 8.5: Proposed ORedu Framework**



Source: Researcher's own work

This research argues that ORedu needs to be educator driven. Successive cycles of exposure to the ORedu process over time could enable the development of OR attributes, behaviours and skills. The framework indicates that competence could be determined through assessment of the process over time. Engagement with the OR process could be enabled by the educator in both the nature of delivery and the development of an appropriate learning environment.

#### 8.9.2.1 ORedu enablers

This research has shown that a learning environment which is safe and encourages experimentation, freedom and the open sharing of ideas between peers and tutors, can contribute to creative behaviours required for OR. These findings suggest that such behaviours are best developed through practice based

project work which requires students to actively participate from the start. Methods of delivery which combine knowledge acquisition with practical application and which repeatedly expose students to the refined ORedu process can, this research suggests, enable attribute, behaviour and skill building over time.

Process based assessment of OR could assess students' ability to negotiate the process, illustrate their creative thought processes and demonstrate their learning from their experience of the process. Forms of assessment in this context could include the use of learning logs/ diaries and student presentations.

#### **8.9.2.2 Educator as key enabler**

The proposed ORedu framework recognises that the educator is a key enabler in ORedu. The educator, it is suggested, should have a role in:

- Building trusting relationships and creating a safe learning environment that encourages both creative thinking and risk taking.
- Designing and facilitating the delivery of ORedu in a way which ignites students' curiosity to engage in the refined OR process, which challenges student thinking throughout and which empowers students to seek out the relevant information as required.
- Assessing the students' performance in the refined ORedu process to enable the objective determination of OR competency.

#### **8.9.2.3 Progression**

The development of OR attributes, behaviours and skills should enable OR competency to be developed over time. In support of the EntreComp framework (Bacigalupo *et al.*,2016) the proposed ORedu framework can be applied to facilitate all levels of competency development. Foundation level would see a greater level of educator scaffolding and support available to students in acquiring the requisite attributes, behaviours and skills to successfully engage in OR. Scaffolding could include tailored OR project briefs, explore frameworks, introductory divergent and convergent thinking techniques, facilitated peer to peer feedback and structured reflection. Regular educator and peer challenge could support initial skill acquisition.

ORedu should be designed to become more student-led and self-directed, as students become more experienced and skilled in the refined ORedu process, as they approach advanced levels of their undergraduate education. Expert levels could encourage independent ownership of the OR process, incorporating more heutagogic learning approaches such as negotiated learning, where students are given the freedom to make learning choices based on their interests and draw on information when they need it (Penaluna, 2011).

## 8.10 Chapter summary

This chapter discussed the lack of prominence of ORedu as a feature of EE education which contrasted with claims in the literature surrounding the relative importance of OR in EE education (Hills and Lumpkin, 1997). Lack of prominence was evident in its lack of visibility, difficulty in identifying competency, lack of assessment and lack of progression, supporting arguments in the literature that OR appears to be overlooked in EE education (Krueger, 2009; Nixdorff and Solomon, 2007; Kellet, 2006; Hills and Lumpkin, 1997). The chapter continued with a discussion of the role of creativity in current OR education which reiterated claims regarding difficulties in understanding the link between creativity and OR (Gielnik *et al.* 2011). Similarly this current research supported research claims that educators' perception of opportunities potentially influences the way they teach OR (Kyro *et al.*, 2011a).

The findings of this study supported existing research on the practical and process nature of DE which progressively develops designerly ways of thinking (Penaluna *et al.*, 2014; Penaluna *et al.*, 2013; Lyon, 2011; Dorst, 2003). In particular, the role of challenge in developing DE student potential and exposing students to risk were supported by the literature (Penaluna *et al.*, 2013; Lyon, 2011; Carey and Matlay, 2010; Penaluna and Penaluna, 2008; Dorst, 2003).

This research revealed the existence of an ORedu process, which addresses all of the key stages of the OR process, thereby positioning it as a creative process in itself (Hansen *et al.*, 2011). However, closer consideration of the ORedu process revealed that both the ORedu process and DE process, as identified in this study, share a number of similar stages. These were identified as explore and idea generation, although the discussion revealed differences in the way in which both stages are dealt with in ORedu and DE.

A number of OR attributes, behaviours and skills were identified in this research. However, the researcher drew attention to the lack of agreement in the literature regarding agreed categorization. The OR attributes, behaviours and skills identified in this research were generally supported by the literature (Chell, 2011; Design Council, 2014; Penaluna *et al.*, 2013; Krueger, 2008; Litman, 2005; Rae, 2004) although resilience was noticeable by its omission as a finding from this current research study.

Synthesis of the research findings led the researcher to identify a number of enablers for ORedu, which were supported by the literature (Penaluna *et al.*, 2014, 2013; Padget, 2013; Schmidt *et al.*, 2012; Carey and Matlay, 2010; Ferrari *et al.*, 2009; Dorst, 2003; Quayle and Paterson, 1989). The chapter closed by integrating the findings, as supported by the literature, to recommend refinements to the current ORedu process, as identified by this research. From this an ORedu framework was proposed, which the researcher contends, can enable the progressive development of ORedu competencies over time. The conclusions from this research have implications for EE education theory, policy and practice which will be explored in the final chapter of this thesis.



## Chapter 9 Conclusion

### 9.1 Introduction

This chapter will draw together all of the elements of thesis. The chapter will begin by briefly revisiting the context of the research and reviewing the research objective and questions, which have driven this research study. The chapter then outlines contributions from this research and considers recommendations for policy and practice. The limitations of the study and its impact on the researcher, as a reflective practitioner, draw the chapter to a conclusion.

### 9.2 Context for the research

This research appears to be the first research of its kind specifically examining EE educator experiences of OR education (ORedu). It responds to developments in European EE policy which increasingly recognises OR as an EE competence (Bacigalupo *et al.*, 2016; QAA, 2012) and considers claims that OR is not taught as a competence (Nixdorff and Solomon, 2007). This research addresses the recognised lack of structured guidance available to educators on selecting appropriate teaching methods for ORedu, and on the skills needed to turn ideas into opportunities (Goldsby and Nelson, 2012; Balan and Metcalfe, 2012). Due to the creative nature of OR (Hills *et al.*, 1999), EE researchers are looking towards education strategies employed in creative industries in an attempt to address this shortfall.

This research responds to calls to make practical guidelines or frameworks available to educators for educating students in OR (Goldsby and Nelson, 2012; Balan and Metcalfe, 2012) by proposing both a refined process and a framework for ORedu.

### 9.3 Research questions and overall research objective

In the context of HE in Ireland, this research sought to explore a number of questions, each of which will be addressed in turn:

#### 9.3.1 Research question one

*How is opportunity recognition currently addressed in practice within enterprise and entrepreneurship education?*

This research revealed that OR has little visibility in current EE education delivery, at HE in Ireland. OR was considered part of the EE package, reflected by a lack of visibility of OR in EE module learning outcomes. This was considered to contribute to the difficulty EE educators experienced in identifying OR competency and associated skills in students. The findings demonstrated that OR is not progressively developed as students move through their undergraduate education (section 8.3).

An OR education (ORedu) process was revealed by this research, which has all the recognisable stages of the OR process (section 8.6.1). The current ORedu

process was found to have multiple starting points, suggesting that stages can be bypassed. The early part of the process, explore, was found to be largely internally focused and brief, with a greater emphasis placed on the idea generation and initial opportunity validation stages of the process. EE educators observed that many students experience difficulty with aspects of OR. This was evidenced by: their resistance to engage in OR, rushing into the process or selecting unsuitable or convenient opportunities. Therefore, these findings suggest that the current ORedu process is far from optimal (section 8.9.1).

### **9.3.2 Research question two**

*How does current enterprise and entrepreneurship education develop opportunity recognition attributes, behaviours and skills in students at higher education in Ireland?*

A number of attributes, behaviours and skills were associated with current ORedu at HE in Ireland, although educators experienced some difficulty identifying them. Attributes included alertness, curiosity, confidence, intent and openness, of which alertness emerged as being most actively developed through exercises, case studies and getting students to read newspaper articles. EE educators identified their role in developing student intent and confidence. EE educators pro-actively tried to build student confidence through positive feedback mechanisms, practice, using creativity techniques and exercises, yet student confidence, particularly in relation the creative aspects of OR, still emerged as an issue. Curiosity, in particular, was considered by some EE educators as being underdeveloped in current ORedu (section 8.7.1).

The most notable behaviours included students being proactive, experimenting, risk-taking and scanning. Being proactive was associated with individuals themselves, who were described as 'keen' students and 'passionate' about their ideas, suggesting motivational issues influence student proactiveness. Scanning emerged as the behaviour which was most actively developed by educators, perhaps reflecting the emphasis on alertness in ORedu. Scenario planning, while mentioned, was not supported in this research as a behaviour typically associated with ORedu. This research contends that the narrow focus of OR on singular outputs may be a contributory factor in this regard. Students were found to be exposed to limited risk taking, associated with creativity, whilst experimentation was considered underdeveloped at the OR stage (section 8.7.2).

Skills included cognitive processing (creative, analytical, problem solving and reflective thinking), communication, networking and research. Analytical thinking was seen to be encouraged from very early on in the ORedu process by requiring students to consider 'validation criteria' from the outset. Creative thinking was found to be developed to a limited degree, most frequently through creativity tools and techniques in addition to the use of exemplars. However, EE educators cited their lack of personal expertise in creativity, or in teaching creativity, as reasons why they do not engage more fully in the creativity side of OR.

Reflective thinking was encouraged in the current ORedu process, through the use of reflective logs. Communication skills were actively developed through impromptu and formalised presentations but networking and research skills, at this stage of the process, appeared somewhat underutilised. This research demonstrates that while a number of attributes, behaviours and skills were identifiable in ORedu, existing approaches fall short of developing these in all areas (section 8.7.3).

### **9.3.3 Research question three**

*How is opportunity recognition education currently assessed in practice within enterprise and entrepreneurship education at higher education in Ireland?*

OR is typically not explicitly assessed at HE in Ireland, although all EE educators considered OR as being an important part of EE education (section 8.3.3). The research found that the focus of assessment was on opportunity development, rather than OR. In the limited instances where assessment of opportunities did occur, it was assessment of the output using traditional assessment methods such as presentations or written reports. Opportunities were typically evaluated based on uniqueness or originality, which stands in contrast with the process view of creativity held by most educators in this research study. Other criteria, that EE educators in this research used to 'judge' but not assess ideas, were how actionable or how realistic they considered the opportunities to be.

OR was not frequently identified as an explicit learning outcome, by EE educators in this research, which may be a contributing factor to its lack of assessment. However, this research found an indirect focus on OR, with seven educators referring to creativity related learning outcomes (problem solving and idea generation). Reasons for not assessing OR included: the need for EE educators to stand over and justify the assessment of students' work to external examiners, constraints of existing assessment rubrics and lack of educator expertise in assessing the creativeness of students' opportunities.

