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# **Student Projects: Investigating the psychological factors of students and supervisors that impact on student success and development**

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## Abstract

A key aspect of the student learning experience in higher education takes place through student research projects. Existing research suggests that the supervisor plays a central role in the success of these projects (e.g. Devos, 2007). Current literature concentrates on the qualities of an effective supervisor and much focus is given to setting out guidance on what academics should do in order to become good supervisors (e.g. Lovitts, 2001). Independently, research suggests that students' characteristics and approaches to learning can have an impact on success (e.g. Busato et al, 2000). Conventionally, the qualities of a "good" supervisor and the qualities of a "good" student are studied separately. No research bridges the gap between these aspects. However, it is proposed that the qualities of the supervisory relationship, and hence the student's learning experience and the outcomes of the dissertation, depends on a complex interaction between the characteristics, personalities and expectations of both the student and the supervisor. This concept of a 'match'/'mismatch' in terms of psychological factors is novel but has significant implications for higher education.

With reference to the central importance of student projects for learning and development the research reported in this thesis concentrates firstly on the student, then on the supervisor and finally on the relationship between them. The thesis is divided into 4 research themes, with the aim of investigating if any psychological factors, of both the student and the supervisor, can predict student success and development during a final year and masters project. The first theme looks at the difference between undergraduate and masters students; the second addresses the characteristics of a "good" student; the third "good" supervision; and finally the 4<sup>th</sup> theme looks at the interaction between the student and supervisor and investigates the significance of "match" or "mismatch" of psychological factors in supervisor-student partnerships. This final theme considers the qualities of students and supervisors together.

Utilising a mixed-methods approach, combining questionnaires and semi-structured interviews, this research investigated pairs of students and supervisors. Data collection occurred in two phases: Student data pre-project and student and supervisor data post project. A total of 580 students and 60

supervisors were surveyed. This was complemented by interviews with 20 students and 10 supervisors.

On the basis of the findings it is concluded that there are qualitative differences between undergraduate and masters students in their approaches and attitudes to doing a project; in line with the findings of other research there are characteristics of students which are important for success; and there are some core characteristics of good supervisor; and finally, uniquely this research found that match and mismatch between student and supervisor is important in terms of students' perceptions of their success and development. It was clear that both the magnitude of difference and direction of the difference, between students and supervisors, had an impact and it seems that certain types of mismatch result in the highest perceptions of success for students. The implications for this research are discussed with a particular focus on higher education.

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## Author's Declaration

I declare that, except where explicit reference is made to the contribution of others, that this thesis is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Signature \_\_\_\_\_

Printed Name NIAMH FRIEL

# 1 Introduction & Background

## 1.1 Purposes of Higher Education

A persistent issue of concern at both philosophical and practical levels is that of the purpose of higher education. It seems clear that higher education has many purposes which are both research and teaching related. Higher education institutes serve students, but also the public as the research they do often has an impact on public policy. In addition, they also serve the public as they categorise students for the job market through the awarding of different degree classifications. However, this thesis focuses on the purpose of higher education for the student, that is, the student experience and issues surrounding student development.

One of the most important outcomes of the educational experience is the academic achievement of students. Upon leaving higher education an important aspect of a student's success is their final degree classification, in that this is a visible indicator to employers of their level of academic attainment during their time at university. Therefore, many institutions strive to provide the highest quality provision to students in order to encourage them to increase their own academic performance.

However, it is also important, particularly in the 21st century, that students should be encouraged to develop in various other capacities during their time at university (e.g. Barrie 2004, 2006). It is clear that broader questions must be asked regarding the purpose of a university in a context, such as the 21<sup>st</sup> century, where knowledge itself is fluid and contested. Thus, Barnett (2000) argues that the purpose of teaching in a university goes beyond preparing the learners with discipline specific skills and knowledge. As a result Barnett urges that learning should focus on 'learning-in-and-with-uncertainty'. Barnett (2000) argues that this is because that we now live in a world of "supercomplexity". By this he means that in the past the world was "complex", but there were solutions and answers to problems, however, now in a time of "supercomplexity" students have to learn that every problem cannot be answered and they have to become comfortable learning within this framework of uncertainty. He argues that we now exist within a period where the pace, nature and demand for

change are much greater than ever before. In addition to this, students live in an environment in which competing values are always an issue of concern. Often, in this “supercomplexity” stakeholders do not agree on values or courses of action and therefore students need to be able to develop their own stance. Barnett (2004) therefore concludes that the primary responsibility of those who teach within higher education institutions is to prepare students for this ever-changing and uncertain world.

One of the ways to prepare students for this ever-changing world is to focus on graduate attributes (Barnett, 2004; Boud 2000; Bowden et al, 2000). Barrie (2004) suggests that for many years universities have expressed their purpose through their claims about “graduate attributes”. Graduate attributes are the qualities, skills and understandings a university community agrees its students should develop during their time with the institution, and these consequently shape the contribution they are able to make to their profession and to society more generally. They are qualities that also prepare graduates as agents of social good in an unknown future (Bowden et al, 2000). Graduates have to be flexible and adaptable to change, since, as Boud (2000) states, only the skilled and flexible learners will be able to flourish in the changing contexts of an increasingly interconnected and complex society.

Some, for example within the graduate attributes literature (e.g. Barnett, 2004; Boud 2000; Bowden et al, 2000; Barrie, 2004), argue that one of the aims of higher education is to develop the student in the broadest possible sense and therefore much of the teaching and learning strategies adopted should focus on the holistic development of student, that is, developing the “whole” student. This means that in addition to developing in their academic capacity, which is clearly of high importance, students should also develop in other broader domains during their time at university.

In order to meet these needs it is argued that students should develop both critical thinking skills and positive attitudes towards learning (Bath et al, 2004). Further, graduates should have developed both autonomy and learning skills. This would allow them to assess their own learning. In being an assessor of learning students must be able to regulate their own learning. They must be responsible for the decisions they make with regards to their learning. That is,

they must become autonomous learners. These graduate attributes are vital in making students attractive to potential employers as these are the very abilities employers consider necessary for today's workers (Watts, 2006). These graduate attributes can be enhanced in students by the use of effective and appropriate teaching and learning experiences. MacKeogh (2006) suggests many of these skills are developed through student research projects.

## **1.2 Student Projects: Their importance to student learning and development**

In Scottish Higher Education an honours degree takes 4 years. After completion of an honours degree students may choose to study a masters degree. This masters degree may be integrated with their course, or it may be a postgraduate taught masters. A key part of both masters and undergraduate study is the independent dissertation - during the dissertation, students have the potential to develop academic excellence and acquire valuable transferable skills and the attributes that will be key to their future successes (MacKeogh, 2006). In order to highlight the importance of student final year and masters projects, it is vital to consider their prominence in relation to the purpose and context of higher education, outlined in the previous section.

Barrie (2004) highlights five clusters of abilities and skills that are important for successful operation within the global knowledge economy: research and inquiry; information literacy; personal and intellectual autonomy; ethical, social and professional understandings, and communication. Indeed, Andretta (2007) described information literacy as “the functional literacy for the 21<sup>st</sup> century”. All of these skills are fostered in final year and masters projects (e.g. see Laursen et al, 2012) and, as a result, in most undergraduate degree courses one of the most important aspects of the course is the final year dissertation/project. In particular, at an individual level undergraduate research promotes deep approaches to learning (Kuh, 2007; Ramsden, 1992), critical thinking (Ellis 2006), skill development (Bauer & Bennett, 2003), intellectual accomplishment (Lopatto, 2004), degree completion and higher degree aspirations (Pascarella & Terenzini, 2005).



In an environment in which students and supervisors have a shared responsibility for the development of graduate attributes (Barrie, 2004), final year projects can contribute to employability by helping the development of many of these attributes. Land (2013) suggests that some of the attributes that may be associated with the undergraduate project, if the correct supervision and student input is given, are; effective management of resources, time and operations; an understanding of the need for a high level of ethical, social, cultural environmental and wider professional conduct. Clearly then, if conducted to a high level, with an appropriate degree of supervision the undergraduate dissertation can allow the student to achieve academic success leading to the enhancement of critical thinking and indeed enhance students' attitudes towards the learning experience. Therefore, undergraduate research can contribute in significant ways to the development of graduate attributes.

Furthermore, undergraduates who participate in research are more likely to enter a research-related career (Kuh, 2007) or postgraduate education (Pascarella & Terenzini, 2005). While not all students will go on to engage with postgraduate study, the skills to perform research, for example to think creatively, are generally seen to be essential for successful operation in a global knowledge economy (Davis et al, 2006). Research experience may be particularly beneficial for those wishing to work within the subject discipline (Lopatto, 2004). MacKeogh (2006) highlights that the undergraduate dissertation is of particular importance as it allows undergraduate students an invaluable opportunity to prepare for postgraduate study in that it gives them an indication of their potential in the area. Therefore, the ability to produce high quality research should be of high importance to all undergraduates, whether their intention is to enter postgraduate study or enter the workplace. Consequently, educational reviews and commentaries such as the Boyer Commission Report (1998) have consistently raised the profile of undergraduate research.

In addition to student research being important to the individual student for their own skill development, research and teaching has a positive impact on the university at an institutional level. The inter-relationship between teaching and research is one of the defining features of Higher Education and the demand for the integration of teaching and research has increased further in recent years. As a result, at an institutional level in the UK, particular emphasis is placed on

the role of the final year research project (Booth & Harrington, 2003). According to Booth and Harrington (2003, p29) “an extended piece of individual academic research is what characterises an honours degree”. Consequently, the dissertation holds ‘a privileged place within many degree programmes’ (Hemmings, 2001, p241). This is due to the fact that it forms an important part of degree classification (Pathirage et al, 2004) and may be used to determine student ability at examination boards (Webster, Pepper & Jenkins, 2000).

Research on conceptions of learning (e.g. Marton et al, 1993) suggests that the most sophisticated conception of learning is ‘changing a person’. In undergraduate courses the aspect of study which perhaps has the most potential to change people is the final year project or dissertation (Light et al, 2001). This notion is outlined by Francis, who suggests that though the course of a project students change and develop in various domains:

“The independent research experience changes people, not simply in terms of technical expertise and knowledge in their field, but also in terms of the ways they value themselves and their work... A self forged through tackling the difficulties of research, especially when stress from other sources is high, is a new self”. (Francis cited in Graves and Varma, 1997, pg 18 ).

### **1.2.1 The particular benefits of practical projects**

When looking at undergraduate final year projects and masters theses it is important to make a clear distinction between dissertations and projects. There is some disagreement in the literature as to the similarities and differences between projects and dissertations. Williams & Horobin (1992) suggest that the aim of a project is to generate primary data. Therefore, the preparation of this requires the student to take a novel stance on an issue with a view to moving the area forward. In contrast, it has been argued that dissertations serve different purposes. They are for the purpose of generating secondary data and very often this takes the form of an essay (Parsons & Knight, 1998). While it is clear that there may be some differences between them, some have argued that both the dissertation and the project are similar, in that they require the student to write an extended piece of work from a scholarly viewpoint (Henry, 1994). This raises questions regarding the approach the supervisor takes. It could be the case that a different approach to supervision is needed for

dissertations as compared with projects. It seems plausible that different skills may be required by the student and supervisor when tackling a “dissertation” focused on generating secondary data compared to a “project” in which the main aim is to create new knowledge. Indeed, in order to take a novel stance on an issue and carry out a piece of research students probably need more supervision and more support from their supervisors. Therefore, the relationship between student and supervisor may be different in projects than in dissertations.

On the basis of this, since students doing practical projects rather than dissertations may have more potential for the development of the graduate attributes described previously, only practical project dissertations and masters’ theses will be considered in this study. For the purposes of this research practical projects are defined as projects in which empirical data is collected and analysed.

### **1.3 Factors affecting the success of the project**

It seems that the supervisor has a key role to play in the success of student projects. Current literature and many books (e.g. Wisker, 2010; Eley & Jennings 2005; Kamler & Thomson, 2014) have been published and developed which give guidance to supervisors on the best way to supervise and the pedagogy of “good” supervision. Much of this research has a concentration, in particular, on problems arising from the conflict that can sometimes exist between students and their supervisors. Some research (e.g. Blaxter et al, 1996) suggests that these conflicts may be related to differences between the expectations of the student and the expectations of the supervisor. Other research suggests that it may also be related to differences in their academic styles (Dawson, 1996). However, a ‘good teacher’ will not always show ‘good teaching’: although someone may have excellent competencies, the right beliefs and be inspirational, the nature of the environment may put serious limits on the teacher’s behaviour (see e.g., Zeichner & Gore, 1990). These environmental constraints may be related to time pressures and workload issues or *massification* - that is increasing numbers of students participating and completing study in higher education.

Since the 1990s, with the global growth in numbers of postgraduate students, postgraduate supervision has become a particularly popular area for research and sharing of practices (Delamont et al, 1997; Denicolo et al, 2000; Eley & Jennings, 2005; Lee & Green, 2009). Literature on doctoral supervision clearly outlines that the supervisor plays a key role in the success of the project (for example: Pearson & Kayrooz, 2004; Devos, 2007). These studies focus on the qualities that “good” supervisors possess, suggesting good supervisors have high levels of interaction, in terms of both frequency of meetings with students and the quality of these interactions (Gerholm, 1990; Hartnett, 1976). They provide students with feedback on their progress (Hartnett, 1976), helping them to complete in a timely manner (Lovitts, 2001).

However, compared to the PhD thesis there is a dearth of research within the area of student experience in relation to undergraduate and masters projects and dissertations. Yet it is important to address this issue, as it seems that while the PhD literature may, to some extent, be helpful this is also different in that the relationship forms over a longer period of time and since for many students the undergraduate research project is their first opportunity to experience independent research and is an important opportunity to acquire research skills.

Due to the importance being placed on these projects at both undergraduate and Masters level for the development of skills, and given the limited research in the area despite the fact that in most UK institutions this is a compulsory aspect of the course, the undergraduate and Masters projects will be the focus of this thesis.

Further, the UK had seen increasing numbers of students. The undergraduate population is large with 1,928,140 registered in the UK in 2012 (HESA, nd). In addition there has been an increase in taught Masters Students in recent years with a growth of 40% between 1995-1996 and 2002-2003 (Sastry, 2004, p. 6) and this has ipso facto led to an increase in the number of students undertaking Master’s dissertations (Taylor, 2002). Considering that the supervisor/student relationship is important for achievement in PhD study (Styles & Radloff, 2001), it could be argued that this relationship would be essential to a successful outcome in UG/master level study. Further, in 2002-03 nearly 120,000

postgraduates enrolled on taught masters programmes compared to only 16,000 starting PhDs (HEPI 2004). Given the large volume of students undertaking masters and undergraduate courses in comparison to PhD courses, research in this area has the potential to impact on a greater number of students.

As a result of the limited research at both undergraduate and masters level, due to the fact that much of the research in the area of effective supervision experience is conducted with PhD students and supervisors, doctoral level supervision research provides a valuable basis in the literature for this project.

### **1.3.1 Evidence from projects at PhD level**

The research discussed suggests that students can do better with a “good” supervisor. However, questions have to be raised regarding what a good supervisor is and if this is the same for every student, as this may be linked to the expectations the student and the supervisor have of each other. The research outlined in the previous paragraphs has suggested that there are qualities that a supervisor should possess in order to be a “good” supervisor. However, there is some tension in the literature with regard to “good” supervisors. Green (2005) explored the subjective nature of PhD supervision and suggested that the pedagogy of supervision should take into account the social and psychological disposition of students, along with their knowledge and educational capacity. It has been acknowledged that;

“appropriate research supervision has no set prescription. Rather, the interactions among quality and style of supervision, role expectations of student and supervisor, field of study, and other characteristics, have all to be jointly considered” (Kam, 1997, pg 101).

Kam goes on to outline that there is no fixed rules of what good supervision is, but rather good supervision evolves when the supervisory process is adapted to meet the idiosyncratic needs of the student. This is possibly due to the fact that supervision is a highly personalised process (Bennet & Knibbs, 1986).

Formulaic guides to supervision are unlikely to be useful as students have different needs and experiences and therefore they may require very different things from a supervisor. There are, however, core qualities that could be argued to be important to any supervisory relationship. Therefore, it is

proposed, that individual differences amongst students and supervisors also make guidelines somewhat hard to implement. What is needed is an exploration of student and supervisor characteristics and how these match/mismatch and come together with styles of supervision.

Students involved in projects often rely on their supervisor for relevant information, appropriate direction, inspiration and motivation necessary for successful thesis completion. Understanding student needs and the nature of their relationship with supervisors can assist in providing students with quality education in project collaboration (Wade-Benzoni et al, 2006). It seems that the individual differences of the student have a role to play in the way they potentially could be, and the way they want to be, supervised.

Independently of the supervision literature, there is a growing body of research on the individual differences between students and the impact these differences can have on success (e.g. Gilles & Bailleux 2001; Nofle & Robins 2007; Parker, Summerfeldt et al, 2004; Parker, Hogan et al, 2006; Blackwell et al, 2007; Lent et al, 1994; Bishop & Bieschke, 1998; Phillips & Russell, 1994). Psychological factors are becoming increasingly important to the study of student learning. Research on the psychological factors influencing learning centres around personality and the expectations students have of themselves. This suggests that student qualities can have an impact on their success.

With this information, it seems clear that the supervisor has a difficult role: they may want to ensure the needs of the student are met; however, there is no clear guidance on how they should do this. Due to the unique nature of supervision, every student may need differing levels of support. This could be based on many things, such as their knowledge of the subject; their level of autonomy; their levels of confidence and self-efficacy and the student's expectations of the process compared to their supervisor's expectations of the process.

The social psychology of supervisory relationships, with particular reference to PhD supervision, has been given some attention by Katz & Hartnett (1976), Lozoff (1976), Taylor (1976) and Schon (1987). This literature centres around the tension between the desire for autonomy and guidance in academic-student

relationships. For the student to become an effective researcher there must be a movement from dependence and guidance to autonomy and collegueship (Hockey, 1991; Overall et al, 2010). Supervision, like all social interactions, is a relationship. However, the kind of relationship which evolves will heavily influence the outcome of the student's success or failure- that is, supervision is a power relationship in which the student is somewhat dependent on their supervisor. Hockey (1994) has argues that every supervisory relationship has two dimensions: that of the intellectual as well as the pastoral or counselling aspect.

The relationship a student has with their supervisor can have many implications. Research into doctoral level supervision has suggested that the quality of a supervisor-student relationship directly impacts on the success the student experiences (e.g. Wisker et al, 2003; Pearson & Kayrooz, 2004; Devos, 2007). Indeed, a positive relationship can lead to many advantages for the student, including successful socialisation into the department and the discipline (Gerholm, 1990). On the other hand, an unsatisfactory relationship has been strongly linked to doctoral students' decision to leave doctoral study (Golde, 2000).