### **9.3.4 Research question four**

*How does design education enable the development of creativity related attributes, behaviours and skills in design students at higher education in Ireland.*

DE, at HE in Ireland, was found to develop 'designerly ways of thinking' which allows students to develop what they consider to be workable solutions to problems (section 8.5). It was found to encourage different types of thinking such as divergent and convergent thinking, which are progressively developed over time, rather than being explicitly 'taught'. DE was shown to be typically problem based, solution focused and user-centred. Due to the project and process oriented nature of DE, this research found that design students acquire and consolidate knowledge and develop skills through process repetition, feedback and assessment.

In the context of this research, DE was found to be collaborative in nature, engaging users, peers and industry from the earliest stages. The role of challenge

was found to play an important part in developing students thinking. The educator was seen to have a central role in enabling student creativity in both the way in which DE was delivered and in the development of an experiential learning environment, inspiring trust, confidence and risk taking. Early stages of DE education were found to be more structured, concentrating on initial skill building, moving to more strategic and student-led approaches in the latter stages.

### **9.3.5 Research question five**

*How suitable are design education approaches to opportunity recognition education at higher education in Ireland?*

A number of areas of overlap emerged from this research, suggesting potential suitability of DE to ORedu in EE education at HE in Ireland:

- Multiple starting points in the ORedu process leads to stages of the process being bypassed (section 6.3.1 and 8.6.4). In particular, the requirement for EE students to come up with opportunities of their own, the literature suggests, can be daunting and potentially de-motivating for students, particularly where they lack the skills necessary to do so. This contrasts with DE, where the catalyst in the DE process was found to be typically in the form a brief, in which 'wicked' problems were posed and constraints were built-in (section 7.3.1.1). DE was found to encourage students to pause, to challenge and to question the brief in an attempt to gain focus and set the boundaries their work. These briefs were designed in such a way as to deter students from jumping to conclusions and served to channel students into the explore stage of the process, in order to proceed.
- The ORedu process and design processes were found to have broadly similar stages, particularly the explore and idea generation stages (section 8.6.3). Explore in DE was, in most instances, an externally focused endeavour, compared with the mainly internal focus of explore in ORedu. Explore was considered a critical stage in the DE process, from which students learned to follow their curiosity in defining problems and to recognise insights. Idea generation in DE involved the use of tools and techniques, but of note was that the explore stage was considered instrumental in informing the idea generation stage, providing the platform upon which creative ideas could be born.
- ORedu was found to be process based and equally it was found not to be assessed (section 8.3.3). In contrast, DE was also process based yet actively assessed, where the emphasis of assessment was clearly on the process of creative expression rather than the final product. Interestingly explore, challenge and reflect were considered valid learning outcomes in DE.
- Challenge was found to be central to developing 'designerly ways of thinking' in DE. Challenge served to: expose students thinking, push students to verbalise their ideas and enabled educators to encourage, divert or re-focus student efforts throughout the process (section 7.2 and

8.8.1). Challenge, in the form of formal critiques, was seen to develop risk-taking behaviour and resilience in students, over time. In particular, challenge was seen as a catalyst for igniting student reflection, which was deemed necessary for driving student creativity.

- Risk-taking, while identified as a required behaviour in ORedu, emerged strongly as a feature of DE. Risk-taking was associated with: the curiosity-driven orientation of DE, creative expression, stages of design processes themselves, being exposed to the process of challenge and potential failure throughout (section 7.6 and 8.7.2.3). The development of a safe learning environment, which encouraged creative experimentation, was considered important in encouraging the risk-taking behaviour required in DE.

## 9.4 Research aim

The ultimate aim of this research was to address the following research objective:

*Explore the suitability of design education approaches in enabling enterprise and entrepreneurship educators to enhance undergraduate students' opportunity recognition attributes, behaviours and skills in Higher Education in Ireland.*

This research found that DE enables the development of many of the attributes, behaviours and skills associated with OR. In particular, in the context of this research, its strength appears to lie in developing those attributes, behaviours and skills as competencies over time.

These include:

- motivating students to engage in the process by igniting student curiosity through the design of the initial brief and enabling students to explore;
- developing student confidence through incremental skill building, scaffolding, practice, process repetition and feedback over time;
- exposing students to risk-taking by encouraging them to trust their intuition, trust the process, explore creative options, identify insights, engage in experimentation, verbalise their ideas and exposing students to potential failure;
- nurturing 'ways of thinking' by developing environments conducive to creative expression, repeatedly encouraging students to explore multiple options, enabling students to develop creativity relevant heuristics, challenging student thinking, actively facilitating student reflection and assessing students' creative expression, over time;
- exercising primary and secondary research skills to explore the problem context and solution development;
- actively developing and using networks in understanding and developing user-centred solutions to problems.

Based on these findings, the researcher concludes that DE approaches can enable EE educators to enhance undergraduate students' OR education at HE in Ireland, as this research has found DE to:

- enable the progressive development of attributes, behaviours and skills associated with OR, over time.
- address the difficulties associated with the current ORedu process, such as skipping stages, rushing the process and selecting convenient or unsuitable problems.
- enable educators to assess student performance at various stages in the process, thereby facilitating them to objectively recognise competency in OR.

## 9.5 Contributions to knowledge

Corley and Gioia (2011) identify the importance of originality and utility as the key features of a research contribution. Originality is described as advancing understanding while utility refers to the usefulness of the research.

### 9.5.1 Theoretical contribution to knowledge

A theoretical contribution relates to advancing theoretical knowledge (Corley and Gioia, 2011). This research makes a valuable theoretical contribution on a number of levels.

In the course of this research the researcher discovered little existing research on ORedu taken from the creative perspective. The literature suggests that enabling student creativity is an area where DE could potentially contribute to ORedu (Penaluna *et al.*, 2013). Advocates from the design domain call for researchers to look beyond simply prescribed 'design thinking' methodologies and to consider process, learning environments and assessment (Penaluna *et al.*, 2013; Carey and Matlay, 2010; Penaluna and Penaluna, 2008). This research addresses this gap by providing insight as to how DE approaches, applied in practice, can potentially enhance ORedu as a subset of EE education.

The literature suggests a lack of understanding as to what is currently involved in ORedu, although it is frequently claimed that more needs to be done to enable students to recognise opportunities (Neck and Greene, 2011; Krueger, 2009; Penaluna and Penaluna, 2008; Nixdorff and Solomon, 2007). Indeed, it is suggested that a challenge for educators in the field of enterprise lies in identifying EE education approaches that develop OR competencies in students (Clydesdale, 2012; Penaluna *et al.*, 2009). At a theoretical level this research contributes much needed clarity as to what constitutes current ORedu by revealing an ORedu process (section 6.3), which at the time of writing, had not previously been mapped.

In light of the totality of the findings from this research, the current ORedu process has been refined. The degree to which current ORedu enables students' creativity appears limited, due to: students' over-reliance on existing knowledge and experience, their resistance to engage in creative processes, their tendency to rush into the process and selecting convenient or unsuitable problems. By proposing a refined ORedu process (Figure 8.4), which seeks to address the

recognised weaknesses in the current ORedu process, this research enhances its contribution to theory.

The refined process is informed by DE where it proposes a single starting point, the OR brief. This single starting point should be designed in such a way as to direct students into a dedicated explore stage, leading directly to idea generation and encouraging experimentation, all of which are considered essential practice in being creative. The role of the educator, in challenging student thinking and stimulating reflective thinking during the process, is seen as central to process. The refined ORedu process contributes to theory by addressing calls by researchers for structured guidance in ORedu (Goldsby and Nelson, 2012; Balan and Metcalfe, 2012).

Finally, the development of a framework for ORedu (Figure 8.5) contributes to theory by meeting the challenge of identifying EE education approaches that develop OR competencies in students (Clydesdale, 2012; Penaluna and Penaluna, 2009). The proposed framework for ORedu compliments the recently published EntreComp Framework developed by Bacigalupo *et al.* (2016) by providing much needed clarification of attributes, behaviours and skills associated with OR. This research suggests that the ORedu process can develop skills such as curiosity, experimentation, creative and analytical thinking and risk-taking, moving students from dependence to independence over time. The proposed ORedu Framework suggests that repetition of the OR process over time can lead to the progressive development of OR attributes, behaviours and skills, where enabled by the educator, the learning environment, delivery and assessment.

### **9.5.2 Practical contribution to knowledge**

A practical contribution to knowledge is considered to be research that generates useful knowledge for practice (Corley and Gioia, 2011). This research contributes at a practical level in a number of ways.

This research serves to draw attention to the continuing lack of prominence of OR in current EE education (Nixdorff and Solomon, 2007; Kellet, 2006; Saks and Gaglio, 2002; Hills and Lumpkin, 1997). While oft cited as an outcome from EE education in practice, this research provides empirical findings which demonstrate it has little visibility, is not assessed and does not appear to be progressed as a competence in EE education, in an Irish context. This research contributes to practice as the framework for ORedu provides educators with a structured approach to ORedu, which facilitates the development of OR relevant attributes, behaviours and skills, thereby enabling overall OR competence over time.

The recognised lack of attention given to assessment in EE research is acknowledged as an oversight (Elmholdt *et al.*, 2016; Pittaway and Edwards, 2012; Pittaway *et al.*, 2009). This research therefore contributes insights into current assessment practices in EE education. However, the clear lack of assessment of OR, as highlighted by the empirical findings in this research, are of concern. Assessment is considered an important component of EE education, creating the link between desired outcomes and student achievement (Pittaway

and Edwards, 2012). These findings clearly suggest that no such link exists with regard to student achievement in OR. The implied rather than explicit nature of OR in learning outcomes is considered a potential contributory factor in this regard (section 8.3.3). This research contributes to practice by enabling educators to consider process based assessment around the ORedu process itself, such as that used in the DE domain.

The findings from this research suggest that perceived student competency in OR was frequently attributed to the individual being naturally good at it, or not, suggesting that educators can distance themselves from student performance in this area. However, many of the problems that students were perceived to encounter with OR are considered avoidable (Gundry *et al.*, 2014; Robinson and Stubberud, 2014; Penaluna *et al.*, 2013; Schmidt *et al.*, 2012), whilst many of the skills required for OR are considered teachable (Puhakka, 2011; Krueger, 2009; Ko and Butler, 2007; Baron, 2006; Amabile, 1983).

Indeed, this research suggests that lack of student motivation to engage in the creativity associated with OR is a particular issue. In this study, negative motivators such as: fear, discomfort, lack of confidence, dislike, anxiety, stress, worry and resentment were clearly evident, and these have been found to contribute to stifled creativity (Newton, 2012). Intrinsic motivation, Amabile (1998) contends, is enabled in an environment which poses the right amount of challenge, the availability of time and tools, freedom to choose the way in which problems will be solved and external encouragement and support, thus demonstrating the importance of the educator in fostering student motivation towards creativity. This research therefore contributes to practice, as the framework offers educators an opportunity to reflect on the centrality of their role in student OR competence development over time.



## **9.6 Recommendations for policy and practice**

In light of the contributions outlined in section 9.5, a number of practical recommendations emerge for both policy and practice from this research.

### **9.6.1 Recommendations for policy**

This research shows that HE institutions are responding to calls for students to be exposed to EE as part of their formal third level education (Gibcus *et al.*, 2012). The findings are consistent with the Thematic Working Group on Entrepreneurship Education (2014:8) which cites the Rethinking Education policy (2012) “calling for it to be embedded at a systemic level and for all learners to receive **at least one** practical entrepreneurial experience during their compulsory education.” The findings from this research suggest that the general lack of exposure to EE education as part of the formal curriculum throughout a students’ undergraduate studies, could in part explain why progression in OR is not easily achieved.