Much of the research that exists in the area of student preference in supervision (e.g. Brown & Atkins, 1988; Wright & Lodwick, 1989) outlines that the most popular style of supervision is one that combines professional and personal aspects. Research on styles of supervision emphasise the crucial need for the supervisor to create a supportive and nurturing environment and to share in a personal relationship with the student (Wilson, 1980). More recent research by Wright & Lodwick (1989, p. 50) confirms student preference for a supportive environment.

There are many models of supervision, most of which are related to doctoral supervision (Enders, 2004; Price & Money, 2002). Perhaps the simplest way of categorising styles of supervision is to view supervision as either 'problem-oriented' or 'process-oriented', where problem-oriented focuses on the tasks that need to be undertaken by the student and process-oriented is directed to the interpersonal processes in the relationship between supervisor and student (Emilsson & Johnson, 2007; Goode, 2010).

This characterisation of styles is reflected in the work of Murphy (2009) who investigated match and mismatch in students and supervisors perceptions of their preferred supervisory practices. Styles that emphasise the person and guidance are seen as more supportive of candidates (Emilsson & Johnson, 2007; Murphy, 2009). This is perhaps due to the fact that a supervisor who is willing to help with the emotional turmoil of the process of conducting a project and who is willing to share in the pleasure as well as the challenges of research has been found to be as important to students as the formal supervision that they receive (Grant, 2003).

Despite this, other authors such as Wright et al (2007) suggest that no one supervisory style is effective for all students. As Walford (1981) notes the rather simple concept of the supervisor's role is an inadequate base for understanding the complex relationship between student and supervisor. The same supervisory style may be 'excellent' for one student yet 'bad' for another. The relationship between student and supervisor is a dynamic one. Wright & Lodwick (1989) reiterate the point that excellent for one student may not be good for another and make clear the matter of supervisory style is problematic and it depends largely on the individual supervisors and students. As such, it has been suggested that “avoiding the twin trap of over or under supervising is never easy” (Day et al, 1998, pg 51).

However, while supervisory style may be important supervisors cannot, and should not, be wholly responsible for the development of their students. If skills are to develop, the student needs to be given, to some extent, control of their own learning. Through the use of effective pedagogy supervisors can encourage and aid the growth of these skills. One of the most effective ways of doing this is by engaging students in active learning (Healey et al, 2010; Lee, 2012).

### **1.3.2 Projects at undergraduate and masters level**

The importance of student projects has been previously outlined, in relation to student skill development and to graduate attributes. However, often where there is an excellent opportunity to develop with education there is also the potential for great disappointment. In undergraduate projects, as with PhD



projects, much disappointment is often traced directly to the *perceived* shortcomings of supervision (Rudd, 1986).

It seems to be the case, from the doctoral supervision literature examined, that the quality of supervision has an impact on student success and retention. Various aspects of supervision are important at PhD level. As mentioned, very little educational research has examined masters level and undergraduate level study and, in particular, there are very few studies that have investigated the dissertation component. The research which does exist in the area of masters supervision is concerned, in general, with expectations that staff and students have of each other in the process of supervision (e.g. Rodrigues et al, 2005; Woolhouse 2002; Hetrick & Trafford 1995; McMichael, 1992). Further, it has been found that supervisors and student often had differing expectations in relation to the project. Sayed et al (1998) investigated student expectations and they found contrasts in expectations of the supervisor as either a 'director' or a 'guide', different students and different supervisors had varying views on the position they should take. Emotional support from supervisors also came through strongly. These authors also described the challenges participants experienced in developing their understanding of the research process and found that supervisor support was important for overcoming these.

In addition to this it seems PhD supervision may differ in substantive ways from undergraduate and masters supervision. In undergraduate and masters supervision, the supervisor, very often, has a dual role of both supervisor and assessor however, at PhD level while the supervisor still assesses the student's progress and development they are not placed in the position of final assessor. The impact of this dual role, in terms of the relationship between students and supervisor, could potentially have implications at undergraduate and masters level.

In project supervision the function of the supervisor, as previously outlined, is diverse because of the wide and varied role the academic has in to play in these projects. It has already been acknowledged that positive supervisory relationships can have many benefits for the student and can enhance their potential by building their confidence and encouraging independence (Light et al, 2001). Traditionally the role of the supervisor has been to "provide guidance,

advice, instruction, encouragement, support, but the work should reflect that of the student and not the supervisor” (MacKeogh, 2006 pg 20).

However, as well as providing support and guidance the second part of supervision requires that the supervisor also acts as the student’s assessor as they provide formative and often summative feedback throughout the process (MacKeogh, 2006) and also, in undergraduate and masters supervision, they often mark the students work.

Parry and Hayden (1994) have pointed out the need for a balance to be achieved between giving adequate, timely help and not interfering. The ultimate aim for some supervisors may be to produce students with competent autonomy and if this is to be achieved students must be presented with opportunities to exercise significant degrees of decision-making (Boud, 1988). Indeed, a recent study by Overall et al (2010) highlights the need for supervisors to allow students to think and act autonomously. While this is generally agreed, what remains unclear is how supervisors can do this for every student. Consideration must be given to how much independence and autonomy students need and can cope with. There is recognition that independence and autonomy can only be realised in a context of considerable preparation of students and supervisors before any form of autonomous learning can be successfully implemented (Hurd, 1999). It has been suggested “avoiding the twin trap of over or under supervising is never easy” (Day et al, 1998, pg 51). Indeed, research has found individual differences in student preferences for supervision styles (e.g. Gatfield and Alpert, 2002).

One possible problem in supervision (e.g. Delamont et al, 1997) is that often a teaching-centred stance is taken. This stance reflects the philosophy of “this is how best to supervise”, rather than fully acknowledging the importance of student-centred learning in which students have a greater voice in how, what and when they are taught (Gurr, 2001). Grant (1999) is in agreement with this suggesting that supervisory advice based on prescribed guidelines is formulaic and is unlikely to be useful. Students have different needs and experiences and therefore they may require very different things from a supervisor.

Consequently, Grant (2005) views supervision as being a complex, uncertain practice which involves “a messy and unpredictable pedagogy in which the academic and the personal come together in an unusual way” (Grant 2005, pg

3). It has been acknowledged “appropriate research supervision has no set prescription. Rather, the interactions among quality and style of supervision, role expectations of student and supervisor, field of study, and other characteristics, have all to be jointly considered” (Kam, 1997, pg 101).

It is clear then, students have the potential to develop over the course of a project and this development is in line with the graduate attribute literature. However, it seems that their supervisor and the interaction between student and supervisor may have an impact on success and development.

## 1.4 Identification of the research focus

To summarise, if one of the purposes of Higher Education is to produce students who are autonomous in their own learning and therefore independent in their ability to learn and the role of a supervisor is to provide support, an academic supervisor is placed in a difficult position. They require the ability to recognise how much support to provide in order to enable the student to succeed while at the same time enabling them to develop autonomy in their own learning. Further, supervisors are under increasing pressures, with increasing workloads and from issues related to *massification*. Over the last few decades participation in the higher education sector has increased and indications are that it will continue to grow. The Higher Education Policy Institute (HEPI, 2009) estimate that in the UK growth between the academic years of 2007-2008 and 2029-2030 will be between 8% and 25%. One criticism of this expansion has been that it has led to *massification* of higher education (Malcolm and Zukas, 2000), resulting in increased student-to-teacher ratios. With higher student numbers, the task of knowing students as individual learners becomes increasingly difficult. Possible times when staff get to know students as individual learners are often during their final year of undergraduate study, and again during masters study, as students are given the opportunity to work more closely with a member of academic staff who is responsible for the supervision of their project/dissertation. These projects/dissertations, therefore, potentially overcome some of the problems created as a result of *massification* of higher education during earlier years of university study, however it places the academic supervisor in a uniquely difficult position as they need to try to meet the needs of more students when under increasing pressure from elsewhere.

By investigating the literature on doctoral supervision, several gaps in the current literature have been identified. On the basis of research, this thesis is an investigation of the psychological factors of learning and teaching which are important in student development and in supervision relationships. In particular it aims to investigate, firstly students in order to examine if there are any differences in characteristics or approaches to learning between undergraduate and masters students. This investigation is important as it would allow student development at different stages to be studied and also the identification of differences could lead to an improvement in interventions to support student learning at undergraduate and masters level.

The thesis then looks at student success and development in an attempt, for the first time, to establish if there are any psychological factors that predict success in student projects. Attention will then be given to the supervisor in order to investigate if there are any qualities of a “good supervisor”. Research on doctoral supervision (e.g. Green, 2005) clearly indicates that there are some similarities in the needs of all students, as students want and need support and guidance, to varying degrees. However, what is less clear is how this may be achieved with every student. Independence cannot simply mean the supervisor takes a hands-off approach to supervision. The challenge in the undergraduate project, for the supervisor, is to provide sufficient support to encourage autonomy while recognising that students have never engaged in this form of study before and may not feel fully prepared for the challenges associated with it. This section of the thesis will build on the previous literature on supervision, which has been conducted at PhD level, investigating the importance of the supervisor at undergraduate and masters level.

Finally, focus will be given to an investigation of the interaction between student and supervisor in terms of “match” or “mismatch” between students and supervisors on psychological factors. The aim being to investigate if this has an impact on student skill development and also supervision efficiency. Investigating matching of “pairs” of students and supervisors is novel.

Several key factors will be concentrated on, namely, personality (students and supervisors); emotional intelligence (students and supervisors); theories of intelligence (students and supervisors); self-efficacy and autonomy (students

only). In chapters 2-6 each of these will be discussed in relation to their importance to the thesis.

## 2 Personality

### 2.1 Importance of personality in education

Cattell (1965) suggested that for university students who have already been selected on intelligence, motivation and personality are just as important for predicting success and academic achievement. Research has confirmed that intelligence is, in fact, not always a good predictor of success in post-secondary settings (e.g. Busato et al, 2000; O’Conner and Paunonen, 2007). Chamorro-Premuzic and Furnham (2005) noted that the correlation between intelligence scores and academic achievement decreased as students became older, declining from 0.60 to 0.50, to 0.40, and to 0.30, at the elementary, secondary, university undergraduate, and postgraduate levels, respectively. This decline has often been attributed to ‘restriction of range’ because students have already been selected on intelligence at each successive stage in their education (Boekaerts 1995). Additional factors, such as personality, are therefore needed to predict academic achievement at post-secondary levels. Personality has been found to have an impact on student performance, in that personality traits predict academic performance and success in Higher Education (for example Busato et al 1999, 2000 and Chamorro-Premuzic & Furnham 2003). Further, recent research has shown that personality accounts for variance in academic achievement over and above intelligence (Bratko et al, 2006; Gilles and Bailleux 2001; Nofle & Robins 2007; Poropat 2009), and that personality may have even more predictive power than intelligence at the post-secondary levels of education (Conard 2006; Di Fabio & Busoni 2007; Furnham & Chamorro-Premuzic 2004). Therefore, it seems that, particularly in higher education, it is important to look at factors beyond intelligence when investigating student success.

Personality has been found to be related to different aspects of a student’s behaviour and attitude within an educational setting (Tokar et al, 1998). Students with different personalities seem to have, for example, differences in learning style (Busato et al, 1999) or strategy (Bidjerano & Dai, 2007), have different educational aspiration (Gasser et al, 2004), and have differing levels of achievement (Lounsbury et al, 2003; O’Connor & Paunonen, 2007).

Independently of the literature to suggest students' personality is important to their success, research (e.g. Korthagen, 2001) has found that the personality characteristics of teachers are also important indicators of their students' achievement. Lowyck (1994) in his investigation of teaching behaviour and teaching characteristics stressed that it is not the teaching behaviour in itself but the teacher's personality that is the paramount indicator for effectiveness.

Further, research (e.g. Patrick, 2011) suggests that there are certain personality characteristics students rate as being desirable in a teacher in higher education. In this research extraversion, openness, agreeableness and conscientiousness were found to be personality traits that students favoured in their instructors, however, neuroticism was an undesirable characteristic. Interestingly, when students are asked to rate the teaching effectiveness of their teachers it seems that students may be more influenced by the personality characteristics of their teacher, rather than other teaching characteristics- for example how much they learn. Thus, instructors who are perceived as having positive characteristics such as being caring have been found to receive higher student ratings, regardless of their discipline knowledge (e.g. Wilson 1998; Ahmadi et al, 2001).

However, when evaluating the importance of teacher personality on student success it is important to be mindful that some of the literature (eg. Clayson & Sheffet, 2006) is based on student *perceptions* of their teachers' teaching effectiveness. While it is clear there is a link between student perceptions of their teachers' personality and student success (e.g. Clayson and Sheffet 2006) other research (Feldman, 1986) has found that when teachers are asked to rate their own personality there is no link between their personality and student evaluations of their teaching. Therefore, it is important to consider both student and teacher perceptions of personality as it seems these may be slightly incongruent.

## **2.2 Theories of personality**

Given the significance of personality to both learning and teaching it is clearly important that a method is found to assess and measure personality. Central to this is a consideration of theories of personality. Modern psychological research

on personality recognises the complexity of people and therefore the field today is wide, with many theories and research methods, all of which take different approaches to measuring personality. There are two main approaches to theories on personality: the “type” approaches and the “trait” approaches. On the basis of current research and an evaluation of the academic literature into type and trait measures of personality it is argued that the five factor model is most useful for the present study (Costa and McCrae, 1995). This argument is made on the basis that trait approaches have been much more widely used within the academic literature than the “type” approaches. In addition, the five factor structure has been found to exist in most of the widely used personality measures (e.g. McCrae & Costa, 1985; McCrae and Costa, 1989; Costa and McCrae, 1995; Krug & Johns, 1986; Cattell et al, 1970; Eysenck & Wilson, 1991). Variations of the Big 5 scale are well validated and reliable and have been found to be universal in different languages, ages and races (Costa and McCrae, 1995).

### **2.2.1 Trait approach**

According to Burger (1997) traits are dimensions of personality used to categorise people. This is done by analysing the extent to which people manifest the particular characteristic. Generally there are two assumptions that underlie all trait approaches to personality. Traits are said to be consistent over time and relatively stable across different situations.

The 5 factor model of personality is perhaps the mostly widely used in academic research, with Costa and Mc Crae (1985, 1989, 1992) possibly being the most influential researchers in the area. Proponents of the Big 5 (e.g. Costa and McCrae, 1985, 1989, 1992; Goldberg, 1990; McCrae & John, 1992) suggest that virtually all personality measures can be reduced or categorised under the 5-factor model of personality, which has subsequently been labelled the “Big Five” (Goldberg, 1990). In brief, the Big 5 claims to be able to reduce personality to 5 main factors: Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism.

Openness refers to how willing people are to experience new things. It includes the characteristics of intellectual curiosity, divergent thinking and a willingness to consider new ideas. Conscientiousness describes our degree of discipline and



our self-control. High scores on this dimension are linked to determination, organisation and an ability to plan for events in life. Extraversion is a measure of the sociability of an individual. Individuals who are high on this scale are friendly, sociable, energetic and optimistic and can be assertive. Agreeableness is the scale that relates to the social interaction of a person. Individuals with high scores on this scale are trusting, helpful and sympathetic. Finally, neuroticism measures a person's emotional stability. People who have high scores in neuroticism experience large changes in their mood and are volatile in their emotions. Individuals with low scores on this are calm and well adjusted.

The dimensionality of the Big Five has been found to generalise across virtually all cultures, languages, ages and races (McCrae & Costa, 1995; 1997) and remains fairly stable over time (Costa & McCrae, 1992). Several longitudinal studies using a variety of standard questionnaires have concluded that mean levels of most personality traits neither increase nor decrease substantially throughout adulthood and that individuals retain their relative standing over periods of as long as 40 years (Costa & McCrae, 1988). It is claimed that "it is now abundantly clear that personality variables are robust predictors of behaviour" (McAdams and Olsen, 2010 pg 518). Under normal circumstances, adult traits are largely stable, as indicated by high correlation coefficients computed for a group assessed twice on the same trait (Caruso, 2000; Viswesvaran & Ones, 2000; McCrae & Costa, 2003).

### **2.2.1.1 Evaluation of the Big 5**

The support for the Big 5 is greater than the support for any of the other models, both trait and type, of personality (Costa and McCrae, 1995). In terms of how well this model "fits" with other models of personality the results are positive. For instance, the Big Five structure is supported by the Myers Briggs Scale (McCrae and Costa, 1989) in that four of the Big 5 factors have been identified in the Myres Briggs Indicator (MBTI) (McCrae and Costa, 1985). Further, the Big Five is also compatible with both Eysenck's 3- factor measure and Cattell's 14 factor measure. For example, Krug and Johns (1986) factor analysed Cattell's Sixteen Personality Factors (Cattell et al, 1970) and they found 5 second order factors. In addition Costa and McCrae (1995) found five factors in a validation study of the Eysenck Personality Profile (Eysenck & Wilson, 1991).

It is worth noting that some trait approaches suggest 5 factors, while others, for example Eysneck (1990) suggest only 3 factors. McCrae and Costa (1997) suggest that the reasons for this rest with the nature of the trait measures that are included. There is increasing agreement within the literature that there are 5 factors but it is the exact nature of these factors that is disputed (Goldberg & Saucier, 1995). The labelling of factors depends on the researcher's judgments about the best description of that particular cluster. Other research in the area has suggested that in the labelling it is possible that a seven factor solution may emerge (Almagor et al, 1995).

## **2.3 Personality and student projects**

Research (e.g. Lounsbury et al, 2003; O'Connor & Paunonen, 2007) suggests that there are some personality traits in students that are important for success. It has been found, for instance, a tendency towards extraversion is negatively associated with academic achievement in terms of students' grade point average (O'Connor & Paunonen, 2007). In contrast, conscientiousness correlates positively with academic achievement (de Fruyt & Mervielde, 1996; Furnham & Chamorro-Premuzic, 2004; Laidra et al, 2007; O'Connor & Paunonen, 2007). While some research has been identified in relation to personality characteristics and student success, in general, no research has been identified which looks at personality in relation to student academic success and skills development when completing a final year or masters project. Therefore current literature highlights that there are certain student characteristics that may be related to success in general in higher education, however, more research is needed to investigate if these factors are the same when conducting an independent research project.

Independently of student characteristics, research (e.g. Lowyck 1994; Patrick 2011; Korthagen, 2001) has outlined that the personality characteristics of a teacher are also of importance in teaching and there are certain personality qualities that good teachers have. Korthagen outlines some personal characteristics that are important for teachers such as empathy and the ability to regulate frustration and impatience. It is clear that some personality characteristics have been found to be "core qualities" of good supervisors. In addition, it seems lecturers receive higher student evaluations of their teaching

when they are extroverted, open, agreeable and conscientious, however, neuroticism was an undesirable characteristic (Patrick 2011). While personality characteristics in relation to “good” teaching and “good” PhD supervision is something that has been investigated within the literature, personality characteristics in relation to “good” undergraduate and masters project supervision is an area that requires more investigation.