This research recommends that EE policy should be more ambitious in terms of student exposure to EE in the context of competency development over time. In a similar vein, the empirical findings clearly illustrate the lack of visibility of OR in the EE curriculum. Therefore, this research calls for OR competence to assume a greater priority in the context of EE education policy, as observed recently with EntreComp (Bacigalupo *et al.*, 2016). In particular, the relative absence of OR from assessment, as indicated by these empirical findings, needs to be addressed at a policy level.

### **9.6.2 Recommendations to EE educators as professionals**

Three specific recommendations are suggested for EE educators as professionals: educator training, the role of the educator and general provision of EE education.

#### **9.6.2.1 Educator training**

These findings clearly indicate the need for EE educator training in creativity and pedagogies which develop students’ capacity to generate creative solutions in response to problems, at HE in Ireland. OR is a creative process (Hansen *et al.*, 2012; Dimov, 2007; Hills *et al.*, 1999), yet this research shows that the link between creativity and OR is not well understood by EE educators. In the context of this research, EE educator knowledge with respect to creative processes was found to be limited in some instances, and these findings illustrate that many educators were aware of their own limitations in their understanding of and in teaching creativity. This is concerning, as studies have shown that the type of instruction that students get can influence their perception of a creative task, their behaviour during the task and the final solution developed (Ruscio and Amabile, 1999). This research calls for tailored creativity training, to facilitate EE educator understanding of creativity and expose them to alternative teaching approaches which can enhance the development of creativity in EE students.

### **9.6.2.2 The role of the EE educator**

This research has highlighted that EE educators, at HE in Ireland, should take a more proactive role in developing students' OR attributes, behaviours and skills. To this end, this research recommends that EE educators should consider:

- tapping into student curiosity through the design of OR assignments,
- creating a safe learning environment, which encourages experimentation and risk taking,
- preparing students for creativity by allowing students time to explore as a pre-cursor to idea generation,
- directly supporting students in negotiating the ORedu process, particularly at foundation level,
- equipping students with the knowledge, skills and tools required for creativity,
- providing regular feedback, intervening where necessary and engaging students in constructive challenge,
- building confidence and expertise through process repetition.

### **9.6.2.3 General EE education provision**

EE education is considered a priority for Europe as outlined in its 2020 strategy (Curth, 2015). Therefore, the findings from this research are of relevance to HE providers in Ireland and across Europe as a whole. However, European EE policy supports EE education delivery across all levels of the education system (Entrepreneurship Forum, 2014) in addition to the provision of support through both European funded and private agencies. This research calls for all EE education providers to reflect on how they currently address OR in the context of broader EE delivery and urges them to consider the ORedu framework and the ORedu process as a valid alternative to facilitate OR competence development.

### **9.6.3 Recommendations for future research**

The literature revealed that interest in OR as a research area has grown since 2000, yet interest in OR as a feature of EE is a more recent phenomenon. Few empirical studies exist in this area, thus suggesting many avenues exist for future research in this domain:

The exploratory nature of this study led to the development of the revised ORedu process and the conceptual development of the proposed Framework for ORedu. Therefore, one avenue for further research lies in testing both the ORedu process and framework against the EntreComp Framework of competences (Bacigalupo *et al.*, 2016). Indeed longitudinal studies, examining the impact of the ORedu framework as students progress through their undergraduate education, could provide valuable insight into the true nature of OR competence development over time.

This research illustrated that educators' perceptions of opportunities appears to have an influence on the way they approach ORedu. Research into the influence of EE educator attitudes, on the development of analytical and creative thinking

skills required for OR, would also provide a welcome contribution to understanding variations of ORedu in practice.

The focus of this research was on educator experiences of ORedu. Similar research, looking at ORedu from the student perspective, could seek out students' lived experiences of current ORedu. Such research could add clarity to our understanding of ORedu from a student learning perspective. Indeed, studies could examine student experiences pre and post implementation of the Framework for ORedu, to consider its impact on student attributes, behaviours and skills.

A more thorough investigation of EE educators' perspectives on creativity and creativity education in the context of EE, could yield valuable insights into the nature of creativity training best suited for EE educators. This could enable tailored programmes to be developed in conjunction with EE educators, thereby addressing educators' self-declared gap in their knowledge and skill base.

This research set out to establish the suitability of DE approaches to ORedu in an EE context. However, opportunities exist to explore both domains from the reverse perspective, looking at the suitability of approaches used in the broader EE education domain that could enhance competency development in DE. Such research could serve to strengthen links between design and EE education.

Finally, this study was qualitative in design as it sought to explore the lived experiences of EE educators in an Irish context. Therefore, a clear opportunity exists to qualitatively replicate this research in other contexts. Alternatively, opportunities exist to quantitatively test these findings and this current research could provide the template from which hypothesis could be developed, to facilitate such studies.

## **9.7 Research limitations**

The current study has a number of research limitations which have implications for the conclusions arrived at. As an exploratory study, this research served to explore the experiences of educators in determining the suitability of DE approaches to ORedu. Therefore, this research did not set out to provide any definitive answers. The research design was qualitative in nature which must be considered when interpreting the findings. Qualitative research, by its nature, implies that the results cannot be entirely consistent if replicated in the same way (Holstien and Gubrium, 2011; Qu and Dumay, 2011; Bryman and Bell, 2007; Crotty, 1998). However, the researcher has taken steps to ensure the findings from this research are as consistent as possible (Holstien and Gubrium, 2011) (section 5.14).

The small sample size used in this research must be acknowledged as a limitation (section 5.15.1). A sample size of twenty educators, ten from both domains, were consulted for this research, although small, sample sizes of around ten participants are recommended for phenomenological studies (Creswell, 2007; Guest *et al.*, 2006; Hycner, 1985). As outlined in section 5.12.4 the researcher was careful to ensure data saturation had been reached before concluding that the

sample size was appropriate for the purpose of this research (Richards, 2009; Guest *et al.*, 2006). However, due to purposeful nature of the sample and the sample size used, the researcher recognises the limitation of the transferability of these research findings (Denscombe, 2010).

Limitations associated with using qualitative interviews, as the primary method of data collection for this study, include sacrificing breadth for depth of coverage and the existence of potential bias in the type and depth of information shared by participants (Sekaran and Bougie, 2010; Mason, 2004). To enhance research confidence, crystallisation in the form of observation was used (Bryman and Bell, 2007; Miles and Huberman, 1994). As outlined earlier in this document, the researcher took deliberate steps to try to minimise bias resulting from potential power differentials between herself and both educators and students who participated in this study (section 5.15). However, the researcher acknowledges limitations associated with the observation undertaken in this study. EE educators were more reluctant than DE educators to agree to observation, which the researcher attributes to the intimate, personal and immersive nature of observation as a data collection method and the fact that the researcher was a peer (Mason, 2004).

The researchers' prior experience and knowledge of the EE domain must be acknowledged as a limitation to this study, as the literature suggests that it is not possible to safeguard against such knowledge (Brannick and Coghlan, 2007). The researcher is an experienced EE educator in a HE Institution in Ireland and she was aware of how these vested interests and assumptions could impact the process and the findings from the research (Findlay, 2008; Creswell, 2007; Mason, 2004). As an EE educator, the researcher considered her position as partly that of an insider researcher (for the EE element of this research) although she deliberately chose not to include any educators from her own Institution, for primary data collection purposes, in order to minimise potential bias. However, she acknowledged that this closeness afforded her certain insights into EE education and she was very aware of her potential vested interest in the findings from the research (Brannick and Coghlan, 2007). The researcher was very sensitive to this throughout the process and was committed to being fully open to what the research would find. The researcher was careful to apply rigor to the research design and process to reduce the influence of her own experience on the findings. In particular she was actively committed to 'researcher reflexivity' by maintaining a researcher diary throughout (Findlay, 2008; Dowling, 2006; Kleinsasser, 2000).

As a sole researcher, judgement was required by the researcher in the coding of the data, and this could be seen as a limiting factor in interpreting the findings from this research. Taking a descriptive phenomenological approach to analysing the data, the researcher was very careful to ensure that the data reflected the participants experiences, not her own (Giorgi, 2006). The researcher checked node references carefully to make sure that the node title and associated references were true to the research. Whilst all data was coded by the researcher,

section 5.14.2 outlines the coding tests which were undertaken to check for coding consistency and to consider reasons for variation (Richards, 2009).

## **9.8 Reflexive analysis of the role of the researcher**

At the outset of this study I was aware of my bias in that I potentially could gain from this research, as an educator. I did my best to bracket my thoughts throughout, as outlined in (section 5.7.2). However, this research has had an impact on me and has changed me as an advanced practitioner.

This study has informed my experience at a number of levels. Firstly, the process of engaging with DE educators opened the door to a different world, one full of possibility, full of optimism, potential and a can do attitude. But this was not a world of mystery and genius, reserved for the talented few. In fact, this research revealed to me approaches that drew out student potential by enabling students to understand and channel their own thinking while at the same time acquiring the skills to express it. Of interest to me was the centrality of the educator in the whole process, but in a collaborative rather than an authoritative sense. The observations in particular served to make sense of all the words, both written and spoken, which I had come across in the research journey. These observations allowed me to really understand the nuances of DE as I saw the process in action, heard students talk through their thinking, saw students helping each other out, captured how educators questioned and worked with students and noted students' reaction to same.

The process of engaging with DE educators led me to question myself in terms of my accepted doctrine in EE, which I recorded in the diary. However, I was careful not to let such thoughts interfere with the data and in fact this made me more careful to check what I had found against the data itself.

Engaging with EE educators informed my experience in a different way. Of interest was that the interviews themselves had a noticeable impact on the interviewees, causing them to pause unnaturally on the topic of OR and consider it at a level that, was evident, they had not often done. On more than one occasion educators indicated that the interview had made them think. But this pause for thought revealed insights into ORedu that heretofore were buried in the totality of activity associated with EE education. To my surprise, explore was a feature of current ORedu, albeit in a different form to that of DE. Indeed, I was similarly surprised by the degree of similarity between stages of the ORedu process and DE process. What started out as a journey exploring two distinct worlds resulted in negotiating paths that were seemingly shared by both.

Undertaking this research created a 'conceptual gateway' into ORedu which has transformed how I approach OR as an educator (Meyer and Land, 2005). I now recognise the clear obligation on me, as an EE educator, to enable students to negotiate OR in a scaffolded way. The repositioning of myself in ORedu reflects a change in liminality brought about by the insights gained from this research. For example I now present students with a carefully designed brief, requiring exploration and the development multiple outputs. I encourage them to find

multiple sources of information and allow them the time to explore. I urge them to follow their curiosity and to find insights. I enable them to go out, to engage with others in truly understanding the problems they are trying to solve. I question their thinking and encourage them to dig deeper and find more. Only when I feel they truly understand the problem they are trying to solve do I allow them to generate options, explore some more and experiment with the solutions themselves.