In addition, there is some evidence to suggest there could be an interaction between student and staff personality. As it has also been shown that students’ seem to have preferences for personalities of lecturers that are similar to their own (eg. Chamorro-Premuzic et al 2008). In addition to this, some research has shown students take into consideration the personality attributes of their lecturers when choosing specific courses (Haghdoost and Shabiber, 2006). Research in this area has highlighted that there may be certain things students’ value in teachers, however, research has never assessed the impact of personality match or mismatch between students and supervisors. Preference for a particular style may not necessarily be linked to performance, therefore, as well as investigating the individual characteristics of students and supervisors there is a need to consider the interaction between the personality traits of students and supervisors and the impact of “match or mismatch” of these traits. This raises questions such as, do students with a particular personality always do well or does the environment they are in (in relation to the personality of their supervisor) also have an impact on their success and development.

In relation to the importance of personality, and students and supervisors working together, another important construct to consider is emotional intelligence (EI).

## 3 Emotional Intelligence

### 3.1 Importance of emotions in education

Teaching has been described as a passionate vocation (Fried, 1995). Fried outlines that good teachers do not just have knowledge of the subject, but also have a passion for ideas, learning, and care about their relationships with students. Several features of the “good teacher” have been investigated for some time by various researchers (Wisker, 2010; Ramsden & Moses, 1992; Nicol & Harrison, 2003) and research into desirable attributes of teachers has found that emotional factors of teaching are highly valued by the students. Harkin (1998), in a study with vocational learners age 17-19, found that affective behaviours are the most important factors in students’ satisfaction with their teachers. Examples of these behaviours included being friendly, listening to the views of the student, showing respect and recognising the student as an individual. Similarly, respect for students alongside sensitivity to the student’s level, clarity of requirements, understandable explanations and encouragement of independent thought were outlined by Feldman (1976) to be the main qualities of good teaching in higher education.

In a research investigation conducted in the school environment, Woods & Jeffrey (1996) studied what made “exceptional” teachers. These teachers did more than teach to a set of standards using approved techniques. Their cognitive scaffolding of concepts and teaching strategies was “held together with emotional bonds” (pg., 71). In relation to teachers of higher education, again, interpersonal characteristics such as empathy and approachableness were important to students as well as attributes that were related to the lecturer’s teaching skills and subject knowledge.

However, the focus on the importance of emotions within learning should not lie solely with the teacher. Emotional factors also play a central role in learning as well as teaching (Hargreaves, 2005). Literature (e.g. Boekaerts 1993; Goleman, 1995) outlines that learning can be enhanced by positive emotions and reduced by negative ones.

Emotions are essential for high levels of information processing, social communication, motivation, attention, critical thinking and memory skills (Jensen, 1998; Sylvester, 1995; Kusche & Greenberg, 1998).

### **3.2 Defining Emotional Intelligence**

It has for some time been accepted that there are various types of intelligence and the work by Gardner (1983) on multiple intelligences popularised the area. Gardner proposes that individuals have a combination of eight different kinds of intelligence and these are: spatial, linguistic, rhythmic, mathematical, kinaesthetic, interpersonal, intrapersonal and naturalistic. Extending on this idea that there are multiple intelligences, Goleman defines emotional intelligence as “the capacity for recognising our own feelings and those of others, for motivating ourselves, and for managing emotions in ourselves and in our relationships” (Goleman, 1998, pg 317). Gardner (1983) highlights that emotional intelligence involves, among other things, the ability to monitor others’ moods and temperaments and to use such knowledge to predict their future behaviour. Emotional intelligence therefore has two important strands, the ability to monitor the emotions of one’s self and the ability to monitor the emotions of others. Both of these may be important to the supervisory relationship.

### **3.3 Link between Trait Emotional Intelligence and Personality**

Research (e.g. Petrides et al, 2007) suggests that trait EI scores and personality scores are often correlated due to the fact that they are similar constructs. Specifically, Petrides et al. (2007) conclude that two dimensions of the Big Five, neuroticism and extroversion, are highly related to EI. This findings was supported by the work of Freudenthaler et al (2008) who found that when analysing global trait EI scores and personality there was a very strong negative correlation between EI and neuroticism and a strong positive correlation between EI and extroversion. Other research has found that trait EI measures generally have large significant correlations with Extroversion and Neuroticism, whilst smaller significant positive correlations with Openness, Agreeableness and

Conscientiousness (Dawda & Hart, 2000; Petrides & Furnham, 2001; Saklofske et al., 2003; Schutte et al., 1998).

Since trait EI is an aspect of personality, rather than a cognitive ability it seems that it fits into personality “space”. By locating trait EI in personality space it allows a comparison of emotional intelligence to the personality literature. Petrides et al. (2007) demonstrate that trait EI is a distinct (it is different to other measures of personality), compound (more than one factor of personality has an impact on EI) construct that lies at the lower levels of personality hierarchies, because the trait EI factor is oblique, rather than orthogonal to the Big Five. This is an advantage of trait emotional intelligence as it allows an integration of trait EI with other influential models of personality.

### **3.4 Importance of Emotional Intelligence in Higher Education**

Student emotional intelligence has been found to be key to their development as learners and ultimately to their success (e.g. Parker, Summerfeldt, et al, 2004). Goleman (1995) in his research outlined that there was a link between academic success and emotional competence, suggesting that emotional intelligence is more important than high I.Q. for success in academic settings (Rode et al, 2007). Indeed, several studies (e.g. Parker, Summerfeldt et al, 2004; Parker, Creque et al 2004; Parker, Hogan et al, 2006) have highlighted the link between success at university and emotional intelligence. Parker, Summerfeldt, et al. (2004) examined the impact of emotional intelligence on the academic achievement of first year students. They found that academically successful students, as measured by grade point average (GPA), scored significantly higher than the unsuccessful students on the intrapersonal, adaptability, stress management and total EI scales (see e.g. Parker, Summerfeldt etl al, 2004; Parker, Creque et al 2004; Parker, Hogan et al, 2006). In addition, Wong et al (1995) found that the ability to understand the emotions of another person was a moderate predictor of academic performance in students.

This however, is not always the case. Newsome et al (2000) in their study found contradictory results, they demonstrated that emotional intelligence was not an important predictor of academic success in a post-secondary environment.

Participants completed measures of general intelligence, personality, and EI. Using GPA as the measure of academic success, they found no significant associations between EI and academic success. From the literature it seems that there are mixed views in relation to the importance of student emotional intelligence and their success in higher education and, therefore, this is an area which requires further investigation.

However, much of the identified research (e.g. Parker, Summerfeldt et al, 2004; Parker, Creque et al 2004; Parker, Hogan et al, 2006) in the area of emotional intelligence in higher education has been conducted with first year university students with a view to investigating if emotional intelligence is linked to retention of students into their second year. Therefore, in addition to requiring more research in this area to confirm the findings of the mixed results, an investigation into the role and impact of emotional intelligence with more academically advanced students is also needed.

Independently to the literature on the emotional intelligence of the student, it seems that the emotional intelligence of the teacher/supervisor may also have an impact on student success. Conventionally, it has been suggested that teachers bring two qualities to the learning situation that are of value to the learner. Firstly, they bring expertise in the subject. Secondly, they have a knowledge of teaching and learning - teachers should be aware of the pedagogical methods they are using and the advantages of these to the learners. Mortiboys (2005) suggests that emotional intelligence is a third component in what a teacher has to offer to learners. Research (e.g. Mortiboys, 2005) suggests the emotional intelligence of the teacher can have an impact on student success. Academics are increasingly required to be innovative and creative (Zuber-Skerritt, 1992) and flexible and reflexive (Edwards, 1997). With increasing numbers of diverse students and an increase in workload, the opportunity for them to have the time to get to know each learner on an individual basis is restricted. While there is some research to suggest emotional intelligence is an important aspect of a good teacher, more research is required in the area to assess the importance of teacher/supervisor emotional intelligence when they are working with academically advanced students who are in the process of conducting a project.

As well as student emotional intelligence and teacher emotional intelligence being potentially important to student learning and development it seems important to be mindful of the relationship that exists between students and supervisors. Learning is described as an intrinsically emotional business (Claxton, 1999) and as a result of this it has been found that the relationship between staff and students can have an impact on student performance (Thomas 2002; Rhodes & Nevill 2004). This research concludes that good relationships have a positive impact on learning and retention. This is perhaps, in part, due to the fact that learning and teaching is an interactive process in which the learner and the teacher are inextricably linked. As with any relationship two parties are involved in supervision and therefore the emotional intelligence of the student and supervisor may interact with each other and influence student success and development. Therefore, not only is it important to consider the characteristics of the student and the supervisor independently in relation to student success and development, it is also important to consider the interaction between the student and supervisor in terms of emotional intelligence and the impact that this may have on the outcome for the student.

While personality and emotional intelligence may be of significance in student learning and in supervision, it is also important to consider other factors, such as the way the students and supervisors perceive themselves. The next section of the literature review will consider the importance of students' perceptions of their intelligence on their success.



## 4 Theories of Intelligence

“The self-theories of students and teachers are a neglected aspect of higher education, yet are important mediators of students’ development and achievement” (Yorke & Knight, 2004, pg 25).

Yorke & Knight (2004) argue that a piece of the student learning jigsaw is missing. They suggest that students approaches to studying and learning and the response of teachers to this has been studied in great detail from both a research (Entwistle, 2000) and pedagogical perspective (Biggs, 2003; Prosser & Trigwell 1999). According to Yorke & Knight (2004), none of these inventories investigates the self-theorising behind learning related activities. It is, therefore, important to consider the value of investigating these theories of intelligence in relation to higher education research and pedagogy.

### 4.1 Self-Theories

Implicit theories of intelligence are assumptions that an individual makes about the malleability of their intelligence (Dweck, 2006). Dweck (1999, 2006) argues that individuals differ with regard to how they view their own intelligence and proposes that students can have two beliefs about their intelligence; they either adopt an entity view of intelligence or an incremental view of intelligence. Learners who have an entity view of intelligence believe intellectual ability is a fixed trait, which they are unable to change greatly. On the other hand, those that have the incremental view of intelligence believe that their intellectual is more flexible and is something they can develop through education and hard work.

Research has shown that students who hold the entity view of intelligence have a fear of failure and as a result of this they do not challenge themselves and they reject opportunities to learn (e.g. Mueller and Dweck, 1998). Research suggests (Dweck & Bempechat, 1983) the reason for rejecting these opportunities to learn is that students who hold this view often adopt strategies to preserve their self-esteem, by looking and feeling intelligent these students engage in low-effort, low risk activities that they view as easy. It is proposed that, in part, this is because these students have a conception that increasing ability requires decreasing amounts of effort to achieve success (Blackwell et al,

2007). Clearly, this view can have a significant impact on a student's attitude to their academic work. The possible explanation for this finding has been subject to investigations by researchers (e.g. Dweck & Bempechat, 1983; Elliot & Dweck, 1988; Dweck & Sorich, 1999) who propose that students who have an entity view of intelligence focus on how much intelligence they have. For them it is important that they feel like they have sufficient intelligence and that others perceive them as being intelligent. This results in them attempting to look intelligent, often at the cost of learning. It is proposed that the reason for this is based around the finding that these students view additional effort as a signal to themselves, and to others that they have a fixed level of intelligence and therefore do not have the ability to solve a more challenging problem. As a result, this creates a helpless response in which the individual loses interest in the task and give up because they believe they lack the necessary intelligence to be able to complete the task (Dweck & Sorich, 1999).

The other view of intelligence that Dweck (2000) proposes is an incremental view of intelligence. Dweck (2000) argues that those students who believe that intelligence can develop, work hard in order to do just that. They try to improve their own ability. Dweck's research with these students found that they approach and perceive tasks in a different way from *entity* students. It is proposed that these students do not worry about challenges, but rather they relish and engage with them in order to accomplish them to the best of their abilities (Dweck 1999, 2006). In Dweck's work (e.g. 1996a, 1996b, 1996c, 1998, 1999, 2000, 2006) it is proposed that these students, who have an incremental view of intelligence, do not view intelligence as a fixed trait, but rather they perceive intelligence as a trait that is malleable and as such they believe it can grow and develop. Research (e.g. Dweck and Leggett, 1988) outlines that students with this view of intelligence believe that people have the ability to develop their own intelligence through learning and engaging with tasks.

In her work Dweck (e.g. 1996a, 1996b, 1996c, 1998, 1999, 2000, 2006) outlines that students with an incremental view are less concerned with looking and feeling clever and more concerned with learning, and as a result they enjoy challenging learning environments, as these are the environments in which they believe they will learn the most. As a result it is proposed that students with this view favour opportunities to learn something new as opposed to opportunities to

look clever (Elliot & Dweck, 1988). For those who have an incremental view of intelligence the goal is not to prove their intelligence to themselves or to others, but rather to improve their intelligence and they therefore engage in challenging learning experiences to achieve this (Dweck & Sorich, 1999).

Interestingly, research has suggested that students who have low confidence in their academic abilities but hold incremental view of intelligence still thrive on challenges (Henderson & Dweck, 1990). Henderson & Dweck (1990) came to the conclusion that being under-confident with a task did not stop students with an incremental mindset from applying themselves and engaging with challenges. They propose that this is due to students with an incremental view of intelligence having the perception that failure is not related to intelligence and therefore they did not have a “fear of failure”. As with the other research outlined they found that those with incremental views of intelligence were more able to apply themselves to difficult situations and engage with the task over a prolonged period of time, and this was independent of their levels of confidence (Henderson & Dweck, 1990). This is not to say that students who have an incremental view of intelligence do not believe there are individual differences between people and their levels of intellectual capacity. Students who hold an incremental view of intelligence still recognise that there are individual differences between how quickly people are able to master material. Further, they have an awareness of individual differences in knowledge, however, they have the belief that with the correct levels of support, guidance and effort anyone can increase their intellectual abilities (Mueller & Dweck, 1998).

## **4.2 Importance of theories of intelligence to student learning**

Dweck (1999, 2000) argues that one of the identifying features of those who are successful, in relation to learning, is that they thrive on situations where they are given the opportunity to learn new things and as a result of this they seek out challenging learning situations. In addition to this, due to the value they place on effort, they have the ability to persist even when faced with challenges and obstacles (Dweck & Sorich, 1999). This ability has been described by Dweck (1999) as “mastery-oriented” qualities.

Although it may seem intuitive that the students who are highly skilled in a particular area should be the ones who relish challenge and persevere more even after they face set-backs, research has provided results that contradict this. Often it is the case that it is students that are particularly talented in a given area who are the ones that have the greatest fear of failure and further these are the student who are often more likely to question their ability- especially when they are faced with a challenging learning experience (Licht & Dweck, 1984). This is perhaps due to the fact that high performing students are the students who have faced challenging situations less often in life and as a result of this they view their success as being related to their own intelligence. This finding is confirmed by other research which suggests that success per se does very little in improving students' confidence and their willingness to engage in challenging experiences. Indeed, research indicates that success can actually have the opposite effect (Diener & Dweck, 1978, 1980; Dweck 1975; Mueller & Dweck, 1998). This may be of particular importance for students in Higher Education, since these students in higher education, particularly at honours level and masters level, are probably the students that have been most successful in their educational careers and therefore there is the potential that these are the students who are particularly skilled and so are most likely to question their ability in challenging situations.

As a result of the empirical evidence from studies such as those outlined above, the notion of self-theories is becoming increasingly important in both education and psychology. There is a growing body of pedagogical evidence (e.g. Dweck, 2000) from within theories of intelligence and also from the self-efficacy literature (e.g. Bandura, 1986; Wood & Bandura, 1989) to suggest that the way learners think about themselves and their own ability to learn could be one of the most important factors that influences their success. This research proposes that self-theories could provide an explanation, to some extent, as to why some students display qualities such as the ability to engage with challenging learning experiences and then persevere while others do not. Dweck (1999) suggests that these two distinct implicit theories of intelligence that learners may hold, an incremental view of intelligence or an entity view of intelligence, are of importance in understanding intelligence and achievement.

Considerable research (e.g. Dweck, 1999; Dweck, 2000; Ablard, 2002; Aronson et al, 2001; Blackwell et al, 2007 ) has revealed that a person's view of intelligence can have a significant impact on the effort they expend on a task as well as their academic performance on the task. Individual differences in entity and incremental theories have been linked to different educational outcomes such as learning strategies, goal orientations, time spent studying and self-regulation (Dweck, 1999). In all her work Dweck proposes that students who holds an incremental view of intelligence engage more fully with tasks and at all times they ensure high levels of effort as they believe this will help them to achieve their goals. Students with this incremental view of intelligence are motivated to put their knowledge into practice and therefore, as a result, they thrive on the opportunity to stretch and develop the skill set they already have (Dweck & Bempechat, 1983).

However, for both entity and incremental theories there seems to be broad generalisations and there is a need for a more detailed investigation into the reasons underlying this. Many of the empirical results in the area of theories of intelligence are based on questionnaires. A more detailed exploration, using qualitative methods, could be beneficial for investigating the reason behind these observed results.

The research investigating implicit theories of intelligence has typically examined the effort and performance of school, as well as undergraduate college students, when they perform generic tasks. For example, studies have had young students complete three dimensional figures (Dweck & Reppucci, 1973), solve arithmetic problems (Dweck, 1975), learn basic principles of psychology (Licht & Dweck, 1984), solve conceptual problems (Diener & Dweck, 1978), or complete reasoning tests (Mueller & Dweck, 1998). In each of these studies implicit theories of intelligence have been documented to exert a large influence on key educational outcomes such as achievement goals (Dweck & Molden, 2005), belief in effort (Grant & Dweck, 2003), attributions (Hong et al, 1999), self-regulation (Molden & Dweck, 2006), and academic achievement (Blackwell et al, 2007). The results of these studies typically reveal that individuals with a fixed view of intelligence exert less effort and do not perform as well as people with a malleable view in challenging tasks.

### **4.2.1 The influence of others in the development of mindset**

Through analysis of implicit theories of intelligence it is clear that the results found support the conception that views of intelligence affect effort and performance on given tasks. These theories, however, also provide evidence to suggest that a person's view of intelligence is not static, and that it can change due to a variety of different influences. For example, Dweck (1999) reported that changes to a person's view of intelligence may occur because other successful people we admire hold a different view of intelligence from ourselves. This finding could be very influential in the context of Higher Education.

Research suggests that the type of praise an individual receives can influence their intelligence view. For example, both Kamins and Dweck (1999) and Mueller and Dweck (1998) praised individuals for either their ability or their effort when they successfully completed different generic tasks. When the individuals later failed a challenging task, the group receiving ability praise exhibited behaviours consistent with a fixed view of intelligence, that is they believed that their ability to complete the task successfully was related to their own intelligence. In contrast, individuals who were praised for their effort believe their success could be attributed to the time and effort they had expended in order to complete the task. This provides evidence which suggests that individuals praised for their ability are more likely to adopt a fixed intelligence view, while individuals praised for their effort are more likely to adopt a malleable view.

Studies have shown that an incremental mindset can be taught, most effectively by teachers or others who also have an incremental mindset (Dweck & Leggett, 1998). However, it seems the process of changing the mindset of another can be problematic and does not happen naturally through the course of studying. Robin and Pals (2002) in their research showed that progression through an education system (from high school to university) tends not, on its own, to change an individual's self-theory, however in certain situations through interaction with others a change of mindset may occur. It is interesting to investigate the impact of other people on a person's own mindset, and indeed what factors may cause a change in mindset.

In turn this could have an impact on both student performance and the relationship between students and their supervisor. Clearly hard work should lead to better results and in addition to this it may be the case that supervisors see that the student is working hard and therefore encourage them more and spend more time helping them. This means that the advantages to the student are twofold, firstly their viewpoint helps them to work harder in order to accomplish the task. Secondly, due to the time and effort they are spending on their work, their supervisor may reciprocate this effort in order to help them more than those students who appear to be doing less work. Indeed, it would seem from research that it is highly possible that those who believe intelligence is fixed are doing less work.

### **4.3 Potential importance of Theory of Intelligence for student projects**

At times during a project students have to face challenges that they perhaps did not expect. Students, often for the first time, are charged with designing and managing a significant piece of work, which is compulsory, and with this comes challenges. If, as Dweck suggests, students with an incremental view relish challenges and thrive on them it is possible they will be particularly suited to conducting a project. However, those with the entity view may be at a disadvantage in that perhaps their project choice will be less ambitious, with a view that they will be able to complete without too much challenge. Facing challenges and realising that they can be overcome must be one of the significant learning experiences to be taken from projects. As the students realise they are able to do something themselves that they may not have thought possible, it seems likely that there is a potential for mindset to be important.

A possible implication of this is the potential for a change in mindset over the course of the project due to the nature of the supervision relationship. In undertaking a degree, students experience most of their learning as one of a group of, sometimes, several hundred students. It is possible that the project is the first time during their time at university that they have worked closely with a member of staff who knows them by name. This change in dynamic could have implications for the student's own mindset. As they work more closely in an

academic environment they may begin to witness, first hand, the time and dedication taken to reach high levels of accomplishment. This could lead them to believe that fundamental aspects of intelligence can be enhanced through learning (Sternberg, 2005); and that dedication and persistence during challenging times are important for success (Ericsson et al, 2006).

Further, often for the first time, students who are writing up their project are given the opportunity to re-draft their work on the basis of feedback given before submission. It is possible, and this will be investigated, that the feedback and re-drafting process could have implications for mindset. Usually in university, feedback is given at the end of the process and the student therefore has to try to apply this feedback to the next piece of coursework, which can be a difficult task given that often the next piece of coursework to be submitted is in the next semester. During the dissertation the student receives more feedback during the process and their supervisor gives them suggestions for improvement which they can implement right away. As they make these changes to their work they are likely to recognise it has improved. If this feedback happens as a continuous two way process, in which the student actively engages, it is likely that some of this becomes internalised and the student can start to self-regulate themselves to evaluate their own work. The ability to recognise that their work can be improved could be key to developing a growth mindset.

The research and findings, mostly by Dweck (e.g. 1991; 1996a; 1996b; 1996c; 1998), in the field of implicit theories of intelligence raises interesting questions regarding achievement, and could, according to Yorke & Knight (2004), complete this missing piece of the student learning jigsaw. It is important to consider these findings in the light of other research in the area of student learning.

Given the research outlined in this chapter, it seems plausible that students' mindsets could have an influence on their success and development over the course of a project. In addition to this, given that incremental mindsets can be taught most effectively by teachers, it seems plausible that when students are working with a supervisor with a similar/different mindset to themselves this may have an impact on the student's theory of intelligence. An important point to note is that this view of intelligence presented by Dweck is possibly too



simplistic and too individualistic. As has been previously outlined, emotions play a key role in student learning, development and success. Dweck gives little consideration to other factors, such as individual, social and institutional factors all of which have been shown (Tinto 1975, 1993, 1997; Benn 1982; Astin 1984; Johnes 1990; Pascarella & Terenzini, 1991) to have an important role in retention and success in higher education. So, while there is the potential for theories of intelligence to explain some of the variation between students, other factors have to be jointly considered. Further research is needed in the area of theories of intelligence in relation to higher education due to the limited research conducted with academically advanced students.

Another, and potentially related theme, self-efficacy and self-confidence will now be discussed in relation to its importance to student learning.

## **5 Self-efficacy & Self-confidence**

### **5.1 Definition of self-efficacy**

Self-efficacy is described by Bandura (1986) as a persons' belief about their own ability to produce a desired outcome. In many ways having high self-efficacy about abilities seems to be related to having an incremental view of intelligence. Bandura (1997) suggests that high self-efficacy is important because it matters that individuals are confident and that they have the required skills to engage in and persist with tasks, especially when they are faced with challenges. Self-efficacy has been researched in a variety of different domains, for example: sport; diet and exercise; human resources; and importantly educational attainment (e.g., Bandura, 1997; Barling & Beattie, 1983; Chen et al, 1998; Gist, 1987; Igbaria & Iivari, 1995; Wood & Bandura, 1989). Each of these studies is important in demonstrating the power of self-efficacy in human learning and attainment, suggesting that self-efficacy is positively correlated with success.

According to Bandura (1986) self-efficacy is not related to a person's actual ability per se; Bandura (1986) suggests that the way in which individuals behave is best predicted by the beliefs they hold about their capabilities rather than what they are actually capable of accomplishing. In his research Bandura proposes that self-efficacy perceptions are an important factor in determining what individuals do with the knowledge they have and the skills they possess.

### **5.2 The difference between self-efficacy and self-confidence**

While intuitively it seems that high self-efficacy, which is a belief in one's own ability, and high self-confidence may be the same construct, research in the area suggests this may not be the case. This link between self-confidence and self-efficacy has been investigated mainly in the area of sport (for example see Feltz et al, 2008; Moritz et al, 2000). From these investigations the researchers come to the conclusion that self-confidence is a more generic term which refers to a person's certainty about their ability to be successful in general (Bandura, 1986). For example Vealey (1986), conducted studies and found high self-

confidence to be related to an athlete's certainty about their ability to be successful in sport. Self-efficacy, on the other hand, refers to one's belief that he or she can be successful in specific tasks, skills or under specific conditions (Bandura, 1986). Therefore, people could have high levels of self-efficacy, they believe they can do well in a specific task, however they could have low self-confidence, believing in general that they will not be successful. Much of the literature (e.g. Bandura, 1986) seems to suggest that self-confidence and self-efficacy are different, however, they seem related. It could be the case that the relationship between self-confidence and self-efficacy is based upon the perceived effort required in order achieve a high standard of performance. Perhaps if people believe they will do well with high amounts of effort they may also feel that they cannot put this much effort into everything they do which could result in high efficacy, but low confidence.

### **5.3 Impact of self-efficacy on performance**

If the belief that one has regarding how well one can perform actually impacts on outcome then self-efficacy becomes a very important consideration for student learning, particularly in the context of higher education.

Research (e.g. Bandura, 1986; 1997) has highlighted that there are four main factors that influence self-efficacy. Each of these is believed to have an impact on performance. Firstly, mastery experiences suggest that students' successful experiences boost their self-efficacy, while failures have a negative impact. This would suggest that students past experiences of success or failure have an impact on their perceptions of later tasks. Secondly, vicarious experiences occur when students are able to observe their peers succeed at a task and as a result this can strengthen beliefs in their own abilities. Thirdly, verbal persuasion outlines the impact others can have on a person's self-efficacy. Teachers, for example, are believed (Shaughnessy, 2004) to be able to boost self-efficacy with credible communication and feedback to guide the student through the task. Finally, student's emotional state/ physiological factors impacts upon their self-efficacy (Margolis and McCabe, 2006). Students with high self-efficacy may perceive and interpret physiological signs associated with stress in a different way to students with low self-efficacy. Margolis and McCabe

(2006) concluded that positive emotions can boost self-efficacy beliefs, however, anxiety can undermine them.

While high self-efficacy has been shown to relate to high performance (e.g. Bandura, 1997) it can also be the case that high self-efficacy is detrimental to performance. If performers of the task are over-confident in their own abilities it may encourage a less careful and systematic approach to their work. This could, in part, explain some of the contradictory findings by researchers who have examined the relationship between self-efficacy and performance in sport. Correlations between self-efficacy and performance seem to range considerably. For example Martin & Gill (1991) found a high correlation of 0.79 between these two factors. However, McAuley (1985) found low correlations between these and in their research there was only 0.01 correlation between the factors.

## **5.4 Importance of self-efficacy development in students conducting research**

Given the research outlined above it seems to be the case that a strong sense of self-efficacy could be an important quality in a student as the student is more likely to be intrinsically motivated. Further, Bandura (1998) proposes that students with high levels of self-efficacy will engage in tasks with higher amounts of effort in order that they can accomplish them and ultimately achieve success. In this research he outlines that students who display high self-efficacy often attribute failures to factors within their own control, rather than looking for external causes to explain their lack of achievement in a particular learning situation. In contrast to students with high self-efficacy, research (e.g. Margolis and McCabe, 2006) suggests that students with lower levels of self-efficacy, believing they may never succeed, are more likely to not engage with the task. As a result of their lack of engagement they also exert less effort than those with high self-efficacy. On the basis of these findings, it seems self-efficacy may have an impact on students' willingness to engage with tasks and also the effort they expend on them.

One situation where students may benefit from high levels of self-efficacy is when they are asked to engage in an individual learning experience, for example

a research project. Research self-efficacy is confidence specifically in successfully performing tasks associated with conducting research (e.g., analysing data, writing up a report). It seems from the literature in the area that early involvement in research can influence research self-efficacy (Betz, 1986), with involvement in research from early in an academic career leading to higher research self-efficacy. Therefore, it seems important to focus on and measure self-efficacy at undergraduate level, as this is possibly the earliest time students engage in research.

Having high research self-efficacy is of importance because high self-efficacy is also believed to be a relevant factor in students career choice and then in persistence in their chosen field (Lent et al, 1994). For individuals seeking careers in science or social sciences, research self-efficacy is critical as these are disciplines which require those working within the area to engage in research in order to develop the field.

Further, a growing body of literature has documented the importance of research self-efficacy in the research training of graduate students in applied psychology and other fields (eg. Gelso & Lent, 2000). Research self-efficacy has been found to predict graduate students' interest in conducting research (Bishop & Bieschke, 1998) and also in productivity (Kahn, 2001). Research self-efficacy is therefore an important construct to understand as perhaps a strong understanding of research self-efficacy and a focus on it could provide educational strategies designed to foster student research interest and productivity. Additionally, and very relevant to this project, the accurate assessment of research self-efficacy may help supervisors identify a student's self-identified strengths and weaknesses with respect to research. This, therefore, could facilitate the research training and guidance the student is encouraged to pursue.

In relation to self-efficacy and achievement in general, evidence suggests that females generally tend to have lower self-perceptions of their academic ability in mathematics and science, even when their actual performance is not lower than that of males (Eccles, 1983). This is particularly relevant in the context of practical projects, as are being investigated within this thesis, where many of the students would be engaged in scientific projects and would be required to

perform statistical analyses. If females have a lower perception of ability it is very likely they will have lower self-efficacy and possibly will require more autonomy support than males. In addition to this, research has indicated that females may have a tendency towards modesty when rating their confidence levels, while males may exaggerate their levels (e.g. Pajares & Graham, 1999). Therefore, the gender of the student may also have implications for the measures of self-efficacy that they display.

If self-efficacy is important in determining the actions and behaviours of students, and as a result is important for predicting outcome, a clear aim for all students should be to have appropriate levels of self-efficacy.

However, it seems that students can be aided in their development of self-efficacy through appropriate learning and teaching methods and pedagogical practice (Schunk & Pajares, 2002). In this research Schunk & Pajares propose that in order to enhance the development of student self-efficacy, teachers should establish specific, short term goals that are challenging, yet attainable (Schunk & Pajares, 2002). Additionally, helping students identify specific learning strategies and then discussing and verbalising their plans has also been identified as being important to the development of self-efficacy. Further, students can be aided in a continuous way as they progress through the learning tasks as the teacher can ask them to reflect on what has already been achieved and outline next steps and future targets (Schunk and Pajares, 2002). This raises interesting questions, for both staff and students, regarding if self-efficacy is something that can be and should be encouraged in students by supervisors and if it can be developed over time.

These issues seem strongly linked to the supervisory process, in that some supervisors will carry out practices such as this, and others will not. Perhaps, in part, problems arise from that fact that some supervisors have a grasp of learning and teaching, and a focus on it. Indeed teaching is subject to a range of different meanings (Ramsden, 1992). One conception of teaching may be that teaching is transmission of information to students and the nature of this transmission is defined by the teacher. Another, contrasting conception may see teaching as a process in which the role of the teacher is to help students to learn how to learn. This model of teaching is not based on the addition of knowledge,

but rather a transformative model of learning. In the context of supervision the perceptions of a supervisor, as to the nature of the project, could have implications on the way they “teach” their students.

Interestingly, in relation to supervision, within counselling training programmes, more positive appraisals of students’ training environment and supervisory relationship are associated with greater research self-efficacy and, in turn, greater interest in research and productivity (Bishop & Bieschke, 1998; Brown et al., 1996; Kahn & Scott, 1997; Hollingsworth & Fassinger, 2002; Phillips & Russell, 1994). Paglis et al. (2006) also found that supervisors who took a nurturing approach to the supervision of their students enhanced the development of self-efficacy over time.

In examining the evidence identified in the area of self-efficacy caution needs to be exercised when considering the results, particularly in relation to student learning. It seems to be the case that all of the research identified supports the view that high self-efficacy leads to higher success, however, it is simplistic to suggest that there is always such a straightforward direct cause and effect relationship between self-efficacy and success. For example, it could be the case that a student has high self-efficacy because they are good at the task, rather than being good at the task because they have high self-efficacy. Further, much of the research on supervision (e.g. Bishop & Bieschke, 1998; Brown et al., 1996; Kahn & Scott, 1997; Hollingsworth & Fassinger, 2002; Phillips & Russell, 1994) uses students as assessors of the supervision they receive and therefore, as a result of this, reports students perceived supervision and not their actual supervision. It could be the case that students own self-efficacy impacts on the supervision they receive, or indeed the view they have of the supervision they receive.

Interesting issues have been raised surrounding the relationship between teaching and research. Griffiths (2004) outlines four different ways of thinking about teaching and research and the different approach to linking these together. He outlines that teaching can be research-led. Using this approach the curriculum (or in the case of supervision- the project) is structured around content. This content is selected based on the research interests of the supervisor. Their teaching style would be based on a transmission model of

teaching and emphasis would be on the final outcome, rather than on the research process. Supervisors who have this view of supervision are likely to have a different process of supervising than supervisors who are research-oriented. Teaching can be research-oriented in the sense that the curriculum places emphasis as much on understanding the processes by which knowledge is produced in the field as on understanding the knowledge. Under this approach to supervision, careful attention may be given to the teaching of inquiry skills and also on the development of a 'research ethos'. Teaching can also be research based. Under this model the curriculum is largely designed around inquiry-based activities. This is in contrast to the curriculum being designed around the acquisition of subject knowledge. In research based teaching there is a two-way interaction between research and teaching. Finally, teaching can be research-informed. In this model of teaching, systematic inquiry underpins the teaching and learning process. With different conceptions of how to teach and how to supervisor research, it is clear there may be individual differences in how supervisors approach the task. The approach they take may have implications students' belief in their own ability and their skill development.

The general importance of self-efficacy in students should be emphasised. Bandura (1997) outlines that, through several mechanisms, mastery experience in one domain can be used and transferred to enhance self-efficacy. If students can develop skills in one area, Bandura (1997) proposes that if the skills are similar to sub-skills in another, then efficacy is transferable. As already outlined, in chapter 1, the skills to perform research are important in the global knowledge economy and research skills are transferable to different contexts. Given this, increasing research in self-efficacy could have beneficial effects for students beyond the context of academic study. Bandura (1997) also identifies "self-regulatory skills" as those that we use for "constructing and evaluating courses of action, setting proximal goals, and creating self-incentives to sustain engagement in taxing activities" (pg, 51). Bandura believes that these skills are linked to the development of self-efficacy. That is, in order to have high self-efficacy students must have skills in self-regulation. These skills of self-regulation are important in many different jobs and situations and therefore development of these skills will also be beneficial to graduates. Clearly, in the context of final year and masters practical projects, there is potential for the



student to develop self-efficacy as they are engaged with a project in which they construct and evaluate the course of action and set goals. Finally, and possibly most importantly, development in self-efficacy can create a “transformational restructuring of efficacy beliefs” (Bandura, 1997, pg 53), by this Bandura explains that personal achievements in one area of learning become transformational experiences and as a result self-efficacy gains can have implications for student careers. Therefore in relation to student projects, a good learning experience, in which students feel a sense of achievement, could lead to self-efficacy gains and in turn this could have implications for their success and development both in the project, and also in future endeavours.

The final section of this literature review will focus on student autonomy and the importance of this in the development of graduate attributes. It will consider if autonomy is a quality which can be encouraged through appropriate learning and teaching strategies.

## 6 Student Autonomy and Autonomy Support

### 6.1 Defining autonomy

Autonomy is often defined as a state of functioning independently without the control of others (MacDonald, 2002). It can be used to describe the psychological trait of individuals who are able to direct their own learning in an independent fashion (Knowles, 1980; Merriam & Caffarella, 1999) as autonomous learners have the ability to acquire knowledge, skills or values independently and they themselves determine the process by which this happens (Chene, 1983). Many authors (e.g. Holec, 1981; Deci & Ryan, 1985, 1991, 2000; Scharle & Szabo, 2000) have contributed to the understanding of the complexity of achieving autonomy and of what it means to learn autonomously and thus become an autonomous learner.