My focus on assessment has also changed, moving more to reflective portfolios which trace the development of the project and students' thinking on the same. For me, the end result of this research is that I know why I am taking this approach and what it is that I am trying to develop in my students. However, by my nature I am open to ideas and constantly looking for ways to improve what I do. Therefore, I see this as the start of the journey and I look forward to myself and others' adding insights by developing this research further.

## **9.9 Concluding comment**

OR is considered critically important for the foundation and growth of all types of enterprises and equally so for graduates themselves in the 21<sup>st</sup> Century. The ability to recognise opportunities to add value to their own, and others' lives, is considered essential in the face of globalisation and rapid change.

This research has put a spotlight on OR as a distinct feature of EE education. While it was clear from this research that EE educators attend to OR, this research has shown that letting students rush into it, or muddle their way through it frequently leads to students experiencing problems with OR, or choosing unsuitable problems.

This research showed that educators, regardless of their perspective of OR, recognised a role for creativity in ORedu. The use of creativity techniques was popular in this regard. But creativity is more than just the output from creativity techniques. Creativity results in novel ideas, but these ideas are borne from insights gained by exploring, questioning, understanding, linking and combining knowledge different ways.

As EE educators we need to allow our students to be curious, to seek out relevant information and to have the confidence to experiment with ideas, before they commit to developing them as entrepreneurial opportunities. Creative ideas are frequently recognised as being novel but also value-laden in a given context. When we encourage students to be creative, we too must understand what it is that we are asking our students to do and how it is that they can do it, so that we can support them in this endeavor. The educators' role is therefore a critical one in this regard. Creative ideas are the feedstock for OR which in turn allows us as individuals, societies and economies to create tomorrow's reality.

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## **APPENDIX**





## **Appendix 1**

### **Attributes, behaviours and skills**

A review of entrepreneurial attributes, behaviours and skills resulted in lists from a variety of different sources. Of note however, was the lack of agreement of categorisation practices of researchers. To facilitate comparisons between these lists, the researcher of this current study has attempted to categorise them, using the QAA (2012) as an initial frame. Of interest, in the categorisation developed on the following pages some duplication between categories is evident, such as creativity and innovation, opportunity recognition, communication and networking. A summary of the categorisations derived from the following table is outlined in the main body of this thesis (Table 2.1).

Attributes	<p><b>Action orientation</b></p> <ul style="list-style-type: none"> <li>• Proactivity in the form of initiative taking (Mitchelmore and Rowley, 2010)</li> <li>• Proactiveness (Lakeus, 2013 citing Fisher <i>et al</i>, 2008)</li> <li>• Action orientation (Welsch and Young, 1982; Gibb, 2002)</li> </ul> <p><b>Alertness</b></p> <ul style="list-style-type: none"> <li>• Know what to look for (Ko and Butler, 2007)</li> <li>• Attitude of receptiveness to opportunities (Kirzner, 2009; 1997)</li> <li>• Alertness (NCGE, 2008)</li> </ul> <p><b>Ambiguity tolerance</b></p> <ul style="list-style-type: none"> <li>• Uncertainty / ambiguity tolerance (Walter and Heinrichs, 2015; Lakeus, 2013 citing Sanchez, 2011; McMullan and Shephard, 2008)</li> </ul> <p><b>Awareness</b></p> <ul style="list-style-type: none"> <li>• Self-insight (Lackeus, 2013)</li> <li>• Awareness of factors conducive to opportunity exploitation (Chell, 2013)</li> </ul> <p><b>Creativity and innovation</b></p> <ul style="list-style-type: none"> <li>• Creativity (Gibb, 2002)</li> <li>• Innovate and offer creative solutions to challenging and complex problems (QAA, 2012)</li> <li>• Innovativeness (Lakeus, 2013 citing Krueger, 2005; Schumpeter, 1934)</li> </ul> <p><b>Curiosity</b></p> <ul style="list-style-type: none"> <li>• Entrepreneurial curiosity (Jeraj and Marič, 2013; Kashdan <i>et al.</i>, 2004)</li> </ul> <p><b>Empathy</b></p> <ul style="list-style-type: none"> <li>• Empathy (Neck <i>et al.</i>, 2014)</li> </ul> <p><b>Intention</b></p> <ul style="list-style-type: none"> <li>• Entrepreneurial intention (do Paço, Ferreira, Raposo, Gouveia, and Dinis, 2015; Boddington and Berg, 2014; Kirby 2006; Ajzen, 1991; Bird, 1988).</li> </ul> <p><b>Internal locus of control</b></p> <ul style="list-style-type: none"> <li>• Recognise that they are in control of their own destiny (QAA, 2012)</li> <li>• Personal locus of control (Kroeck, Bullough and Reynolds, 2010; NCGE, 2008)</li> <li>• High internal locus of control (Gibb, 2002)</li> <li>• Internal locus of control (Welsch and Young, 1982)</li> </ul> <p><b>Openness to learn</b></p> <ul style="list-style-type: none"> <li>• Learn both from actions and active experimentation (QAA, 2012)</li> <li>• Ability to learn the 'rules' (Chell, 2013)</li> <li>• Curiosity (Litman, 2006)</li> <li>• Openness to innovation (Welsch and Young, 1982)</li> <li>• Learning by doing (Gibb, 2002)</li> </ul> <p><b>Passion</b></p> <ul style="list-style-type: none"> <li>• Entrepreneurial passion (Lakeus, 2013 citing Fisher <i>et al</i>, 2008)</li> </ul> <p><b>Perseverance</b></p> <ul style="list-style-type: none"> <li>• Demonstrate perseverance (QAA, 2012)</li> <li>• Perseverance (Lakeus, 2013 citing Markman <i>et al.</i>, 2005; Kirby, 2004; Gibb, 2002)</li> </ul> <p><b>Resilience</b></p> <ul style="list-style-type: none"> <li>• Ability to endure and cope with difficulties (Chell, 2013)</li> <li>• resilience and determination to achieve goals, especially within challenging situations (perseverance) (QAA, 2012)</li> <li>• Positive adaption to factors (Windle, 2010)</li> </ul> <p><b>Risk Taking</b></p> <ul style="list-style-type: none"> <li>• Risk Taking propensity (Zheng, 2012; Carland, Carland, Carland, Pearce and Pearce, 1995; Schwer and Yucelt, 1984; Welsch and Young, 1982; Brockhaus, 1980).</li> </ul>
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	<p><b>Self-belief / self efficacy</b></p> <ul style="list-style-type: none"> <li>• Self-belief, self-awareness (Chell, 2013)</li> <li>• Self-confidence (QAA, 2012)</li> <li>• Self-confidence, self-belief (Gibb, 2002)</li> <li>• Self-esteem (Welsch and Young, 1982)</li> <li>• Trust in own judgement; trusting (Chell,2013)</li> <li>• Self efficacy (Boddington and Berg, 2014; Lakeus, 2013 citing Fisher <i>et al</i>, 2008; Kruger, 1994)</li> </ul> <p><b>Self actualisation / achievement</b></p> <ul style="list-style-type: none"> <li>• Achievement orientation (Gibb, 2002)</li> <li>• Recognise and achieve goals and ambitions (QAA, 2012)</li> <li>• achievement orientation (NCGE, 2008, Kirby, 2006)</li> <li>• Need for achievement (McClelland, 1961 cited by Steward and Roth, 2007)</li> </ul>
Behaviours	<p><b>Creativity</b></p> <ul style="list-style-type: none"> <li>• Putting things together creatively (Gibb, 2002)</li> <li>• Being able to demonstrate creative innovative approaches (Chell, 2013)</li> </ul> <p><b>Management</b></p> <ul style="list-style-type: none"> <li>• Demonstrating independent responsibility for managing projects (managing autonomously) (QAA, 2012)</li> <li>• Approach to management (QAA, 2012; Cunningham and Lischeron, 1991)</li> <li>• Able to grow and sustain the enterprise (Chell, 2013)</li> <li>• Ability to exert influence and create change (Chell, 2013)</li> <li>• Ability to manage other people (Chell, 2013)</li> <li>• Ability to garner necessary material resources (Chell, 2013; Bird, 1988)</li> <li>• Entrepreneurial Management (Drucker, 1985b)</li> <li>• Strategy development (Drucker, 1985a)</li> <li>• Managing autonomously (Gibb, 2002)</li> </ul> <p><b>Opportunity recognition and development</b></p> <ul style="list-style-type: none"> <li>• The ability to seek out, be alert to, and identify opportunities (QAA, 2012)</li> <li>• Opportunity seeking and grasping (Gibb, 2002)</li> <li>• Scanning the horizon (Kirzner, 1997)</li> <li>• Creating new or transforming old products / services (Schumpeter, 1934)</li> </ul> <p><b>Ownership development</b></p> <ul style="list-style-type: none"> <li>• Ownership development (Chell, 2013)</li> <li>• Taking responsibility for and ownership of things (Gibb, 2002)</li> </ul> <p><b>Problem solving</b></p> <ul style="list-style-type: none"> <li>• Problem solving (QAA, 2012)</li> <li>• Solving problems creatively (Gibb, 2002)</li> </ul> <p><b>Risk taking</b></p> <ul style="list-style-type: none"> <li>• The initiative to act on perceived opportunities while considering risk factors (QAA, 2012)</li> <li>• Incremental risk taking (Chell, 2013)</li> <li>• Moderate risk takers (Brockhaus, 1980 citing McClelland, 1961)</li> <li>• Outcome of decision making (Zheng, 2012 citing Tversky and Kahneman, 1991)</li> <li>• Using judgement to take calculated risks (Gibb, 2002)</li> </ul> <p><b>Perseverance</b></p> <ul style="list-style-type: none"> <li>• Commitment to see things through (Chell, 2013)</li> <li>• The ability to reflect and persevere in challenging environments in pursuit of achieving desired objectives or goals (Personal awareness)(QAA, 2012)</li> </ul>