Holec (1981) defines autonomous learning as the ability to take charge of learning. Scharle and Szabo (2000) suggest that for a student to become an autonomous learner it requires that they progress through three different stages. Firstly, there is the stage of raising student awareness. During this stage students must realise what it means to be autonomous. This process involves them becoming aware that there are steps they can take in order to achieve this. During this stage it is important students realise that learning is within their control and as a result they do not always need a teacher in order to learn. Secondly, students must change their attitude towards learning and with whom the responsibility for learning lies. Often this involves a shift from their believing responsibility lies with the teacher, to them believing that responsibility lies with the learner. Finally, after progressing through the previous stages, students and teachers can experience the transferring of roles. In this phase students take control of their learning from their teacher. As a result of this transformation, from dependent to autonomous learners, research has found that autonomous learners have insights into their learning styles, take an active approach to learning, and are more willing to take risks.

However, as Little (2000) points out, caution needs to be exercised during this transferring of roles from student to teacher. Students do not, and cannot, become autonomous learners by simply being instructed to take charge of their

own learning. As the student develops they become capable of taking increasing control of aspects of the learning process, but only to the extent that they have the appropriate skills, knowledge, motivation and abilities. This, therefore, raises questions regarding learning strategies that can be put in place to encourage the development of autonomous learning, on the part of the student, but also the role the teacher may have in the scaffolding of this transformation from dependence in learning to autonomy in learning.

### **6.1.1 Self-determination theory**

A key theory within the autonomy literature is Self-Determination Theory. According to Self-Determination Theory (Deci & Ryan, 1985, 1991, 2000) psychological autonomy is a crucial individual difference that exists between learners and reaching it is a developmental achievement. In order that a learner feels self-determined there is a need to feel a full sense of ownership. As a result of this, self-determination is associated with a wide variety of positive outcomes (see Deci & Ryan, 2000, for review).

Self-Determination Theory suggests that behaviours vary in the degree to which they are autonomous or controlled. Behaviours which are said to be autonomous have an internal perceived locus of causality (deCharms, 1968) and are experienced when an individual decides upon or commits to a course of action which has been formed out of personal importance. According to Deci & Ryan (1991) these autonomous behaviours come from an integrated sense of self. In contrast, controlled behaviours have an external locus of causality (deCharms, 1968). Controlled behaviours are experienced when pressure is exerted by interpersonal factors. These interpersonal factors may be, for example, striving to achieve a certain grade or working in order to please another person (Ryan, 1982).

Deci & Ryan (1985, 1991, 2000), conclude in their work that intrinsically motivated behaviours are the prototype of autonomy. The reason for this is that they are undertaken out of interest and are sustained by the feelings that emerge with increasing engagement in the activity. In contrast, extrinsically motivated behaviours are behaviours which are usually undertaken for reward. In the context of student learning this reward may be a grade in a certain

subject that is required, however, the student does not find the subject intrinsically motivating.

According to the Self-Determination Theory, the opposite of autonomy is not dependence but rather heteronomy. Learner autonomy requires that student's experience choice and options in their learning and as a result of this they are given the opportunity to exercise some control regarding their own actions. Heteronomy, in contrast, relates to the actions and choices being controlled by factors out-with the self (Chirkov et al, 2003).

Self-Determination Theory proposes that individuals have three innate, psychological needs (Baard et al, 2004; Williams et al, 2006). These three innate needs are related to the individual. It is proposed, within this theory, that all individuals strive for competence, autonomy, and relatedness as these appear to be essential for facilitating self-motivation and effective functioning (Ryan & Deci, 2000; Baard et al, 2004). Within Self Determination Theory (Deci & Ryan, 2000), it is suggested that the motivation and self-regulation of the learner can be facilitated through actions which nurture these basic psychological needs.

## **6.2 Importance of autonomy to student learning**

Learner autonomy has implications beyond academic success at university - on leaving university and entering further study or the work place students are expected to have the skills to, and experience of, engaging in autonomous learning. Therefore, autonomy is directly related to graduate attributes that were outlined and discussed in chapter 1. Students' preparing themselves and being supported to prepare themselves to work autonomously is an important skill and one that may form a focus for Higher Education Institutes. Students are now learning in an ever-changing world and as a result universities are independently implementing strategies in order that they produce 'work ready' graduates. Governments have made public funding available for universities and a key criterion of achieving this funding requires that universities can outline demonstrable graduate outcomes with an emphasis on the production of 'work ready' graduates who are competent within their disciplinary fields and possess the abilities necessary to negotiate a world of work that is in a state of constant

change (Barrie, 2006; Bowden et al, 2000). As a result the literature concludes that studying at university requires that students become autonomous learners (e.g. Bryde & Milburn 1990; Chemers et al, 2001; Stephenson & Laycock, 1993) due to the importance of this to their success and because it is valued by employers (Confederation of British Industry, 1994). The reason for this success is clear as:

“... there is convincing evidence that people who take the initiative in learning (proactive learners) learn more things and learn better than do people who sit at the feet of teachers, passively waiting to be taught (reactive learners)... They enter into learning more purposefully and with greater motivation” (Knowles 1975, p. 14).

Consequently, learner autonomy has become an increasingly important issue in contemporary education and it is worthwhile investigating if teachers can promote learner autonomy and in turn increase learner independence.

It is clear that many of these ‘core skills’ that graduates require refer to the students thinking for themselves and being confident in their ability to do so, therefore highlighting the importance of students becoming autonomous learners. It is not enough to solely teach students course content and disciplinary knowledge. While these things are important, the pace of change in the world is rapidly increasing, so much so that in a few years much of the information students have learned will be out of date. It is therefore important that graduates are adaptable and flexible, they should be able to effectively apply what they have learned during their time at university- increasing student autonomy is therefore key.

### **6.2.1 Importance of autonomy in relation to student projects**

From research and practice, a range of assessment-related activities have been identified that are thought to foster the development of learner autonomy (Nicol, 2009). These are activities such as: assessing the quality of their own work through reflection, deciding quality criteria to apply to their own work, being able to both set their own learning goals and also being aware of their learning needs, being faced with challenges or issues that they go on to address and reflecting on and evaluating their own learning (Nicol, 2010). Each of these autonomous acts could contribute to promoting the development of graduate

attributes. These crucial skills for graduates are key features of conducting a dissertation/project. As such the dissertation is often promoted as the opportunity to advance autonomous learning in students (White 2000; Snively & Wright 2003; Todd et al, 2004; Todd et al, 2006). As a result it offers the opportunity for students to develop in key graduate attributes and skills (see Greenbank et al, 2008).

Learner autonomy is an important aspect of developing graduate attributes. Given this and the theory of autonomy outlined above, the development of autonomy should be an important consideration for higher education staff when selecting student activities and assessment. However, during much of their studies students are guided, to varying degrees, in that they are told the intended learning outcomes of their work and are often guided, for example, to the book chapters that they should read. With this high level of “control” over their studies, students do not have the opportunity to experience high levels of autonomy in their learning. Whilst it is important that learning is controlled for reasons surrounding assessment, it is also important that students leave university with the ability to make decisions and guide their own learning. A dissertation/project is an excellent grounding for autonomy skills to be further developed in students. The dissertation/project is the most sustained engagement that an undergraduate student will have with writing and increasingly this is in the form of a research project (Todd et al, 2004). As such, Bean (2001) argues that engagement with tasks such as the dissertation provides the catalyst for students to engage with and develop their own thinking skills.

### **6.3 Importance of autonomy support during projects**

As discussed in the previous chapter, research suggests that greater academic guidance and personal support will augment research self-efficacy (Bishop & Bieschke, 1998; Kahn & Scott, 1997; Hollingsworth & Fassinger, 2002; Phillips & Russell, 1994; Paglis et al, 2006). For supervisors, then, it seems that one of the aims may be to actively teach students necessary skills while, at the same time fostering the development of an autonomous researcher who has confidence in their own skills and abilities. This highlights one of the many challenges of supervision- supervisors may want to provide support and guidance

to their student, while at the same time encouraging independence (Delamont et al, 1997; Manathunga & Goozée, 2007).

It is clear that students must develop autonomy and whilst much of this development is reliant on individual effort, it seems they can be aided, to some extent, in the development of this skill. The growing body of research on autonomy support provides evidences highlighting the importance of supporting student autonomy development (Ryan & Deci, 2000). In studies with school teachers, autonomy supportive teachers' demonstrated behaviours such as listening to students, asking about students wants, responding to student-generated questions, volunteering perspective-taking statements, and supporting students' intrinsic motivation and internalisation (Reeve, 1998; Reeve et al, 1999). As a result of these approaches, students achieved greater autonomy in their own learning.

Once they reach their final year or masters year, students often experience varying degrees of choice as to what they study and also how they conduct the project. This is somewhat dictated by their supervisors preference and also perhaps their discipline. However, while they may have control and choice over what they study (internal control) they are also externally controlled as they aim for a mark. In a final year project this striving for a good mark is important if the student is to succeed, however, this could interfere with the student's autonomy in the task. Behaviours that are pressured by external contingencies (e.g. supervisors choosing the topic of study for the student) are considered controlled, but through the process of internalisation initially external regulations can be transformed into internal regulations (Ryan, 1993; Schafer, 1968). It seems that even students who have a "controlled" project, which is given to them, could still experience autonomy so long as the process becomes internalised. The supervisory role then in supporting the development of autonomy is somewhat dependent on the project.

In addition to this tension between internal and external control, interpersonal aspects, which are clearly very relevant to supervision, may have an impact. Self-determination theory proposes that the interpersonal context can have an important influence on if individuals believe their learning is directed or controlled. The concept of autonomy support (Deci & Ryan, 1985) means that an

individual in a position of authority (e.g. supervisors) takes the other's (e.g. a student's) perspective, acknowledges their feelings and provides the other with information and opportunities for choice. However, they attempt, as far as possible to minimise the use of pressures and demands.

An important element of "good" supervision is therefore the ability to provide appropriate levels of autonomy support. Autonomy support can be described as the interpersonal behaviours teachers demonstrate in order to nurture students' own intrinsic motivation. (Deci & Ryan, 1985; Reeve et al, 2004). It includes acknowledging the student's perspective, encouraging the student to be open with their ideas, and providing opportunities for students to make their own decisions. As a result of this opportunity for choice in decisions, autonomy-supportive contexts tend to enhance intrinsic motivation, whilst controlling contexts tend to undermine intrinsic motivation due to the lack of choice and, therefore this reduces engagement in the learning context (Deci et al, 1981). Other research has shown that autonomy-supportive contexts were associated with better conceptual learning (Grolnick & Ryan, 1987), more creativity (Koestner et al, 1984). With these results it is clear autonomy support is important to the development of learners generally.

Autonomy support is also important to the development of research self-efficacy because autonomy support from authority figures is critical in the development of either intrinsic or extrinsic motivation (Deci & Ryan, 1985). As a result, autonomy support from university teachers has been associated with students actively engaging in academic activities and as a result becoming motivated by development, rather than by grades (Black & Deci, 2000; Williams & Deci, 1996). Increases in intrinsic motivation through autonomy support, seem to have other benefits such as; increased academic performance; the ability to cope with failure and higher engagement with learning tasks (Black & Deci, 2000; Williams & Deci, 1996; Vansteenkist et al, 2004). Furthermore, autonomy support enhances persistence and academic success because this type of learning environment cultivates greater efficacy and competence (Black & Deci, 2000; Williams & Deci, 1996).

Another strand to the issues surrounding student autonomy support is centred on the issue of giving the 'correct' amount of autonomy to each individual student



in terms of what the student expects and also what the supervisor expects. The research on doctoral supervision clearly indicates that there are some similarities in the needs of students, as all students want and need support and guidance. However, what is less clear is how this may be appropriately achieved with every student. Parry & Hayden (1994) highlight the importance of finding the balance between providing support and guidance whilst not interfering and allowing the student to exercise some autonomy in their learning. For the supervisor, the aim may be to produce a student who is competent in their knowledge and also competent in their level of autonomy. In order to achieve this, students must be given the opportunity to develop by exercising degrees of decision making (Boud, 1988). This relies on both the student and the supervisor. As Francis (1997) explains “most is gained from the research process by finding a balance between individual drive and autonomy and the engagement and support of others” (pg, 19). Indeed, a recent study by Overall et al (2010) highlights the need for supervisors to allow students to think and act autonomously, but also to engage with them and provide support.

It is generally agreed that students need support and guidance, while at the same time they need the opportunity to be autonomous. What remains less clear is how supervisors achieve this with every student. Individual differences between students needs to be give consideration and as such, attention must be given to how much independence and autonomy students need and can cope with. Independence and autonomy cannot be achieved without support and there is recognition, from within the literature, that these things can only be achieved and successfully implemented after considerable preparation of students and supervisors (Hurd, 1999). Providing independence during research supervision, cannot simply mean the supervisor takes a hands-off approach. A challenge for supervisors, particularly during undergraduate supervision, may be finding the balance between providing sufficient support to encourage autonomy but also being mindful that students have not engaged in a learning activity such as this before and as a result they may not be, or feel, fully prepared for the challenges associated with it. It is possible, therefore, that how much autonomy and independence a student needs may be based on their own levels of self-confidence and/or self-efficacy.

Supervisors may view autonomy support as an important issue in Higher Education due to the combination of two important factors - student satisfaction and a sense of role or responsibility for the student. Student satisfaction has been found to be directly correlated with the contact time students have with tutors (Ashby et al, 2008). Driven by the need to respond to student feedback, such as the feedback collated by the National Student Survey (NSS), as well as a sense of role, often makes staff at universities feel obligated to respond to requests for additional contact and input. However, the pressure to generate high National Student Survey (NSS) scores for student satisfaction is having a detrimental impact on staff workload and it is becoming increasingly difficult to provide the 'high-quality, consistent and equitable support' that all students have come to expect (Dhillon et al, 2008, p.290). Students expecting increased staff time potentially causes two problems. Firstly, this model of providing support to students on request heightens the risk of creating an unmanageable increase in supervisor workload (Owen, 2002). Secondly, and of importance to student learning and development, there is the potential for students to be over-supported and as a result of this, denied of the opportunity to develop the autonomy they need to succeed both academically and professionally. Providing appropriate levels of autonomy support is important to overcoming both of these problems.

Autonomy support and providing structure, in the form of having set guidance and expectations, should not be viewed as being opposing teaching dimensions. Instead, "they can, and should, exist side-by-side in a mutually supportive way" (Reeve, 2002, p. 193). Sierens et al (2009) found, using confirmatory factor analysis, that autonomy support and structure are separate, yet positively related, teaching dimensions. Recent contributors within the literature have suggested that autonomy support and structure be viewed as separate and compatible dimensions (e.g. Soenens & Vansteenkiste, 2010), and as such researchers have paid more attention to the effects of combining teacher autonomy support and structure on learning gains for students. Studies conducted in this area have generally found positive results suggesting that both teacher autonomy support and structure play a role in the regulation of student learning behaviour. For instance, Trouilloud et al (2006) showed that the way teachers communicated their expectations to students was important. When

provided in an autonomy supportive way, the communication of expectations yielded a more positive effect on student perceived competence.

Autonomy support is, thus, an interesting and somewhat controversial area that supervisors must consider. According to Harmer (2007, p.396) “What may feel appropriate from the teacher’s point of view may not seem so appropriate for students. What is appropriate for one student may not be appropriate for all”. Further to this, Scharle & Szabo (2000) suggest that it is of importance to become aware of a students’ level of knowledge and motivation and also of the learning strategies the students use and to encourage students to think about their own learning style.

In summary autonomy and autonomy support are important to student development, particularly in the context of the student project. The final year/masters project, as outlined above, is an opportunity for students to exercise higher levels of autonomy than other parts of their learning (White 2000; Snively and Wright 2003; Todd et al, 2004, 2006) and it is therefore important to monitor the levels of autonomy development and the implications of this. However, it is also of important to realise that this ability to become autonomous can only be implemented after considerable preparation of the students (Hurd, 1999). Potentially if students are given too much autonomy they may feel overwhelmed, while being given too little may make students feel controlled. Further, the correct level of autonomy can increase student learning gains. Therefore, investigation into autonomy in relation to the autonomy students felt they developed over the course of their project and also the autonomy support supervisors/students feel they give and receive is required. Of particular importance may be the interaction between students’ perceived autonomy support and supervisor perceived autonomy support. Students do not become autonomous learners in isolation and this emphasises the importance of the role of the supervisor in supporting the development of student autonomy. Therefore, student levels of autonomy and students/supervisors perceptions of the autonomy and the support they receive/provide are of significant interest.

## 7 Research Aims & Research Questions

To summarise it seems that qualities of a successful supervisor and qualities of a successful student are often studied as two separate issues. Research suggests that students' characteristics and approaches to learning can have an impact on success and psychological factors are becoming increasingly important to the study of student learning. Research on the psychological aspects of learning centre around personality and the expectations students have of themselves. Within this research these psychological characteristics are often studied in relation to success and retention at school or very early in an undergraduate career. As a result of the limited amount of research on the psychological factors: personality; theories of intelligence; expectations; emotional intelligence; autonomy and self-efficacy, that are important for success and development in academically advanced students (honours and masters students) who are conducting a project this, will become one of the focuses of the thesis.

Alongside literature on the student, current studies in supervision tend to concentrate on what makes a good supervisor, setting out guidance for academics to become good supervisors. However, most of this literature has a focus on PhD supervision. Therefore, in addition to the student, and again given the lack of research in the area of supervision at undergraduate and masters level, it is important to investigate the qualities of "good" supervision with undergraduate and masters students.

Currently, limited research bridges the gap between these aspects of "good" students and "good" supervisors. Green (2005) explored the subjective nature of thesis supervision and suggested that the pedagogy of supervision should take into account the social and psychological disposition of students, along with their knowledge and educational capacity. However, with this there also seems to be practical constraints relating to time pressure and *massification*. In addition, it seems that a "one size fits all" approach to supervision may not be effective. Indeed, it has been proposed that understanding student needs and the nature of their relationship with supervisors can assist in providing students' quality education in project collaboration (Wade-Benzoni et al, 2006).

From the research reviewed within this thesis, it is proposed that student skill development and ultimately student success is related to a complex interaction between the characteristics, expectations (e.g. Jamieson & Gray, 2006) and personalities of the student and supervisor that can influence the quality of the supervisory relationship and in turn result in a good or a poor project. The area of expectations has not been included within the literature review chapters as it is believed expectations is an overarching concept, that may be related to all of the other psychological characteristics. This PhD therefore will add to the limited research in the area of the psychological factors related to success for academically advanced students conducting a project. Further, it will enhance the limited research in the area of undergraduate and masters supervision, and aims to distinguish between the characteristics of a good student and a good supervisor in general, and the characteristics of a good supervisor in relation to a particular “type” of student. It aims to do this by investigating, the impact of “match” and “mismatch” of psychological factors between student and supervisor. Investigating match and mismatch between students and supervisors in relation to psychological characteristics is novel however, it is hoped this will contribute to betterment of support of student learning and skill development.

In an attempt to address the “gaps” in the literature and for the purposes of clarity the research has been divided into the 4 themes highlighted below. These themes are explored by firstly considering the students, followed by the supervisors and finally the interaction and relationship between them becomes the focus. The research questions within these themes are outlined below:

### **Theme 1: Differences between students at different levels of study**

RQ 1: Are there differences between undergraduate and masters students in relation to their experiences of doing a project?

### **Theme 2: Student Development**

RQ 2: How do students develop over the course of their project and what evidence is there of this development in relation to autonomy, self-efficacy, expectations and theory of intelligence?

RQ 3: What are students' perceptions of their skill development over the course of the project? What shapes these perceptions of their skill development?

RQ4: Do any psychological factors predict how well students perceive they have done and what is the relative importance of these psychological factors to student success?

### **Theme 3: Good supervision**

RQ 5: When students pick their supervisors what factors do they consider in making their choice?

RQ 6: What, if anything, are the characteristics of a "good" supervisor and do any of these predict student success? How does this relate to staff and student perceptions of good supervision?

### **Theme 4: Match or Mismatch of psychological characteristics between student and supervisor**

RQ 7: What effect does match/mismatch between student and supervisor have on student success? If it has an impact, what is the relative importance of each of the factors of "matching" between student and supervisor?

RQ 8: How does masters supervision compare with undergraduate supervision in terms of the importance of the "fit" between student and supervisor?

## 8 Methodology

### 8.1 Introduction

This chapter will outline the methods that have been chosen to investigate student skill development over the course of a project, the characteristics of a “good” student and supervisor, and the impact of “match” or “mismatch” between student and supervisor on student success and development. In particular, it will argue that a mixed-methods approach is the best strategy to inform the research aims. In this research three questionnaires were developed and disseminated to students and supervisors at two research-intensive universities in Scotland in the academic year 2012/2013 (pilot work conducted in 2011/2012). The students completed two questionnaires, one at the start of their project, before any substantial project work had been completed and before their relationship with their supervisor had developed, and then one on completion of the project as they submitted. As the student questionnaires were longitudinal, student development could be assessed. Supervisors of these same students completed questionnaires only at the end of their students’ projects. A subsection of these students and supervisors took part in semi-structured interviews at the end of the students’ projects.

The chapter begins with a reflection on the role of the researcher when conducting the research and the influence this may have had. Following the discussion of reflexivity the chapter describes the research design that was used in the study. It outlines the mixed methods approach and discusses the ontology and epistemology underpinning the research. The materials used in data collection are outlined and the procedure for data collection is then discussed. The final section of the chapter considers ethical issues in relation to this research.

### 8.2 Reflexivity of the researcher

Outlining the position of the researcher within this research is important, as it helps to situate the research in a context and enhances understandings of how the findings were generated. Reflexivity has a firm place within qualitative research; however, it is rarely discussed in relation to quantitative research.

Qualitative researchers accept the researcher is a central figure who influences the collection, selection and interpretation of the data (Finlay, 2002). However, quantitative researchers tend to take a more positivist approach that implies that the generation of data should be objective. Thus, they have a goal to measure and analyse causal relationships between variables within a value-free framework (Denzin & Lincoln, 1994). However I believe that it is arguable to what extent true objectivity is possible within any research and therefore acknowledge that the researcher and the objective of the study influence each other continually and mutually in the course of the research process. It is argued that a positivistic conception of research, in which the object of study is uninfluenced by the researcher and the research is unaffected by the object of the study, is unattainable in areas of social research. Indeed, it is suggested that even in the creation of the questionnaires there was still an element of researcher influence. Therefore, attempts are not made to describe the research as value free, objective and neutral.

As a PhD student under supervision, and given the focus of the study was on supervision perhaps I had a unique view on the situation that was carried into the research. However, this is not something that is viewed as a negative. From the outset of this thesis, I was aware of my own potential influence in the process and was aware this was unavoidable in part, but also believed that my own subjectivity could be minimised. In addition, there was a view that subjectivity in research could be “transformed from a problem into an opportunity” (Finlay, 2002, pg 531).

In this case, my position was potentially influential on the research questions, the data collection, the analysis of the data and indeed the focus of the write up. The literature comments on the importance of a researcher being reflective as they conduct research and suggests that it is important that the researcher is open and honest about their preconceptions, their epistemology, and their interpretation of any data (Denzin & Lincoln, 1998 cited in Gibbs 2007).

From the conception of the idea of the project, there has been an aspect of researcher involvement. I was influenced by the surrounding literature, but also potentially by my own experiences and the experiences of others and this may have impacted on my selection and refinement the research questions. It is



possible that my own experiences as an undergraduate were relevant in the generation of the research idea and questions and also in the analysis of the data. As an undergraduate student I found the experience of conducting a project an important milestone in my own learning and development and I perceived that good supervision was central to this development. However, I had awareness that some students had a very different experience. This raised questions about why this would be the case. It therefore seemed important to investigate if it was something about students' characteristics that may be important to the student experience of conducting a project, while being mindful of the fact that the supervisor probably plays an important role in development. Further, I believed that "good" supervision may hold different meaning for different students and therefore issues surrounding match and mismatch may be important to the process and ultimately to student success and development.

In the creation of the interview schedule and the questionnaire it is, again, important to reflect on the researcher's role and impact. At this point in the process I was guided, again, by the literature in the area. However, the literature that became the focus for the study was on the basis of what I believed might be particularly influential and important and this had an impact on the questions that were asked and the way in which they were asked.

In the collection of the qualitative data, I played a very significant role. Throughout the process my aim was to engage with the participant and explore their experience and their meaning. However, as a student who is currently being supervised, interviewing students who are also being supervised placed me in a unique position. It is believed that this is valuable to the research. I presented myself to the participants as a PhD student and therefore the students being interviewed knew they were discussing their experiences with someone who was in a similar position to themselves. Presentation of myself as a student may have been beneficial in the production of very "rich" data.

Triangulation of the data was an important component of ensuring this. Triangulation is the application of more than one approach (in this case semi-structured interviews and questionnaires with students and supervisors) to the investigation of a research question. Through the use of triangulation it is hoped

that confidence in, and the meaning taken from the findings, can be enhanced. By triangulating the data in this research, elements of rigour can be introduced, whilst at the same time the “rich” subjective data generated from the interviews can be explored. Throughout each stage of the process, from the initial formation of the research questions; the formation of the interview schedules and questionnaires; the collection of the data to the analysis of the data and the write up, reflexivity is an issue that has constantly been revisited.

Being reflexive in the process of data analysis was of great importance. While the qualitative data was interpreted and therefore my role was large at every point in the process, the quantitative data, at the point of analysis, was an objective measure. However, it is important to be aware of the role of interpretivism and subjectivity at the stage of creation of the questionnaire. Further, as is the case in all such research, participants when completing the questionnaires will have interpreted the instructions and subjectively answered the questions. In order to utilise the strengths of both the qualitative and quantitative data the qualitative data was first analysed alone, so not to be influenced by the outcome of the quantitative. This ensured that the qualitative data was explored in depth and then meaning was sought. However, in order to introduce objectivity to this “rich” data it was then reviewed in the light of the quantitative results.

Having reached the conclusion that the research would benefit from the qualitative and quantitative data being presented together and not separated, the researcher faced the challenge of selecting research questions which were appropriate for both qualitative and quantitative research. Although I had come to the conclusion that mixed methods was a distinct paradigm I was still very much of the view that qualitative and quantitative methods have to be utilised appropriately and often answer different research questions. The challenge in the selection of the appropriate wording and focus of research questions was something that became apparent during the process of the research. Initially, I had one set of research questions which I believed would encompass both the qualitative and quantitative aspects of the work. However, it became increasingly apparent that one set of research questions to integrate qualitative and quantitative research would have limitations. While from the outset I was clear about the themes of the research and the areas of exploration, the

challenge was rooted in that fact that quantitative research questions tend to be hypothesis driven and therefore specific and directive. In contrast qualitative research questions are open and exploratory.

As a solution I created overarching research questions and then within each of these overarching research questions distinct qualitative and quantitative questions could be created. This initial challenge became advantageous to the research as the qualitative data could be presented in a way in which the richness was not lost and the quantitative data presented in a way that allowed reliability and generalisability. This allowed for a unique combination of both and therefore a deeper exploration and understanding of the phenomenon.

## **8.3 Research Design**

### **8.3.1 Ontology & Epistemology**

In this research a mixed method approach was taken. Mixing qualitative semi-structured interviews and quantitative questionnaires in an attempt to answer one research question presents an interesting ontological position. The quantitative questionnaires are more often related to positivist positions while the semi-structured interviews are more common in paradigms such as interpretivism or constructivism.

Positivists take the stance that the social world can be investigated using methods derived from scientific paradigms, essentially defined by hypothesis testing to produce quantitative data (Hughes & Hayhoe, 2008). Positivism is usually most closely associated with scientific research and is characterised by empirical research. Researchers operating under this paradigm argue that all phenomena can be reduced to empirical indicators which represent the truth. In general, the ontological position of the quantitative paradigm is that there is only one truth and this is objective and exists independently of the researcher. Therefore, those using this perspective tend to argue that the researcher is able to study a phenomenon without influencing it or being influenced by it and as a result it is believed that “inquiry takes place as through a one way mirror” (Guba & Lincoln, 1994 pg 110). The positivist approach therefore implies that the generation of data should be objective.

In contrast, qualitative semi-structured interviews are more in line with a paradigm that is based on interpretivism (Kuzel and Like, 1991; Altheide & Johnson, 1994; Secker et al, 1995) and constructivism (Guba & Lincoln, 1994). Using these perspectives it could be argued, ontologically speaking, that there are multiple realities or multiple truths. These truths and realities are based, primarily, on one's own interpretation of them. There is a belief, therefore, within these paradigms that reality is socially constructed (Berger & Luckmann, 1966). As a result of this, as is the case when interviewing students about their experiences, the researcher/interviewer and the student/interviewee are interactively linked so that findings are mutually created within the context of the situation which shapes the inquiry (Guba & Lincoln, 1994; Denzin & Lincoln, 1994). The emphasis, therefore, during the qualitative aspects of the research was on processes and meanings.

Now, as the basic philosophical assumptions of qualitative and quantitative research have been outlined, arguments will be provided to defend the use of both methods within a single study. Firstly, and from the most pragmatic viewpoint, both approaches share the goal of understanding the world in which we live (Haase & Myers, 1988). Therefore, this allows "fitness for purpose" to be considered and the best method can be used for the phenomenon being investigated. In relation to this argument it has been suggested that research methods should be viewed on a continuum of research, rather than as dichotomous opposites (Casebeer & Verhoef, 1997) as this allows the selection of specific techniques on the basis of the research objective.

Further, as noted by Clarke and Yaros (1988), combining research methods is useful in some areas of research because the complexity of phenomena requires data from varied perspectives. Student learning is a unique experience for the individual student and supervision is a unique experience for both students and supervisors and therefore consideration must be given to individual views and experiences of individual differences that exist between individual learners and supervisors. However, it is also important that findings can be generalised in order that practical outcomes can be implemented. In an attempt to ensure the data are "generalisable" and "rich", the use of a broad spectrum of qualitative and quantitative methods is advantageous. On this basis, this research takes a stance which is between positivism and interpretivism/constructivism. The

research does not assume that everything can be measured, however it assumes that some things can. It also acknowledges that there are multiple realities and truths and these truths and realities are based on one's own interpretation of them. In this research qualitative and quantitative research methods are not considered as opposites, but rather are considered together in order to answer the research questions. The decision to use a mixed method approach was reached after consideration of the advantages and disadvantages of various research methods.

### **8.3.2 Mixing Methods**

Having considered these broader issues, relating to the ontology and epistemology of qualitative and quantitative approaches, it is important to discuss the closely surrounding arguments for integrating qualitative and quantitative approaches within one study. Within the literature, it is clear that there are two possible reasons for adhering to a mixed method approach.

Mixing methods firstly allows cross-validation or triangulation (outlined in section 8.3.3 below) - combining two or more theories or sources of data to study the same phenomenon in order to gain a more complete understanding of it (Denzin, 1970). Using mixed methods, particularly the combination of interviews and questionnaires, is something that has been utilised a great deal in the academic literature, particularly in relation to student learning research (e.g. Beaty et al. 2005; Entwistle et al, 2003; Hounsell ,2005). Although quantitative and qualitative methods, to some extent, originate in distinct epistemological and methodological foundations (Barbour, 1999) it does not exclude their combination. Quantitative and qualitative approaches produce different, but not incompatible, data.

Secondly, it allows the researcher to achieve results that complement each other. This is based on the possibility that the weaknesses of one research method can be reduced by the strengths of the other (Morgan, 1998). In research methodology "fitting the approach to the research purposes is the critical issue" (Rossi & Freeman, 1993, p.437). Since qualitative approaches to research design are suited to uncovering new ideas and exploring areas that have not been investigated before (Marshall & Rossman, 1999) this study used qualitative

methods. However, as quantitative measures allow an empirical comparison of the results and eliminate or minimise subjectivity of judgment (Kealey & Protheroe, 1996) quantitative methods were also used to allow a detailed exploration of the magnitude of the influence of any mismatches and their importance. The quantitative surveys introduce concepts of validity, objectivity, reliability and generalisation. In turn, the qualitative in-depth interviews allow the research to be credible and dependable (Hamberg et al, 1994). The quantitative strengths of hypothesis testing can therefore be balanced by hypothesis generating qualitative approaches and their emphasis on describing a meaningful social world (Silverman, 2000).

### **8.3.3 Triangulation of the data**

Triangulation is broadly defined by Denzin (1978) as "the combination of methodologies in the study of the same phenomenon" (pg 291). It is thought that researchers can improve the accuracy of their judgments by collecting different kinds of data on the same phenomenon. In the social sciences, the use of triangulation can be traced back to Campbell & Fiske (1959) who developed the idea of "multiple operationism". They argued that more than one method should be used in the validation process to ensure that the variance reflected that of the trait and not of the method. Thus, the convergence or agreement between two methods ". . . enhances our belief that the results are valid and not a methodological artifact" (Bouchard, 1976 pg 268).

Triangulation is often presented as a means of addressing qualitative/quantitative differences. The use of 'between method triangulation' has received much attention in the literature (Foss & Ellenfsen, 2002). Foss & Ellenfsen's (2002) perspective was that, rather than being opposites, the mixing of paradigms might complement each other. Triangulation, therefore, has the advantage of being able to check for cross validation when two or more distinct methods are found to be congruent and yield comparable data. For researchers, this involves the use of multiple methods to examine the same dimension of a research problem. These multiple and independent measures, if they reach the same conclusions, provide a more certain portrayal of the phenomenon. Thus, triangulation may be used not only to examine the same phenomenon from

multiple perspectives but also to enrich our understanding by allowing for new or deeper dimensions to emerge.

The most common method of triangulation, and one that will be used within this research, is “between method” triangulation (Denzin, 1978 pg 302). In this research semi-structured interviews and questionnaires are used together in order to allow for between method triangulation. Between method triangulation is advocated to ‘circumvent the personal biases of investigators and to overcome the deficiencies intrinsic to a single-investigator, single-theory, or single method study, thus increasing the validity of the findings’ (Kimchi et al. 1991, p. 365).

As well as using “between method” triangulation, there are aspects of “within-method” triangulation within the design (Denzin, 1978 pg 301). This method uses multiple techniques within a given method to collect and interpret data. For quantitative methods, such as in the questionnaire aspects of the research, this can take the form of multiple scales or indices focused on the same construct. In addition, in both the qualitative and the quantitative research there are “multiple comparisons groups” (Glaser & Strauss, 1965 pg 7). Many students and their supervisors completed the same questionnaires, and also were involved in interviews about the process of supervision and this allowed more confidence in the emergent theory. In short, “within-method” triangulation essentially involves cross-checking for internal consistency or reliability while “between-method” triangulation tests the degree of external validity and both of these are employed within the research.

The notion of triangulation has been compared to crystallisation. Both are similar concepts but Richardson argued that our world is ‘far more than three sides’ (Richardson, 2000, p. 934), and in order to understand this we must embrace the concept of crystallisation. This enables a shift from seeing something as a fixed rigid two-dimensional object towards a concept of the crystal, which allows for infinite variety of shape and angle of approach. Crystallization necessitates seeing the field of methodology not as having two opposing dichotomies but rather as existing along a continuum from positivism (i.e., scientific research that claims objectivity) through to interpretivism. For most people, they cannot situate themselves at one end or the other, but rather they fall somewhere in the middle (Ellis & Ellingson, 2000). An important aspect of crystallization is that

it is more flexible about the “category” of the researcher as too much emphasis on orientation can constrain the researcher to act according to “type” and not according to research questions.

This mixture of various qualitative and quantitative methods allowed the data to be triangulated and limited the weaknesses of using only one of the approaches. One of the advantages of this research was that in order to ensure that these research methods were integrated and triangulated the research was conducted in a staged approach and what came next was somewhat based on what came before. The research began with pilot studies of several questionnaire measures and some interviews for both staff and students separately. Based on the outcome of these pilot studies the final questionnaires and interview schedules were formulated. The questionnaires allowed a large sample to be studied and the semi-structured interviews were conducted with staff and students from this sample. Therefore their responses to the qualitative interviews can be used to cross check and validate the questionnaires.

## **8.4 Participants**

For both the quantitative and qualitative aspects of the study, in each of the phases, the participants were final year undergraduate/masters students and their supervisors from two research-intensive universities in the UK. Participants of this study were selected from two populations, a student population and a staff population (for a list of disciplines involved and level of students see table 1 below). The staff were the supervisors of the final year/masters students and thus they were all lecturers/teachers or post-doctoral research staff from within the same institution and department.

In order to access these students and supervisors, contact was made with the individual university departments. In all cases, access to students and staff was granted from the Head of School or the Director of Teaching. In some departments there was a designated staff member who organised student projects and therefore in these cases they became the key contact for that department.



### 8.4.1 Quantitative

As the focus of the study was to investigate students who were engaged in practical projects, the process of selecting disciplines to take part in the research was pragmatic - Science and Social Science subjects were selected as they were in line with the focus and aims of the research. In order to ensure the sample was as representative as possible of the broad range of practical projects being conducted by students, a broad range of disciplines (see table 1) were investigated. In phase 2 (main phase pre-project measures) eight hundred questionnaires were issued to students who were in their final year or masters year from these disciplines. Five hundred and ten of these questionnaires were returned to the researcher.

In phase 3 (main phase post project measures) eight hundred questionnaires were issued to the same students on the completion of their project. Three hundred and seventy five of these questionnaires were returned to the researcher. In addition, during this phase, 105 supervisors were contacted. Sixty supervisors completed and returned the questionnaires.