	<ul style="list-style-type: none"> <li>• Able to go the distance, energetic, motivation and effort expended (Chell, 2013)</li> <li>• Seeing things through (Gibb, 2002)</li> </ul> <p><b>Communication and Networking</b></p> <ul style="list-style-type: none"> <li>• Use of social skills to build trust, relationships and networks and to communicate ideas and information (QAA, 2012; Bird, 1988)</li> </ul> <p><b>Take Action</b></p> <ul style="list-style-type: none"> <li>• Take action (QAA, 2012)</li> <li>• Taking initiatives to make things happen (Gibb, 2002)</li> </ul>
Skills	<p><b>Analytical and conceptual thinking skills</b></p> <ul style="list-style-type: none"> <li>• Ability to perceive patterns in information in a given environment (Chell, 2013)</li> <li>• Recognition of social need / market need (Chell, 2013)</li> <li>• Ability to differentiate amongst opportunities / information (Chell, 2013)</li> <li>• Ability to overcome institutional and other constraints (problem solving) (Chell, 2013)</li> <li>• Mental models (Lakeus citing Kraiger et al, 1993)</li> <li>• Careful analysis of necessary factors (Drucker, 1985b)</li> </ul> <p><b>Communication and negotiation</b></p> <ul style="list-style-type: none"> <li>• Proposing opportunities (QAA, 2012; Gibb, 2002)</li> <li>• Persuasion (QAA, 2012)</li> <li>• Persuading (Gibb, 2002)</li> <li>• Selling /persuasive capacity (NCGE, 2008; Gibb, 2002)</li> <li>• Negotiation capacity (NCGE, 2008; Gibb, 2002)</li> <li>• Interpersonal skills (Lakeus, 2013 citing Fisher <i>et al</i>, 2008)</li> </ul> <p><b>Creativity and innovation</b></p> <ul style="list-style-type: none"> <li>• Creativity and innovation (QAA, 2012)</li> <li>• Openness to innovation (Welsch and Young, 1982)</li> <li>• Innovative / creative ability to generate novel ideas; ability to envision possibilities (Chell, 2013)</li> <li>• Being able to demonstrate creative innovative approaches (QAA, 2012)</li> <li>• Creative ability (Schumpeter, 1934)</li> </ul> <p><b>Decision-making</b></p> <ul style="list-style-type: none"> <li>• Decision making (QAA, 2012)</li> <li>• Intuitive decision-making with limited information (NCGE, 2008; Gibb, 2002)</li> </ul> <p><b>Information Acquisition</b></p> <ul style="list-style-type: none"> <li>• Ability to acquire information (Chell, 2013; Drucker, 1985b)</li> <li>• Information search strategies (Welsch and Young, 1982)</li> <li>• Scanning the horizon (Kirzner, 1997)</li> </ul> <p><b>Opportunity recognition</b></p> <ul style="list-style-type: none"> <li>• Identification of opportunity (Chell, 2013)</li> <li>• Recognition of opportunity (QAA, 2012)</li> <li>• Opportunity-seeking (NCGE, 2008)</li> <li>• Opportunity skills (Lakeus, 2013 citing Fisher <i>et al</i>, 2008)</li> </ul> <p><b>Problem Solving</b></p> <ul style="list-style-type: none"> <li>• Identify and evaluate problems (Guest, 1988)</li> <li>• Creative problem solving (Gibb, 2002)</li> </ul> <p><b>Planning</b></p> <ul style="list-style-type: none"> <li>• Strategic thinking (NCGE, 2008)</li> <li>• Business modelling (QAA, 2012)</li> <li>• Ability to plan and think ahead (Chell, 2013)</li> <li>• Ability to manage risk (Chell, 2013)</li> </ul>

	<ul style="list-style-type: none"><li>• Focus on strategic position (Drucker, 1985b)</li><li>• Strategic skills (Lakeus, 2013 citing Fisher <i>et al</i>, 2008; Drucker, 1985a)</li><li>• Holistically managing business / projects / situations (Gibb, 2002)</li><li>• Strategic thinking (Gibb, 2002)</li></ul> <p><b>Networking</b></p> <ul style="list-style-type: none"><li>• Networking and social embedding (Chell, 2013; Bird, 1988)</li><li>• Networking capacity (NCGE, 2008; Gibb, 2002)</li><li>• Use networking skills effectively (QAA, 2012)</li></ul>
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## Appendix 2

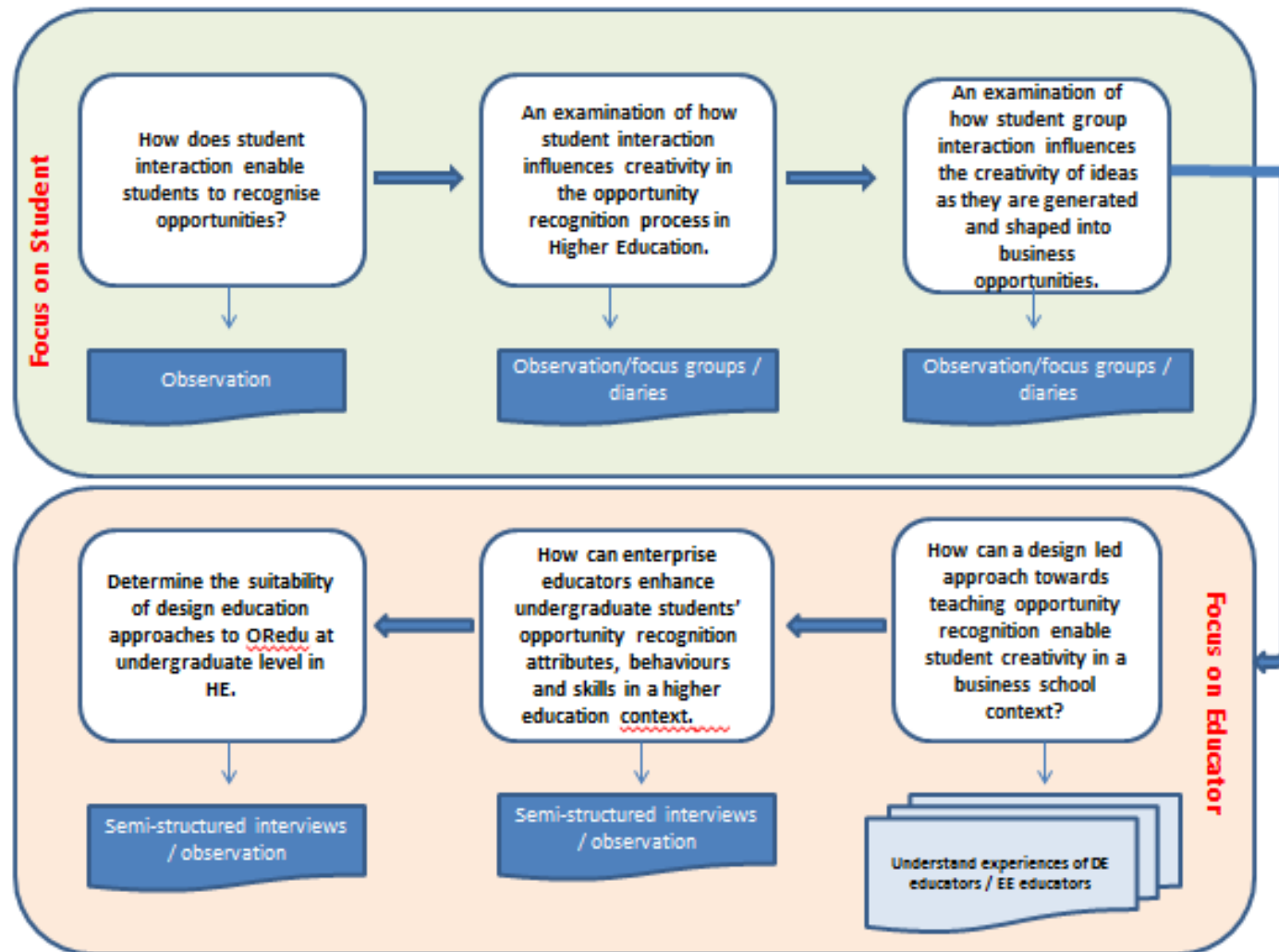
### The research journey

As a constructivist, the researcher acknowledges her role in the construction of meaning throughout the research process. Therefore, the researcher considered it important to outline how this research came about and to illustrate the research journey leading up to the operationalisation of this research.

The researcher, as an educator in EE education, became increasingly interested in the phenomenon of opportunity recognition. The researcher initially set out with a focus on enabling student creativity in OR. Therefore, at the outset the educator was interested in the student experience. Initially the researcher considered using convenience samples of students and thought that she might gather data using observation, focus groups and diaries.

However, as the researcher continued to engage with the literature, the research focus began to change. In light of the gap which emerged from the literature, it became clear that the research required an exploratory investigation from the EE educators' perspective. Therefore, the researcher realised that the data gathering methods initially considered would no longer enable the researcher to answer the research questions. The researcher had to consider an alternative research strategy that would provide the data required to answer the revised research question.

As the focus of the research was now on the educator experience of ORedu the researcher recognised that the research participants needed to be educators. The researchers' interest in exploring educators' lived experiences led her to purposeful sampling of educators, from both the design and EE education sectors, and data gathering using in-depth interviews, observation and a research diary, as outlined in chapter 5. The research journey is depicted in the figure on the following page.



## Appendix 3

### **'Pilot' questions EE educators**

- What EE courses do you deliver?
- What would you identify as the main learning outcomes from enterprise education?
- To what extent do the courses you teach require students to recognise opportunities?
- Is OR specifically addressed in the classroom or independently outside the classroom?
- In your opinion, how important is it for students to be competent in recognising opportunities?
- How does Ent Edu develop OR abilities in students?
- How is OR developed in students as they progress through their education?
- What do you find challenging about teaching OR?
- What do you enjoy about teaching OR?
- Can you talk me through an example of how students identify opportunities?
- Could you describe what is happening in the classroom when you are teaching OR?
- Can you talk me through who does what in this environment?
- What are the most important features of this environment?
- Can you talk me through how you assess student opportunities?
- Who is involved in assessing student performance?
- How do you assess student opportunity recognition abilities?
- To what extent do students receive feedback on their opportunities during or from assessment?
- How would you recognise if a student was competent at recognising opportunities?
- How would you recognise if students had challenges recognising opportunities?
- In what way do you encourage student creativity?
- How would you feel about using more creativity based education approaches to teach OR?
  - What challenges would you face introducing more creativity based approaches into what you do?
- What would encourage you to more creativity based approaches into what you do?



## **Final semi-structured interview questions EE education**

### **Opportunity Recognition**

- What are your thoughts on OR in EE?
- In your opinion, do students need to be competent in recognising opportunities?
- How does EE develop OR abilities in students as they progress through their education?
- What skills do you associate with OR?
- Can you talk me through an example of how students go about identifying opportunities?
- What aspects of OR do you emphasise when working with students?

### **Creativity and OR**

- In your opinion what role does creativity play in OR?
  - In what way do you encourage student creativity?
  - Tools / techniques

### **Learning Environment**

- Could you paint me a picture of what is happening in the classroom during OR?
  - If someone was looking in the window, what would they see?
  - Can you talk me through who does what in this environment?
  - What are the most notable features of this environment?
  - Can you describe the physical environment for me?
  - How would you describe the culture in this environment?

### **Assessment**

- Can you describe how you assess students in EE?
  - Can you talk me through how you assess student opportunities?
  - How would you recognise if a student was competent at recognising opportunities?
  - How would you recognise if students had challenges recognising opportunities?
- To what extent does OR feature as a learning outcome on the modules you deliver?

### **Design**

- What do you know about the concept of design in enterprise education?
  - How would you feel about using more design / creativity based education approaches to teach OR?

Are there any other aspects of opportunity recognition education that we haven't discussed but that you would like to mention at this stage?

### **'Pilot' questions DE educators**

- How would you describe a 'typical' design graduate.
- What would you identify as 'characteristic features' of design education?
- In what way does design education enhance student creativity throughout their education?
- In what way do design students need to be opportunity focused?
- How do students distinguish between ideas and opportunities?
- In your opinion, how does a design education develop opportunity recognition capabilities in students throughout their education?
- How does the design process start?
  - What is the purpose of the design brief?
  - Can you talk me through an example of how a student moves from a design brief to developing design ideas.
- Could you describe what is happening in the studio when students are developing their ideas?
  - Can you talk me through who does what in this environment?
  - What are the most important features of this learning environment?
  - Emotion, reflection, peers, critical feedback?
- Can you talk me through how you assess ideas developed by design students?
  - Who is involved in assessing student performance?
  - How do you assess students' opportunity recognition abilities?
  - To what extent do students receive feedback from assessment?
- What aspects of design education, if any, do you think would be suitable to enhance OR in non-design students?
- What challenges do you think non-design educators would face in incorporating design approaches into their courses?
  - How do you think these challenges could be overcome?