Name of discipline	Undergraduate	Masters
Chemistry	√	
Physics	√	
Biology	√	
Psychology *	√	√
Sociology *	√	√
Engineering *	√	√
Computing Science		√
Education		√

**Table 1- Disciplines included in the main study**

\*Disciplines that also participated in the both the interview component and the quantitative aspects. Disciplines without stars participate only in the quantitative aspect.

### 8.4.2 Qualitative

In order to complement and expand upon the data from the quantitative questionnaires a subset of students and staff from the same departments/schools/institutes that had completed the questionnaires were

then interviewed. As it was not possible to interview as many students as completed the questionnaires, decisions were made about the selection of participants. Three of the disciplines were selected (sociology, psychology and engineering) for interviews. These subjects were selected as it was felt that this covered a broad range of research as they vary from “softer disciplines” in social sciences to “harder disciplines” in science. In total, including the pilot interviews, analysis was conducted on 20 student interviews and 10 supervisor interviews. For the student interviews 11 were undergraduate students (5 psychology, 3 sociology, 3 engineering) and 9 were masters students (3 psychology, 4 sociology, 2 engineering). The number of paired interviews was 15.

Pairs of students and supervisors were interviewed; however the supervisors did not know which, if any, of their students had taken part in the interviews. Staff were emailed an invitation to participate and if they agreed they were asked to forward this invitation to participate on to all the students they supervised. This invitation asked the students to email the researcher directly should they wish to be involved in the research. For the qualitative aspect of the project all of the students were paid for their time.

## **8.5 Materials**

### **8.5.1 The Quantitative Questionnaires**

#### **8.5.1.1 Questionnaire Design**

As previously stated, the design of this questionnaire was a process which was dependent on pilot work. During the course of the academic year 2011-2012 scales were selected/adapted/designed on the basis of literature and then piloted. The questionnaires were slightly adapted and some of the items within them were re-worded on the basis of the findings from the pilot. All of the changes made after piloting were very modest changes, for example changing one word or reversing a questionnaire item. This was because distribution of responses was skewed for some of the items. With the exception of these items the remainder of the items on the questionnaires were the same in the pilot study and the main study. On the basis of this, items were combined into one manageable questionnaire battery for staff and “pre” and “post” questionnaire

batteries for students. The various measures included in the questionnaire are outlined in more detail below.

#### **8.5.1.2 Personality Measure: Mini-markers - Saucier (1994)**

The mini markers were developed by Saucier (1994) and these were based on the work of Goldberg (1992) and have reliability Chronbach alpha scores of between 0.78- 0.86 (Mooradian & Nezlek, 1996). They were produced in response to the need for simply structured measures of the Big 5. Prior to use in the main study this adapted questionnaire was piloted for suitability in order to ensure it was suitable for the target population. The measure asks participants to rate their traits on a scale of one to nine, with one being extremely inaccurate of them to nine being extremely accurate of them. Once the negative items had been reversed and subscales had been calculated high scores of each of the 5 characteristics (openness, conscientiousness, extroversion, agreeableness and emotional stability) were related to high levels of the trait. All of the traits were one word. Appropriate items on each of the subscales were then reverse scored and the average for each subscale was calculated. The subscales and example items within each of these are outlined in table 2 below.

Name of subscale	Example of subscale item	Example of reverse scored subscale item
Openness	Imaginative	Uncreative
Conscientiousness	Organised	Inefficient
Extroversion	Talkative	Bashful
Agreeableness	Warm	Rude
Neuroticism	Fretful	Relaxed

Table 2- Subscales and example items for personality measures

#### **8.5.1.3 Emotional Intelligence (Petrides et al, 2007)**

The TEIQue is a scientific measurement instrument based exclusively on trait EI theory. Independent studies (e.g. Freudenthaler et al, 2008) have been conducted which assess the validity of this construct. Freudenthaler et al (2008) tested and validated the questionnaire using a sample of 352 German-speaking participants. They concluded through a detailed psychometric analysis that

there was evidence in support of the reliability of the TEIQue (at the facet, factor and global levels) and the robustness of its proposed four-factor structure. All of the literature published by the creators of the scale (Petrides & Furnham, 2001) suggests the use of the TEIQue over other instruments.

Prior to use in the main study this adapted questionnaire was piloted for suitability in order to ensure it was suitable for the target population. The current short form of the TEIQue v 1.50 (Petrides et al, 2007), used within this research, comprises 30 items, providing scores on the four factors and global trait EI. Participants were asked to rate their agreement or disagreement with each statement. There were 7 different responses ranging from “completely disagree” (number 1) to “completely agree” (number 7). The internal consistency of the TEIQue short form was found to be 0.88 (Petrides et al, 2007). The scale is divided into 4 subscales: wellbeing; self-control; emotionality and sociability (see table 3 below for example questions which load onto each subscale).

Subscales	Example of subscale item
Wellbeing	I feel I have a number of good qualities
Self-control	I'm usually able to find ways to control my emotions when I want to
Emotionality	Expressing my emotions with words is not a problem for me
Sociability	I can deal effectively with people
Global EI (not within a subscale but contribute only to the global measure)	On the whole, I am a highly motivated person

Table 3- Subscale and items contained within each subscale for Emotional Intelligence

#### 8.5.1.4 Theory of intelligence Dweck (2000)

Dweck developed a scale to measure “theory of intelligence” (as cited in Dweck, 2000). Overall, research indicates the scale displays good internal consistency

( $\alpha = .82$  to  $.97$ ) and test-retest reliabilities at 2 weeks ( $\alpha = .80$  to  $.82$ , Dweck et al, 1995).

This scale asks students and supervisors to rate how strongly they agree or disagree with certain items. The standard 8 Dweck questions were used and 4 additional questions in the same format were added by the researcher as there were additional aspects of theory of intelligence that seemed interesting to investigate. This was in an attempt to relate theory of intelligence more closely with higher education. Prior to use in the main study this adapted questionnaire was piloted for suitability for the target population. All of these questions asked the participants to use a scale from 1 to 6 to rate their feelings with 1 being strongly disagree and 6 being strongly agree. Once scoring and reverse scoring were complete, items on the scale were averaged and higher scores related to a higher belief in the malleability (incremental view) of intelligence. The two scales and example items within each of these are outlined in table 4 below.

Name of subscale	Example item	Example of reverse scored item
Dweck's scale	You can change even your basic level of intelligence considerably.	You have a certain amount of intelligence and you can't really do much to change it.
Researcher additional questions	My own potential is unknown (and unknowable). It is impossible to see what I could achieve with hard work and training.	I believe that my capacity to succeed academically can not be changed through hard work

Table 4- Example items from Theory of Intelligence Measure

#### 8.5.1.5 Dweck Confidence

Dweck also developed a scale which aimed to measure academic confidence (as cited in Dweck, 2000). Prior to use in the main study this adapted questionnaire was piloted for suitability for the target population. This scale consisted of 3 questions and in each of the questions participants were asked to read two statements and tick the one that applied to them the most. Following this they

were then asked to rate how true of them this was on a scale from 1 to 6. All the statements are rated on a 6 point Likert scale with “very true of me” at one end and “sort of true of me” at the other end. An example item from this scale is outlined below. This scale was removed from the final analysis as many students either did not complete it or completed it incorrectly. This was not evident the pilot data and this was possibly due to the fact that the pilot was done with psychology students who would have experience of completing questionnaires such as this.

\_\_\_\_\_ I usually think I am intelligent

\_\_\_\_\_ I wonder if I am intelligent

1	2	3	4	5	6
Very true of me			True of me		Sort of true of me

#### **8.5.1.6 Self-efficacy**

A further scale was developed to investigate students’ research self-efficacy by asking students to rate how confident they were in their ability to perform a variety of research tasks.

Research self-efficacy has been investigated in the literature (e.g. Bieschke et al, 1996; Phillips & Russell, 1994; Overall et al, 2010) and a variety of different measures have been used to investigate this. Each of these scales are similar in format and therefore Forester et al (2004) conducted research on 3 research self-efficacy scales: Self-Efficacy in Research Measure (Bieschke et al, 1996); Self-Efficacy in Research measure (Phillips & Russell, 1994) and the Research Attitudes Measure (O’Brian et al, 1998) scales in order to investigate the commonalities between the scales. The exploratory factor analysis revealed that there are possibly four dimensions of research self-efficacy. These are; data analysis, research integration, data collection, and technical writing.

The scale, used in this research, was adapted from the work of Forester et al (2004) who identified four factors as underlying the three most commonly used

research self-efficacy scales. These were (1) data collection (2) data analysis (3) writing self-efficacy (4) research integration. This scale was only modified slightly. Prior to use in the main study this adapted questionnaire was piloted for suitability. The reason for these modifications was to ensure that items were worded to refer to all types of research as the research was being conducted over a range of disciplines. In addition, it was important that the practical aspects of research were included in the scale. A final question about working with their supervisor, since this is an important aspect of the project, was also added. Students were asked to rate themselves on a scale of 0 (not confident at all) to 100 (completely confident) for a range of research tasks. Scores were averaged across the whole scales and also across each of the subscales. Higher scores related to higher levels of self-efficacy. The subscales and example items within each of these are outlined in table 5 below.

Name of subscale	Example item
Research Integration	Identify an area that needs more research
Data Collection	Select and use the appropriate methods/techniques to carry out your research
Data Analysis	Effectively interpret the results obtained from your analysis
Technical Writing	Write the introduction
Supervision	Effectively work with your supervisor towards completion of the dissertation/project

Table 5- Example of subscales and items from each subscale for self-efficacy

#### 8.5.1.7 Autonomy

The scale was originally developed by Macaskill & Taylor (2010) and is a brief measure of autonomy for university students. Based on Principle Component Analysis, Macaskill and Taylor found that there were 2 main factors and the coefficient alpha of the total scale was found to be 0.81 (Macaskill & Taylor, 2010). Factor one consists of 7 items and has been labelled as “Independence of learning”, as the authors claim it reflects elements of responsibility for learning. Factor two relates to learning and study practices and therefore this scale has

been labelled “study habits”. All the statements are rated on a 5 point likert scale with 1 relating to “very like me” and 5 “not like me at all”.

In addition to using the established questionnaire it was noted that the all of the items (except number 3) were positively loaded. In order to ensure that this did not have an impact on outcome the items were reversed and therefore students completed 24 questions (12 positively loaded and 12 reverse scored). Prior to use in the main study this adapted questionnaire was piloted for suitability. The subscales and example items within each of these are outlined in table 6 below. Once the items had been reverse scored and the overall mean calculated higher scores related to higher levels of autonomy.

Subscales	Example of subscale item	Example of reverse scored subscale item
<b>Factor 1: Independence of learning</b>	I enjoy finding information about new topics on my own	I am not happy working on my own
<b>Factor 2: Study Habits</b>	Even when tasks are difficult I try and stick with them	When tasks are difficult I find it hard to stick with them

Table 6- Subscales and items contained within each of the subscales for autonomy

#### 8.5.1.8 Autonomy Support

Items from the Learning Climates Questionnaire (Williams & Deci, 1996) were modified to assess the extent to which students believed that they were encouraged to be autonomous in their learning. Prior to use in the main study this adapted questionnaire was piloted for suitability. These questionnaires were modified because the original questionnaire focuses on the assessment of a course, rather than the assessment of an individual. The modified questions asked the students to reflect on the autonomy support their supervisor provided. The questions asked the students to consider if they felt their supervisor understood their perspective and if their supervisor was successful in providing opportunities for them to make their own decisions and choices. The scale ranged from 1 “strongly agree” to 7 “strongly disagree”. All items on the scale



were reverse scored and higher scores in the scales meant a higher belief that autonomy support had been provided. Example items within this scale are outlined in table 7 below.

Supervisors also completed the same scale. However, it was modified to measure the extent to which they believed they encouraged their students to be autonomous in their own learning, consider the student's perspective, and provide opportunities for the student to make their own decisions and choices. This modification simply involved changing "my supervisor..." to "as a supervisor...". As in the student measure, the scale ranged from 1 "strongly agree" to 7 "strongly disagree". All items on the scale were reverse scored and higher scores in the scales meant a higher belief that autonomy support had been provided. Prior to use in the main study this adapted questionnaire was piloted for suitability. Example items within this scale are outlined in table 7 below.

Person completing the scale	Example of item	Example of reverse scored item
<b>Student</b>	My supervisor listened to how I would like to do things	My supervisor liked me to do things the way they thought they should be done
<b>Supervisor</b>	As a supervisor I listen to how students would like to do things	As a supervisor I take control of the choices and decisions in relation to student projects

Table 7- Example items contained within the autonomy support scale

#### 8.5.1.9 Expectations

Students and supervisors completed the same questionnaire that aimed to establish if there were differing perceptions, between staff and students, regarding the roles of the supervisor and the student with regards to student

research projects. This scale was adapted from the Role Perception Rating Scale (Moses, 1985). Prior to use in the main study this adapted questionnaire was piloted for suitability. This scale was adapted in order to more closely follow the stages of practical student research projects. Each question was presented as pairs of statements (semantic differential question format) with numbers ranging from 1-5 between the statements. Students and supervisors were asked to circle the number that best corresponded to their level of agreement with each the statements. If they most agreed with the statements on the left (the responsibility lay more with the supervisor), then they were instructed to select 1 or 2, if they most agreed with the statement on the right (the responsibility lay more with the student) then they were instructed to select 4 or 5. For the whole scale, a mean was found. Higher means related to a belief that the responsibility lay more with the student.

The scale was divided into 4 subsections: Topic/course of study, practicalities of the project, contact/involvement and the write-up. The subscales and example items within each of these are outlined in table 8 below.

Name of subscale	Example item				
Topic/Course of study	It is the supervisor's responsibility to select the topic	1	2	3	4 5 It is the student's responsibility to select their own topic
Practicalities of the project	The supervisor is overall in charge of this project. They should lead the student through each of the appropriate stages.	1	2	3	4 5 Ultimately this is the student's project and they should be in charge of progressing through each of the appropriate stages
Contact/involvement	The supervisor should be responsible for the time-management of the project	1	2	3	4 5 The student should take full responsibility in the time management of the project
The write-up	It is the supervisor's responsibility to ensure that the project write-up is professional	1	2	3	4 5 It is the student's responsibility to ensure that the project write-up is professional

Table 8- Example subscales and items in subscales for expectations

#### 8.5.1.10 Perceived enjoyment and skill development in the process (outcome measure)

Students also completed a series of Likert scale questions about the experience. Prior to use in the main study this adapted questionnaire was piloted for suitability. All of these questions were selected by the experimenter based on previous work that had already been carried out within the educational and psychological literature which suggested increasing students' enjoyment in studies can lead to academic advantages and that their interest in the subject matter can improve (Kulick & Kulick, 1979). Also, the advantages of active learning and interactive engagement with the learning process are becoming increasingly important (Healey, 2005). In addition, there were key elements

that seemed important to measure based on the graduate attributes students are meant to develop during their time at university. Therefore, the measure of the student experience consisted of seven questions which gauged students' enjoyment of the supervision process, how much they felt they had developed as learners and their engagement with the learning process. In addition to this, the scale gauged their perceptions of their supervisor's input to the development of these skills. Students were asked 17 questions and on each of the questions participants were asked to rate their responses on a 5 point likert scale, with higher scores relating to a more positive attitude/increased importance of an item. Example items included: How important would you say the role of your supervisor was in developing your critical thinking skills?; Overall, how important was role of your supervisor to your success this year?; And how important would you say the role of your supervisor was in developing you as an independent learner?

#### **8.5.1.11 Proxy measure of student's attainment for students and staff**

The final questionnaire included a proxy measure of student's attainment. In this measure students were asked to rate how well they think they did in this project as a whole. They were asked to rate themselves *objectively*, based on any marks, grades or comments that they have been given. Supervisors were also given the names of the students they had supervised, who had consented to being involved in the project and were asked to rate how well the students did in the project as a whole. This method of assessing final performance was employed to overcome ethical issues and difficulties surrounding the release of student marks. Prior to use in the main study this adapted questionnaire was piloted for suitability. In addition, this measure has been used successfully elsewhere in the literature (Entwistle and McCune, 2013). This scale ranged from 1-9 with higher scores relating to better perceived performance.

### **8.5.2 Semi-Structured Interviews**

In-depth semi-structured interviews were conducted with pairs of students and their supervisors, both were interviewed separately and supervisors were not aware which of their students had participated in the interview. During these interviews the students and supervisors reflected on the process of doing a

dissertation/project. Supervisors discussed general expectations and their experiences, often referring to particular incidents or students. Students discussed and reflected on their experience of supervision.

### **8.5.2.1 Interview Schedule design**

The qualitative interview guides worked very well during the course of the pilot interviews. Over the course of these interviews, students and supervisors discussed interesting aspects that they believed were influential in their project. Most of the comments made could be captured by the initial interview schedule. However, all of the students discussed the importance of feedback on their work and this seemed very salient to the students. In addition students discussed the emotional aspects of the process of doing a project and reflected on what they believed supervision was. As a result, three additional questions were added to the student interview schedule to ensure that these issues were discussed in all further interviews.

In the supervisor interviews the schedules remained virtually the same during piloting and therefore the questions were maintained for the next phase- the main study. The only difference being the addition of a final question for the supervisors. During the piloting process it seemed that the interviews ended too abruptly and it would be better to get supervisors to do an overall reflection of what they believed supervision was and what it meant to them as this would finish the interviews well.

As a result of the minimal changes to the interview schedules and given that the interviews were semi-structured in format it was decided to consider the findings of the qualitative pilot along with the findings of the main study.

In the main study, it was important to ensure that certain questions (see appendix A for final interview schedules for supervisors and students) were included on all interview schedules to aid comparison across the in-depth interviews. However, it was also important that the interview schedules served the purpose of a “guide” that outlined the main topics, rather than prescriptive questions, allowing flexibility in the approach to interviewing. The design of the schedule was therefore semi-structured in order that the interviewer could

respond to issues that emerged during the course of the interview. This allowed the researcher to explore the perspectives of the participants on the topic under investigation.

The interview schedules were, in part, informed by the literature on the topic of supervision. The interview was divided into 4 different sections for both the students and the supervisors as the interview schedules were designed to mirror each other. Firstly, both students and supervisors were asked to reflect on the general supervision process that they had experienced, for example what they covered during the first meeting with their supervisor/students. Supervisors were asked if this was always the case or if things were different with different students. Following this they were asked to reflect on quality of the supervision they believed that they had experienced. So, for example, students were asked to reflect on and discuss the aspects of the project that they felt worked well for them and the aspects they thought could have been improved. Supervisors were asked to reflect on the best student they believed they had supervised and were asked to discuss the qualities that this student had. Thirdly, they reflected on the expectations they had of themselves and their supervisor/student during the process. This part of the interview encouraged students/supervisors to consider if their expectations changed during the course of the project. Finally, the students/supervisors reflected on the process as a whole. They reflected on how they felt they had developed as learners/teachers and the students also discussed the transferable skills they developed from completing a project. Throughout the whole interview students were asked to think about the role their supervisor had played.