## **Final semi-structured interview questions DE educators**

- Can you talk to me about your understanding of the term 'design education'.
  - What would you identify as 'characteristic features' of design education?
- Can you describe what a typical design graduate is like?
- How does a design education develop a student into a designer?
  - How does a design education enhance student creativity?

### **Design Processes**

- What are your thoughts on 'design processes'?
- What is the purpose of the design brief?
  - Can you talk me through an example of how a student moves from a design brief to developing design ideas.
- What skills are developed in students as they engage in this process?

### **Learning Environment**

- Could you describe what is happening in the studio when students are developing their ideas?
  - Can you talk me through who does what in the studio?
  - What are the most notable features of this environment?
  - How would you describe the learning culture in this environment?

### **Assessment**

- Can you talk me through how you assess student ideas?
  - What are you assessing?
  - Who is involved?
  - Feedback from assessment?

### **Opportunity Recognition**

- What do you understand by the term 'opportunity' in a design education context?
- What role does 'opportunity' play in a design education?
  - Does a design education develop opportunity recognition capabilities in students?

### **Design Thinking**

- What are your thoughts on design thinking?
  - How do you feel about the adoption of design thinking in non-design domains?
  - Are there other elements of design that you think would be transferrable to non-design domains?
  - What challenges do you think non-design educators would face incorporating broader design approaches into their courses?

Is there anything else that you consider to be a feature of design education that we have not discussed?

## Appendix 4

### DE / EE Observation Guide

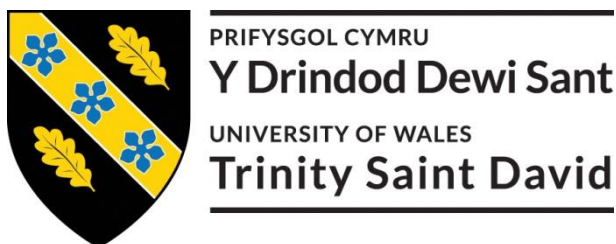
#### Learning environment

- What is noticeable about the physical environment?
- What is the atmosphere like?
- How is this created?
- What are the most notable features of this learning environment?

#### What is happening in this environment?

- How is the activity started?
  - What are educators doing?
  - How are they doing it?
  - What are students doing?
  - How are they doing it?
  - What type of feedback do students receive and from whom?
  - How do students respond?
  - Other?
- 
- Duration of event?

## Appendix 5



Participant Identification  
Number:

**PROJECT TITLE: Explore the suitability of design education approaches to opportunity recognition education at undergraduate level in HE.**

Dear (EE educator),

My name is Margaret Tynan and I am a lecturer in Enterprise at Waterford Institute of Technology. However, I am studying for a PhD in the School of Business at the University of Wales, Trinity Saint David and it is in this capacity that I have approached you.

I would like to invite you to participate in my research project. This project is looking at the way in which students are educated in opportunity recognition in higher education. In particular it aims to determine the suitability of creative education approaches to this area of enterprise education.

As an experienced enterprise educator I believe your opinions will be extremely helpful to me in understanding how opportunity recognition is currently developed in higher education in Ireland.

All information that you share with me will be kept strictly confidential and at **NO** time will you, or your institution, be identifiable in the final thesis or academic papers that may arise from this research. Your participation in this study is completely voluntary so you can withdraw from the research at any stage.

If you would like to participate in this research then you can do so in **one** of two ways.

1. Interview only
- or
2. Interview and observation

You will be required to participate in one interview which should take no longer than one hour. The interviews will allow me to explore your experience of educating students in opportunity recognition. With your permission, I would like to audio record this interview as a record of what we discussed. The interview can take place in a location of your choice such as at work or in a neutral location. All information shared with me during the interview will be kept confidential and coded to ensure anonymity.

A valuable insight into how opportunity recognition is taught would be gained should I have permission to observe this aspect of your course being delivered in context. I fully appreciate that this might be an unusual request but it would enable me to passively observe what happens in a classroom when students are identifying opportunities. I would be prepared to observe in any way that suited you i.e. sitting discretely at the back of the class either taking notes manually or video recording the class (if you were agreeable to this). I would not even have to be present in the room if you preferred. Observation is simply an option and you are free to just participate in the interview alone if you so wish. If you are amenable to letting me observe, then you are free to retract this offer at any stage prior to the observation taking place.

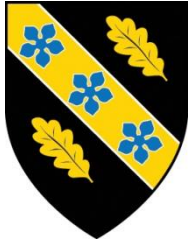
Information produced by this study will be stored in a file on my dedicated research computer and identified by a code number only. The code key connecting your name to specific information about you will be kept in a separate secure location. Information contained in your records will not be given to anyone unaffiliated with the study in a form that could identify you without your written consent, except as required by law. In addition, if used, you will be given the opportunity to listen to or read the audio transcript before you give your permission for their use if you so request. Upon completion of the PhD dissertation any transcripts and recordings will be destroyed. After careful and precise analysis of the data obtained from the interviews and the observation, I will be happy to provide you with a copy of the findings at your request.

The results of this research will enhance the depth of understanding of what happens in the classroom when educating students in opportunity recognition. I will also be interviewing and observing design educators to determine the suitability of creative approaches when educating students in opportunity recognition.

The output from this research could provide benefit to you as an enterprise educator in the form of greater clarity, focused guidance and potentially new approaches towards educating students in opportunity recognition.

If you have any questions regarding your rights as a participant in this research and/or concerns about the study, or if you feel under any pressure to enrol or to continue to participate in this study, you may contact my research Director of Studies, Dr. Jill Venus by email [jill.venus@uwtsd.ac.uk](mailto:jill.venus@uwtsd.ac.uk) or my Supervisor Professor Andy Penaluna at [andy.penaluna@uwtsd.ac.uk](mailto:andy.penaluna@uwtsd.ac.uk).

I thank you in advance for your time and participation. If you have any questions regarding the content of this letter or if you would like to voice concerns then please do not hesitate to contact me at your convenience.



PRIFYSGOL CYMRU

**Y Drindod Dewi Sant**

UNIVERSITY OF WALES

**Trinity Saint David**

Participant Identification  
Number:

TEITL Y PROSIECT: / PROJECT TITLE: **Explore the suitability of design education approaches to opportunity recognition education at undergraduate level in HE.**

Dear (DE Educator),

My name is Margaret Tynan and I am a lecturer in Enterprise at Waterford Institute of Technology. However, I am studying for a PhD in the School of Business at the University of Wales, Trinity Saint David and it is in this capacity that I have approached you.

I would like to invite you to participate in my research. This research is looking to determine the suitability of design education approaches in educating students in opportunity recognition in non-design disciplines. As an experienced design educator I believe your opinions will be extremely helpful to me in understanding design education and how it is currently delivered in higher education in Ireland. This research seeks to move beyond the popular attachment to design thinking and explore the potential that the broader design domain might offer.

All information that you share with me will be kept strictly confidential and at **NO** time will you, or your institution, be identifiable in the final thesis or academic papers that may arise from this research. Your participation in this study is completely voluntary so you can withdraw from the research at any stage.

If you would like to participate in this research then you can do so in **one** of two ways.

1. Interview only

or

2. Interview and observation

You will be required to participate in one interview which should take no longer than one hour. The interviews will allow me to explore your experience of educating design students. With your permission, I would like to audio record this interview as a record of what we discussed. The interview can take place in a location of your choice such as at work or in a neutral location. All information shared with me during the interview will be kept confidential and coded to ensure anonymity.

A valuable insight into how design education is delivered would be gained should I have permission to observe some elements of your course being delivered in context. I fully appreciate that this might be an unusual request but it would enable me to passively observe what happens in the design learning environment. Being from a non-design

domain this opportunity would provide a rich source of information which would deepen my level of understanding of design education. I would be prepared to observe in any way that suited you i.e. sitting discretely at the back of the class either taking notes manually or video recording the class (if you were agreeable to this). I would not even have to be present in the room if you preferred. Observation is simply an option and you are free to just participate in the interview alone if you so wish. If you are amenable to letting me observe, then you are free to determine when such observation can take place and also free to retract this offer at any stage prior to the observation taking place.

Information produced by this study will be stored in a file on my dedicated research computer and identified by a code number only. The code key connecting your name to specific information about you will be kept in a separate secure location. Information contained in your records will not be given to anyone unaffiliated with the study in a form that could identify you without your written consent, except as required by law. In addition, if used, you will be given the opportunity to listen to or read the audio transcript before you give your permission for their use if you so request. After careful and precise analysis of the data obtained from the interviews and the observation, I will be happy to provide you with a copy of the findings at your request. Upon completion of the PhD dissertation any transcripts and recordings will be destroyed.

The results of this research will enhance my depth of understanding of learning approaches used in design education and what takes place in the design learning environment. I will also be interviewing and observing enterprise educators to enable me to determine the suitability of design approaches when educating students to recognise opportunities in enterprise education.

The output from this research could be insightful to you as a design educator as it aims to strengthen the links between design and other non-design disciplines, where relevant and in a form that aspires to remain true to the nature of design education.

If you have any questions regarding your rights as a participant in this research and/or concerns about the study, or if you feel under any pressure to enrol or to continue to participate in this study, you may contact my research Director of Studies, Dr. Jill Venus by email [jill.venus@uwtsd.ac.uk](mailto:jill.venus@uwtsd.ac.uk) or my Supervisor Professor Andy Penaluna at [andy.penaluna@uwtsd.ac.uk](mailto:andy.penaluna@uwtsd.ac.uk).

I thank you in advance for your time and participation. If you have any questions regarding the content of this letter or if you would like to voice concerns then please do not hesitate to contact me at your convenience.





PRIFYSGOL CYMRU

**Y Drindod Dewi Sant**

UNIVERSITY OF WALES

**Trinity Saint David**

Observation

Number:

TEITL Y PROSIECT: / PROJECT TITLE: **Explore the suitability of design education approaches to opportunity recognition education at undergraduate level in HE.**

Dear student,

My name is Margaret Tynan and I am a student who is undertaking a PhD with the University of Wales, Trinity Saint David. I am undertaking research which is looking to determine the suitability of design education approaches for students in non-design disciplines.

To help with my research, I would like your permission to sit in and observe aspects of your course / tutorials in action. However, you are free to decline participation at any stage. An opportunity to observe would be extremely helpful to me in understanding design education and how it is currently delivered. The focus of my observation is on the education process taking place and how this is done. Most importantly the focus is not on you as an individual.

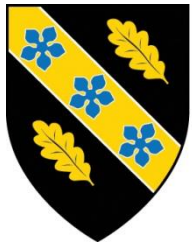
So what will this require of you?

- You are simply required to work away as you normally would and I will be sitting discretely in the room, taking notes on what is taking place.

I will be recording notes in a research diary will not be shared with anyone unaffiliated with this study. All data from this research study will be kept strictly confidential and will be stored in a locked cabinet until the study has come to a successful conclusion. Your identity will be kept confidential at all times in the write-up of this research. Findings from this research will be published in my final thesis and in academic papers or presentations related to this research.

I thank you in advance for considering my request. If you have any questions regarding the content of this letter or if you would like to voice concerns then please do not hesitate to contact me at your convenience.

## Appendix 6



PRIFYSGOL CYMRU  
**Y Drindod Dewi Sant**  
UNIVERSITY OF WALES  
**Trinity Saint David**

Participant Identification  
Number:

### FFURFLEN GANIATÂD CYFRANOGIAD PARTICIPATION CONSENT FORM

TEITL Y PROSIECT: / PROJECT TITLE: **Explore the suitability of design education approaches to opportunity recognition education at undergraduate level in HE.**

Name of Researcher: Margaret Tynan

**Please initial box**

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.
3. I understand that any information given by me may be used in future reports, articles or presentations by the research team.
4. I understand that my name will not appear in any reports, articles or presentations.
5. I agree to take part in the above study.

Name of Participant:

Researcher:

Signature:

Signature:

Date:

Date:

## Appendix 7

### Extracts from Code Change Log

Date	Initial Code	Description	Changed to	Description	Reason for Change
07/02/2016	Student Perceptions	Descriptions of student perceptions of entrepreneurial ideas	Student Pre-conceptions	Descriptions of pre-conceived ideas students have around idea generation and innovation.	More closely aligned to the meaning described in the transcript.
7/2/2016	Evolution of ideas	Description of creativity being required for ideas to evolve	Opportunity Development	Description of creativity required for opportunity development	Analysis of the references in this node revealed that a more accurate description of the content of this node was opportunity development. The focus of the references was not on the ideas alone but creativity required at stages in the opportunity development process.
8/2/2016	Delivering Material	Descriptions of delivering content to class groups.	Method of delivery	Descriptions of methods used for delivering EE	Closer examination of this node revealed that the descriptions were more illustrative of the methods of deliver rather than simply the content.
08/02/2016	Lead	Descriptions of educator leading students	Guide	Descriptions of educator guiding students on their journey	Lead was too narrow and guide suggests a less formal role as indicated in the transcripts.
08/02/2016	Classroom monitor	Description of the educator monitoring classroom activities	Monitor	Description of the educator monitoring student activities	Initial code was too narrow and limited monitoring to the classroom. However, from the transcripts it became clear that educators were monitoring more than just what goes on in the class room.

17/02/2016	Guest Speakers	Description of involvement with guest speakers	Industry Links	Description of involvement with industry	The interaction of links with industry were constrained by the 'guest speaker' title
18/2/2016	Challenges Ent Student- Idea Generation	Descriptions of idea generation being difficult for students	Deleted		The references attached to this node actually fit into other nodes e.g. resistance, fear, student experience of OR or out of their comfort zone. As such this node was deleted.
18/2/2016	Creativity Aspect	Description of the difficulty teaching the creative aspects of EE	Teaching Creativity	Description of the difficulty teaching the creative aspects of EE	Name change only. The old name did not reflect the references and the definition originally applied.
22/2/2016	Lack of buy-in	Description of the challenges posed by lack of buy in by staff	Culture	Description of the challenges posed by the culture of the institute	Lack of buy-in was too restrictive as other cultural features were revealed in the references attached to this node.
24/2/2016	OR Criteria	Descriptions of criteria used to recognise opportunities	OR Evaluation Criteria	Descriptions of criteria used to evaluate opportunities	Closer examination of this node revealed that the criteria were evaluation criteria.
25/2/2016	Filtering Ideas	Descriptions of the process of filtering ideas	Opportunity Selection	Description of the process of selecting opportunities to progress further	This re-definition extended the scope of this node to include filtering of ideas to the point of opportunity selection.

## **Appendix 8**

### **Extracts from Researcher's Reflective Log**

#### **Extract 1: 28/07/2015**

'The research is now moving on to the next stage but this first one has already taught me a lot e.g. a researcher needs to keep an open mind and not search for 'the answer'. Similarly, this process is fraught with emotion. There are the highs of finding a good paper, of writing a tricky paragraph and from engaging in constructive discussions with my supervisors. The lows of thinking you know what you are looking for but suddenly feeling lost. There is the awe of the scale of this undertaking. It feels as if I am standing at the bottom of a steep cliff and looking up! Then there is the passion of reading about an area you are interested in, devouring 'relevant articles' and constructing sound arguments. And lets not forget the impatience at wanting to move on, but knowing that there is more to do.'

#### **Extract 2: 02/11/2015**

'Undertaking the data collection has been very interesting and has forced me consider unexpected things. For example how should I appear? Whilst for some I am their peer, in this instance I am the student. I don't want them to think that they are being judged in any way. For that reason I decided to dress casually, but neat and this feels right. On all occasions I was relaxed and I think they were relaxed. In some cases, those I met were very casual, and for the observation I just blended in with the students.'

'The observation has been very revealing. Things I had read about and then heard about in the interviews played out in front of me and I can honestly say I now understand them at a different level. I saw the process in action. I realised what students were doing. I recognised what tutors were attempting. I could see the nature of the interactions and 'feel' the atmosphere in the room. Even I am surprised at how much can be learned in such a short period of time.'

#### **Extract 3: 13/11/2015**

'I have just returned from the ISBE conference which was a great experience. I came across different links between others' research and my own and presenting my own paper was a very re-assuring experience for me. Revealing what I am doing in front of peers, experts and practitioners was a risk. How would they react, am I making sense, can I justify my research 'gap'. However, the response was on the whole very positive, welcoming the research, both on the OR side and the fact that I am taking a broader look at design. I had offers of help, offers of reading material, offers of further discussions, and I am only at the conceptual stage yet!'

#### **Extract 4: 23/11/2015**

'As I prepare to undertake another interview I have become quite aware of attempts to 'bracket' my experiences in relation to the research. It feels as if I am

putting the brakes on the analytical part of my brain and consciously preventing myself from jumping to any conclusions. As the moment I am treating each interview as a stand-alone entity. I hear points coming up, which mirror arguments made in the literature, or my own experiences to some extent. However, I am consciously not labelling them. I stand with one piece of the jigsaw in my hands but I will not allow myself at this stage of the process to try to guess the final picture.'

**Extract 5: 27/11/2015**

'Transcribing the interviews soon after they were conducted is proving challenging but very rewarding. The interview is very much alive in my memory and I am brought straight back to the time, place and person I was with. Whilst I am careful not to rush to conclusions and I have the brake firmly on my thoughts, I am struck by things that I am surprised by or did not expect when transcribing. These are just whetting my appetite to start analysing the data. What is the relevance of these comments? Whilst I am keen to find out, I won't let myself go there. I am noting these things as I'm transcribing. This is not an easy process to do as I am a dreamer by nature and I like to think. I know there is value in what I am transcribing. I just don't know where it is or what it all means and I must be patient and wait.'

**Extract 6: 01/12/2016**

'My role as educator and researcher cannot be underestimated. I am conscious of my impact on EE educators, who, even though I wish to present as a student, I know they see me as a peer. DE educators appear to be curious and on the whole seem to welcome the fact that I am trying to understand DE beyond design thinking. However, I have realised that being an educator creates an openness around sharing their views on HE education, the system, the process and structure of semesterisation.'

**Extract 7: 24/02/2016**

'Analysis of the OR process was an interesting exercise. It became clear from the descriptions that there is not just one process, but similarities across processes were recognised. To this end I attempted to draw a common process from the themes identified in the data. Determining the flow of the process caused me to seriously consider my position as researcher. Was I reflecting what the data was telling me or was I allowing my own experience to colour what the data was revealing. This was particularly so in relation to 'explore' as a step. Where did it occur, did it really occur? I made a conscious effort to scrutinise the data and only to include what I saw in the descriptions given by the participants. This exercise lifted the veil that I hadn't realised had descended. I went back over the data and as carefully as I could and I examined the experiences of EE educators, making sure I focused on what they actually described, not on what I thought.'

'Analysis of the data has really only begun and whilst I was aware that my position as an educator was something I needed to be aware of, my experience today was

an eye-opener. I need to be cognisant of my thinking, what is guiding my thinking. I need to concentrate on being true to the data, to tell the story from the data. I need to question myself more often and be more critical of my role as a researcher.'

**Extract 8: 08/03/2016**

'The data analysis phase is a much slower phase of the research than I expected. However, as it progresses I feel I am becoming much closer to the data. I can recognise codes that emerge and locate relevant references in transcripts very quickly. Connections are starting to emerge and when they do, I note them down. At this stage I'm still down at the fine detail so I'm not yet sure where I'm going with those connections or the picture they are painting.'

'My analysis at this stage is mainly descriptive. I'm conscious that I need to remain true to the experiences described by the educators and I'm careful to ensure that my descriptive findings to date clearly reflect what the participants have said, rather than what I think they say. Therefore I am careful to check that any statements made are evidenced in the words used by the participants.'

**Extract 9: 09/03/2016**

'Today I analysed the role of the educator and found that a number of nodes collapsed into each other. I considered why this had happened. I realised that initial coding used the words that the participants had used (as recommended in the literature) and at times different nodes actually contained similar references. The process of filtering through the nodes seems slow and time evaporates when I'm analysing. Codes are collapsing or breaking down into sub-codes.'

**Extract 10: 25/04/2016**

'I'm heavily engaged in data analysis at this stage. To help make sense of all the coded data I have found, to my surprise, that I need to write about what I see. I have always thought I was quite visual in the way I see things, so the fact that I need to turn to words first to gain some sense of clarity is somewhat surprising!'

'Interestingly, now that the themes are emerging, I'm starting to visualise how they impact each other and what is feeding into them. This is resulting in sketches and trial runs of models. So I do need to draw after all ... but only after I have found words to describe what I can see'.

### **Extract 11: 04/05/2016**

'I am surprised how time consuming this stage has been. In particular, to really understand the data I have had to get into the minute detail. The broad categories that I initially started populating have become very full and were in need of finer analysis to get a true picture of what was happening. Once the fine detail was teased out I then had to come back up from the data to prune the data trees and see what story the data was telling me.'

'Sitting above the data requires a different mind-set. I consulted the literature before I attempted this stage, to help gain some clarity in terms of approach. This proved very helpful particularly in identifying linkages and challenging myself to rise above the detail.'

### **Extract 12: 28/10/2016**

'Today I presented my second paper at ISBE. I had mixed emotions before I began, as I was both excited at the prospect of sharing my empirical findings and also a bit nervous at the prospect. What would my peers make of it? The presentation went well, even if I did ignore the time check! At the end I had lots of questions and to my delight I could answer them. The questions were aimed at how you 'assess' ideas and also methodological ones, which I answered confidently, I think. However, it is clear that people are interested in this research.'

I attended a presentation on design yesterday and to my surprise I could see my critical evaluation skills have improved. I'm learning all the time and learning more than I had really expected from this process. It's not just learning about the research topic, but my research skills, my own creativity and critical reasoning skills have definitely been sharpened'.

### **Extract 13: Reflections from observations**

'Students chatting away as normal, laughing, singing and some starting to eat lunch as the tutorials progressed. The final tutorial is noticeably different. The tutor began by making a connection from where the student was from and where I live. This had an impact on the student as I felt he was the least comfortable and most conscious of my presence. I made a deliberate effort not to make eye-contact with the student during his tutorial and to sit to the side. The student engages well with the tutor, but asks a question .. and then promptly forgets the question ... maybe because I am observing?'



## Appendix 9

### Node tree for Current ORedu Process

Nodes			
	Name	Sources	References
[-]	OR Education	13	1268
[-]	Current ORedu Process	11	200
	Challenge	7	18
[+]	Explore	9	31
	Idea Generation	9	25
	Iterative	5	7
	Opportunity Development	7	15
	Opportunity Selection	6	9
	Outputs	4	6
	Problem Definition	5	12
[-]	Starting Point	6	10
	Company Problem	2	6
	Course Requirement	6	6
	Own Idea	5	9
[+]	Source of Ideas for Opportunitie	11	64
	Validate	7	13

## Node tree for Prominence of OR in EE

Nodes			
	Name	Sources	References
[-]	Prominence of OR in EE	11	210
[-]	Assessment OR EE	10	96
[+]	Determining Competency in OR	9	27
[+]	OR Evaluation Criteria	9	25
	Visibility of OR in assessment	9	21
[-]	Importance	9	21
[+]	Value of OR to the students	8	32
[-]	Progression OR Education	10	63
	Duplication	1	1
[+]	Ex Curricular Exposure to EE	8	11
[+]	Exposure to EE in the curriculum	9	22
	Gradual	4	5
	Scaffolding	2	2
[-]	Validating the Opportunity	9	24
	Validation Tools	1	2
[-]	Visibility of OR in EE	4	6
	Time Spent	6	10

## Node tree for Current ORedu

	Name	Sources	References
+	Factors influencing creative approaches to	11	246
-	Features of current OR education	13	577
-	Behaviours	9	39
	Experimenting	2	4
	Proactive	4	11
	Risk Taking	3	6
	Scanning	5	15
	Scenario building	1	2
+	Educator Background	7	18
+	Emotion	8	73
+	Learning Environment EE	13	116
+	Nature of Opportunities	8	21
+	OR in EE	10	77
+	OR Tools and Techniques	10	55
+	Role Enterprise Educator	12	45
+	Role Enterprise Student	8	24
+	Role of Creativity	8	27
-	Skills OR	11	82
+	Cognitive Processing	9	20
	Communication	8	18
	Networking Skills	4	7
+	Research Skills	9	30
	Teamwork	1	2

## Node tree for DE Develops Thinking

Name	Sources	References
DE Education Develops Thinking	0	0
DE Education is Process Based	16	392
Design Models	5	8
Design Process Can Be Unique	4	13
Making	5	17
Processes Design	16	302
Time	9	23
Influencing factors DE	14	987
Assessment DE	10	106
Challenge	13	303
Delivery	13	359
Learning Environment DE	13	219
Risk	11	64
Educator role risk	7	19
Student Resistance	1	2
Types of Thinking	14	202
Creativity in DE	12	79
Inventing the future	3	4
Problemsolving	11	61
Reflective Thinking	8	19
User Centric	7	21

## **Appendix 10**

### **Areas of difference**

This thesis would not be complete without highlighting a number of areas of difference between ORedu and DE which were found in this research. In particular education approaches, student progression, educator experience and resource constraints emerged as distinctive from this research.

### **Pedagogic stance**

In the context of this research EE educators were found to adopt both pedagogical and andragogical approaches to ORedu, reflecting the perspective that education frequently falls somewhere in the middle (Knowles, 1984). The role of the educator was clearly identified as one of coach and facilitator (section 2.5 and section 8.8). Educators described working closely with students to help them, yet responsibility for successfully recognising opportunities was found to lie firmly with the student. Reflecting pedagogic undertones, one educator explained that it was the future application of knowledge and skills that was considered most important (Knowles, 1984). The predominantly inward focused nature of the explore stage of ORedu, leaning on students' existing experience and knowledge, also reflects the andragogical nature of ORedu (Ashton and Newman, 2006).

In contrast DE educators in this study indicated that they push students to assume responsibility of their own work early on. These findings echo Ferrari *et al.* (2009) who see the educator as instrumental in fostering creativity by empowering students to take ownership of their own learning. DE educator descriptions of themselves as 'triggers' or guides in the process (section 7.3.6) hints at heutagogical influences in their approach (section 2.4).

The heutagogic nature of DE was more evident in the later stages of undergraduate study providing support for Blaschke (2012) who asserts that the movement from pedagogy to andragogy to heutagogy requires a level of maturity. At this stage DE students were considered more self-directed in their learning (section 7.6.6) making choices based on what they considered interesting or important to them thereby echoing features of heutagogy (Blaschke, 2012). DE educators explained that repetition of the design process enables students to understand what is required, to reflect, to develop their skills and to help them refine their own design processes and style over time.

All DE educators referred to the collaborative nature of DE, which was reflected in the emphasis on peer to peer engagement. Of note, was the collaborative nature of peer to peer learning by collectively pooling research, working things out and giving feedback (section 7.3.5). Evidence of learner-directed questions observed during tutorials and descriptions of flexible and negotiated assessments in later stages of DE strengthen heutagogic arguments in this regard (Blaschke, 2012). Similarly, the emphasis on reflection in the DE process in this research study suggest double loop learning associated with heutagogy, which Hase and Kenyon (2001) consider core to the process.

While features of heutagogy were evident in this research, this research study did not find that students were given complete control for learning and method of assessment in all cases (Blaschke, 2012). The method and form of assessment in particular was found to be clearly under the control of educators and guided by assessment rubrics (section 8.8.4). Systematic and structural changes such as moves towards modularisation, changes in course design and class size were seen to constrain learning and assessment practices, thus supporting the assertion that in reality moves towards heutagogy may prove unrealistic due to the dominance of pedagogy assertions in higher education (Jones *et al.*, 2014).

### **Operational structures**

As highlighted earlier in this chapter (section 6.3.4) student progression in ORedu was not clear cut. The findings show that the majority of students seemed to only encounter EE as a module once during their undergraduate education. Most frequently, modules were delivered in fifteen week semesters. An exception to this was encountered in one instance where semesterisation did not apply and students were exposed to EE education as a specialism each year of their undergraduate studies (section 6.2.5). However, this does not mean that EE educators were restricted in what or how they teach, and aligns with the findings of Penaluna *et al.* (2012) who discovered that EE educators perceive themselves to have freedom to organise the curriculum in whatever way they want and teach in whatever manner they wish.

EE educators were typically limited to three or four hours per week contact time, typically spread across a week, for a full semester (section 6.2.5). Of the EE classes observed, contact time of one hour at a time appeared to be the norm for EE education. EE educators mentioned time as a concern where EE formed part of another subject, therefore restricting the time available for OR in addition to other aspects of EE that needed to be covered. This echoes the findings of Phuakka (2011) who identifies time constraints as a contextual factor which influences creativity development and Ferrari *et al.* (2009) who identified teachers' overloaded schedules as a barrier to creative teaching.

This current research found that DE on the other hand was not delivered as a stand-alone module as it is recognised as a dedicated discipline. As such, students were exposed to DE across all subjects right throughout their undergraduate studies. DE educators frequently had blocks of time allocated to student contact, with a minimum of three hours blocked, where semesterisation and modularisation existed (section 7.3.4.1).

In DE, students had time to develop the skills and ways of thinking associated with DE (section 7.3.3). Time was also associated with building trust based relationships with students in DE, where educators frequently had contact with the same group of students across semesters or across academic years, over which time relationships could develop.

### **Educator expertise**

EE educators were typically specialists in other disciplines such as accounting, management, marketing, engineering or healthcare and they delivered modules in EE as required (section 6.1.2). All but two of the EE educators mentioned previous work experience in their area of expertise. Half of the EE educators had personal experience of OR, having previously had entrepreneurial ventures of their own. Two educators were currently still involved in their ventures. The number of educators with first-hand experience corresponds unfavourably with the 76% found by Penaluna *et al.* (2012), albeit levels are higher than those found by Matlay and Carey (2007). EE educators emphasised the importance of sharing their stories with students or bringing in external guest speakers to speak with students (section 6.4.5).

DE educators in contrast were typically design specialists in their educational role. Seven were still currently practicing designers whilst all had at some stage previous experience as professional designers in commercial enterprises (section 5.1.1). DE educators frequently used their expertise in the form of demonstrations to students. Similarly, they used their own contacts to draw in guest speakers or industry experts to speak with students. The following table illustrates these differences which these findings suggest influence the delivery of ORedu and DE.

## Areas of difference between the delivery ORedu and DE.

Areas of difference	ORedu	DE
Pedagogic stance	<ul style="list-style-type: none"> <li>• Pedagogical /Andragogical               <ul style="list-style-type: none"> <li>○ Focus on future application</li> <li>○ Educator led</li> <li>○ Educator as coach / facilitator</li> <li>○ Shared responsibility for learning</li> <li>○ Based on past / existing experience</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Andragogical /Heutagogical               <ul style="list-style-type: none"> <li>○ Educator as facilitator and guide</li> <li>○ Student-led</li> <li>○ Student ownership for learning</li> <li>○ Collaborative</li> <li>○ Future focused</li> </ul> </li> </ul>
Semesterisation	<ul style="list-style-type: none"> <li>• EE appeared to be offered in single stand-alone modules across disciplines</li> <li>• Extra-curricular enterprise activities which supported the formal curriculum.</li> </ul>	<ul style="list-style-type: none"> <li>• As DE is recognised as a discipline, students are continuously exposed to DE processes across subjects throughout their undergraduate studies.</li> </ul>
Time	<ul style="list-style-type: none"> <li>• Lack of time due to the confines of semesterisation.</li> <li>• A small proportion of an existing module being dedicated to EE</li> </ul>	<ul style="list-style-type: none"> <li>• Students worked for blocked periods of time ranging from a minimum of 3 hour blocks to more long term working space.</li> <li>• Educators emphasised the need to develop trust between themselves and the students, and that this takes time.</li> </ul>
Educator expertise	<ul style="list-style-type: none"> <li>• Five EE participants had some previous personal experience of entrepreneurship.</li> <li>• Two currently involved in their venture.</li> <li>• Eight described relevant experience in their discipline.</li> </ul>	<ul style="list-style-type: none"> <li>• All had prior experience as designers in industry.</li> <li>• 6 DE educators are still currently running their own design business.</li> <li>• Demonstrating the skill and then working with students in perfecting that skill.</li> </ul>
Facilities	<ul style="list-style-type: none"> <li>• Traditional classroom layout.</li> <li>• In most instances the rooms were stark, with bare walls, clean rows of desks all facing towards the front.</li> </ul>	<ul style="list-style-type: none"> <li>• Mostly studio based</li> <li>• Studio spaces displayed lots of artwork and work in progress, lots of post-it notes stuck on boards, models in various stages of completion and personal objects or symbols defining students' work place.</li> <li>• Other instances studio walls and allocated spaces were bare and clean. Tended to define rooms where student groups temporarily used the studio according to timetabled hours.</li> </ul>

Source: Researcher's own work