## **8.6 Procedure for data collection**

### **8.6.1 Phases of data collection**

Following ethical approval from the College of Social Sciences and, later, the college of Science and Engineering at the University of Glasgow, supervisors and students were recruited from various departments at two research intensive institutions. Data collection had several phases. The first phase involved initial small scale studies which pilot tested the questionnaires and interview schedules. After this the data collection moved into the main study. Phase 2 of

data collection focused on the collection of pre-project measures (time 1). This involved the collection of questionnaires from students. Following this, phase 3 of the data collection involved the collection of post-project measures at the end of the academic year (time 2). This final phase involved the collection of questionnaires from students and their supervisors. In addition to this, semi-structured interviews were conducted with students and supervisors. The stages of data collection are outlined in more detail in figure 1 below.

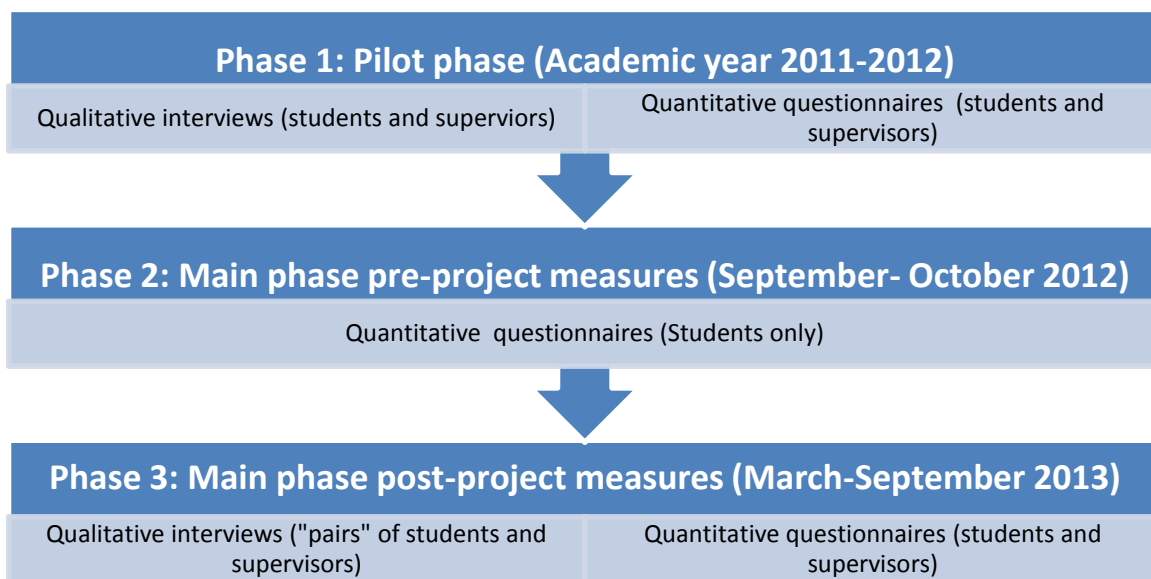


Figure 1- Diagram of the phases of data collection

The questionnaire research period ran from September 2012- August 2013 for the main phases of data collection and was designed to build on the pilot phase which was conducted from September 2011- May 2012. After the completion of the second questionnaire the supervisors of the same students were given questionnaires to complete. During this final phase (phase 3) of data collection students and their own supervisors were also interviewed individually and given the opportunity to express their view on the topic.

Students were given the “pre” questionnaire battery at the start of the semester - for most students this was during an induction session - and then a “post” questionnaire battery on submission of the project. The measures contained within each questionnaire are listed in table 9 below and then the each of the scales are discussed.

Measures	Student time 1	Student time 2	Supervisor measure
Minimarkers Personality	√		√
Emotional Intelligence	√		√
Dweck Mindset (self)	√	√	
Dweck mindset (others)			√
Self-efficacy in research	√	√	
Confidence	√		
Autonomy	√	√	
Autonomy support		√	√
Expectations	√	√	√
Outcome measure of students			√
Perceived enjoyment and skill development in the process (outcome measure)		√	
Proxy measure of attainment		√	

Table 9- Measures contained within the main study questionnaires

One of the strengths on the data collection was the timing of the circulation of the questionnaires. Students were issued with questionnaires at the start of the year, before they had worked with their supervisor or started their project and then again at the end of the year, as they handed in their dissertations. This meant that the pre- and post-measures were as well positioned as they could be. In addition, it was organised with the cooperation of the gatekeepers for all of the subjects, that the initial questionnaires would be distributed in the induction lectures at the start of the course. On reflection this was key to the outcome of the research. This ensured very high response rates at time 1 and therefore attrition was less detrimental than it might have been had this not been planned.

### 8.6.2 Phase 1: Pilot Studies

In the academic year 2011-2012 two pilot studies were conducted in order to assess the reliability and validity of selected questionnaire measures. In addition, interview schedules were piloted. A summary of the measures contained within each of the quantitative pilots is shown in table 10 below.



Measure	Student questionnaire time 1 (pilot 1)	Student questionnaire time 2 (pilot 1)	Supervisor questionnaire (pilot 1)	Student questionnaire (pilot 2)
Personality	√		√	
Theory of Intelligence (others)			√	
Theory of Intelligence (self)	√	√		
Expectations	√	√	√	
Confidence in Intelligence	√	√		
Experience of project		√		
Student autonomy				√
Self-efficacy				√
Emotional intelligence				√

Table 10- Summary of the measures contained within quantitative pilots

### 8.6.2.1 Quantitative pilot 1

Participants of this study were selected from two populations, a student population and a staff population. All of the students were final year honours psychology students from a research-intensive university. The staff were the supervisors of the final year students and thus they were all psychology lecturers/teachers or post-doctoral research staff from within the same institution. In this pilot study, similar to the main study, students were issued with questionnaires at two points in time. Staff only completed one questionnaire battery, at the end of the academic year, however students completed two questionnaires, one at the start of the academic year and one at the end of the academic year.

In the first pre-project questionnaire, administered to students between week 3 and 4 of the first semester, 74 of the available 130 final year psychology students formed the total sample. All of the students who participated in this study were recruited through lectures. This gave a response rate of 57%. This questionnaire measured their personality, the theory of intelligence they held, and their expectations of their project.

The second (post-project) questionnaire was administered to the same group of students in the final week of term two, on the day they handed in their final

dissertation project. There were 65 students in the total sample. This gave a response rate of 50% of the year. Fifty percent of the sample completed the questionnaire at time 1 and at time 2. The time 2 questionnaire measured their confidence, theory of intelligence held, their expectations and there was also a series of outcome questions which assessed their learning and development and overall satisfaction with the experience.

Following this, the supervisors of these students were issued with their questionnaires. There were 10 staff in the total sample. The staff questionnaire measured personality, expectations they have of project students, the theory of intelligence they held, and there was a series of outcome questions measuring their satisfaction with the supervision process.

#### **8.6.2.2 Quantitative pilot 2**

Questionnaires were administered to Psychology Masters students who were completing a psychology course at the same research-intensive institution. The questionnaire was administered to students on the third week of their course, just before the submission date for their dissertation. There were 47 students in the total sample. This gave a response rate of 87% (47/54 students completed the questionnaire). These questionnaires measured student autonomy, self-efficacy and emotional intelligence.

#### **8.6.2.3 Qualitative pilot 1**

Throughout the research process the researcher was aware that an inexperienced researcher could limit the research. This is common at doctoral level research so, at various stages, quality checks were put in place to ensure that inexperience impacted as little as possible on the outcomes of the research. Firstly, as an inexperienced qualitative researcher a decision was made to observe a qualitative interview conducted by a very experienced qualitative interviewer before commencing any qualitative data collection. This decision was based on the importance placed on the strong interviewing technique of the interviewer for the generation of rich data. Interviewers must be “skilled in interpersonal interaction, question framing, and gentle probing for elaboration” (Rossman and Rallis 2012, pg 179). The opportunity to observe the projects interview schedule being demonstrated through the use of an example

supervisor interview before commencing data collection was an invaluable opportunity to develop as a researcher and also impacted on the quality of the data that was produced. Observing this interview focused the researcher's attention on the importance of interview technique and a flexible approach to the use of the interview schedule for the production of rich data. From this experience the researcher became aware that, often, it was the additional questions and prompts for explanation which led to the generation of high quality and rich data. This activity, therefore, reduced possible challenges that may have arisen from the researcher's lack of experience as a qualitative researcher.

Following this observation of an interview, qualitative semi-structured interviews about the experiences of supervision with staff and students were conducted. For this initial small scale study 4 students and 4 supervisors were interviewed. These interviews helped to clarify what might be particularly important about the supervision relationship. Interviews were conducted with a subset of the students and staff who completed the questionnaires in study 1. Interviews were conducted with pairs of staff and students, however, both were interviewed individually and supervisors were unaware which of their students had taken part. Participants were asked a series of questions (see Appendix E), in a semi structured fashion. The aim of the in-depth interviews was to gain a detailed insight into the research issues from the perspective of the study participants themselves. These initial interviews provided rich data and the questions remained almost unchanged in the final schedules (see appendix E for pilot interview schedules and appendix A for final interview schedules), therefore they are included in the analysis with the interviews in the main study.

### **8.6.3 Phase 2: Main phase pre-project measures**

Students, who were all final year honours students or masters students, were recruited from their induction lectures where they were informed of the aims of the study and were invited to take part. When completing the questionnaire they were told they had the right to omit any questions that they did not wish to answer. The students were then given the questionnaire to complete. This took about 10-15 minutes.

For each of the disciplines, with the exception of one, paper copies of the questionnaire were issued. These were issued during the first week of the university term and during the students' induction lecture. The return rate using this method of data collection was extremely high with >80% of most courses completing the questionnaire. For one of the subjects it was not possible to reach the students during an induction lecture and therefore an online questionnaire was set up using SurveyMonkey. This subject had 300 students enrolled in the course. The return rate of these questionnaires was 15/300 (5%).

### **8.6.4 Phase 3: Main phase post-project measures**

#### **8.6.4.1 Post-project Quantitative Questionnaires for Students**

The same students, once they had handed in the final year project, were then invited to complete another questionnaire in relation to their experience. The students were then given the second questionnaire to complete. Again, this took about 10-15 minutes.

Most of the students completed a paper copy of the second questionnaire battery on the day they handed in their project. Students were invited to participate as soon as they handed in the copy of their project. However, some of the students were unable to complete questionnaires batteries on the day and others did not hand in their project on the day they were due. As a result, in an attempt to get "paired" responses at time 1 and time 2 the remaining students were emailed the link to the online questionnaire, which again, had been set up using SurveyMonkey. Participants were verbally debriefed on the purpose of the experiment and given contact details should they have any other enquiries.

#### **8.6.4.2 Post-project Quantitative Questionnaires for Supervisors**

Once all the students had completed their questionnaires, the supervisors of the same students were contacted. Supervisors were only approached if one or more of their students had completed questionnaires at time one and again time two. On the basis of this, 105 supervisors were contacted. Supervisors were emailed with the link to the online survey. However, there were also informed that they would be sent a paper copy of the questionnaire by post should they wish to complete it in that way. There were given an addressed envelope in

order to return the questionnaires to the researcher. Sixty supervisors completed the questionnaires. Supervisors, who were all teachers/lecturers or postdoctoral research staff from the same school/department/research centre as the students, were recruited through an invitation. The supervisors were given the questionnaire to complete. This took about 10 minutes.

#### **8.6.4.3 Post-project Qualitative Interviews with pairs of students and supervisors**

Semi-Structured interviews were conducted with students and supervisors. In order to ensure any nuances were identified, students and their actual supervisor were interviewed individually to discuss their views on the topic. Semi-structured interviews were selected as the aim of the in-depth interviews was to gain a detailed insight into the research issues from the perspective of the study participants themselves. The style of interviewing was based on research arising from the phenomenographic tradition. Marton (1981) describes phenomenography as “research which aims at description, analysis, and understanding of experiences; that is, research which is directed towards experiential description” (p. 180). This method of interviewing has been found to be very useful for understanding student learning (e.g. Entwistle, 1984, 1997; Marton and Booth, 1997; Biggs 1987; Tait & Entwistle, 1996). Research in student learning is particularly suited to a phenomenographic approach to data collection because it enables the researcher to identify the range of different ways in which people understand and experience the same thing (Cousin, 2009). In a study such as this, where individual differences in experience of both the student and the supervisor are being explored, this is extremely useful. Indeed, the aim of this research was to identify the ways in which different students and supervisors experience teaching and learning, what is important therefore is not an abstract truth, but rather what they perceive to be true as it is these perceptions that lead to practical consequences of the student having a valuable and enjoyable experience in supervision.

The style of interview adopted was open and conversational. However, while the interviews were conducted in a conversational way there were some variations from everyday conversation. Indeed, research in the area of student learning suggests that interviews in which the interviewer uses a natural

conversational style encourage students to provide detailed accounts of their learning (Entwistle, 1984, 1997). Firstly, both students and supervisors were prompted to expand on their original answers or asked more questions about their experiences. Secondly, there was an emphasis on asking students and supervisors to speak initially about their concrete experiences and then to elaborate and reflect on this basis. This method of interviewing was selected as concrete examples are helpful for framing the interview and allowing the participant to make sense of things. This allowed an in-depth exploration of students' and staff meanings so that their perspectives can be reported fully. The interviews were set out to follow a logical order which was guided by an interview schedule consisting of a list of topics and sub-topics (see appendix A). Each student and supervisor was interviewed once and their interviews were later transcribed and analysed. Interviews lasted around one hour.

## **8.7 Ethics**

It is also important to consider the ethical constraints of the research as these had implications for the methodology and also the reporting of the findings. When researching human participants it is important to be mindful that the researcher is entering into individuals' private worlds and as such there is a need to be respectful and adhere to a strict code of ethics (Stake, 2000). As student and supervisor data was being collected in a paired format, ethical issues were an important consideration. With the quantitative data students and supervisors were asked to disclose their name, and in the case of students their matriculation number. While this led to unanonymised data the researcher ensured that data was coded and entered in a way that all students and staff were paired, but also unidentifiable. For this reason the pairing and analysis of the quantitative data was non-problematic from an ethical viewpoint. However, the researcher was aware that the qualitative data could be more sensitive and as such ethical considerations were put in place to ensure respect was shown to the participants. In order to ensure there was no potential for staff to identify their students or students to identify their supervisor, the researcher assured participants, as part of their informed consent, that the data would not be reported in a paired format.

For the purposes of clarity the quantitative and qualitative methods, in relation to ethics, will be discussed as two distinct sections. First, consideration will be given to the ethical issues which affected both the qualitative and quantitative aspects of the project and then consideration will be given to issues surrounding the questionnaire before moving on to discuss the ethical issues which were taken into consideration before conducting the interviews.

### **8.7.1 Ethical Issues for the study**

Ethical approval was sought and granted from the College of Science and Engineering Ethics Committee at the University of Glasgow. In agreement with the terms of this approval, all contributions from participants (both the questionnaires and the interviews) were treated as confidential.

Questionnaires and interview transcripts were locked in a filing cabinet, which was only accessible by the main researcher. Electronic sound files of the interviews were stored on a password-protected computer and could, again, only be accessed by the main researcher. In addition, to satisfy the university ethical committee, ethical considerations were informed by the Code of Ethics published by the British Psychological Society.

### **8.7.2 Quantitative Questionnaire Ethics**

Students who showed an interest in the study, at each of the phases and stages of data collection, were first given a Plain Language Statement to read and then they were given the questionnaires and consent forms. These forms contained contact details should they have any further questions or should they wish a copy of the anonymised group results. These consent forms informed the participants that their participation was voluntary and they had the right to withdraw from the experiment at any time and for any reason. They were informed that all information would be coded to ensure anonymity and would never be identifiable as their own. Each of the consent forms and Plain Language Statements for each of the phases are provided in the appendix section (Quantitative pilot 1- see Appendix B; Quantitative pilot 2- see Appendix C; Main project quantitative for students- Appendix F ; Main project quantitative for supervisors- Appendix G) -

As student and supervisor questionnaires had to be matched and students completed questionnaires at the beginning and the end of the project it was important that the questionnaires were coded. This coding was only accessible to the main researcher. Questionnaires returned by the students were given an identification code of a letter (indicating the subject the student studied) and a number denoting the order of return within their subject and then another letter (which indicated their supervisor). Supervisors within each of the departments were then coded by two letters (one indicating their subject and the other to indicate their identity). These codes were used as the identifier when entering the data into SPSS as this allowed statistics on “match” or “mismatch” to be carried out.

### **8.7.3 Qualitative semi-structured interview ethics**

Students were asked to respond directly to the researcher and were assured that their supervisor would not be aware of their participation in, or withdrawal from, the interview. Therefore, supervisors would never find out which of their students had agreed to take part in the interview. This ensured anonymity and confidentiality of the students.

Supervisors and students who agreed to participate in the interviews were informed of the purposes of the research. This was conveyed to the participants through two different methods: a written plain language statement and also verbally at the beginning of the interview. Each participant was made aware that they could withdraw from the interview at any time and for any reason. Participants were asked to sign a ‘consent to participation’ form in which they gave their consent to being recorded. Each of the consent forms and Plain Language Statements for each of the phases are provided in the appendix section (qualitative pilot 1 see Appendix D; Main study qualitative - see Appendix H)

After completion of the interviews student and supervisor data was paired for analysis. However, in the writing up of the findings, in order to protect the confidentiality and anonymity of the students and supervisors the data has not been reported in a paired format. In addition, the names of the students and



supervisors have been replaced by codes to ensure the participants are not identifiable.

## **8.8 Data Analysis**

In both qualitative and quantitative research there were 3 main stages of data analysis. Both involved preparation of the data, reduction of the data and then analysis and conclusions were drawn. Miles & Huberman (1994) outline these three different activities in relation to qualitative research. Although the quantitative and qualitative data analysis methods were very different the general steps were similar. Therefore, for the purpose of clarity the main steps in the analysis process for both the qualitative and quantitative data are outlined below.

### **8.8.1 Quantitative Analysis**

#### **8.8.1.1 Preparation of the quantitative data**

The preparation of the data for the quantitative analysis was important as it ensured that student time one and time two data were coded and matched and also matched with the data from their supervisor. The first step of this involved coding the time one and time two data and entering it into SPSS. In total there were data from 600 students and their supervisors. Each respondent had 406 data points.

Following the initial entry of the data the data set was cleaned and checked and at this point all errors, such as errors in data entry, were corrected and any missing data was identified and coded as missing data in order that it was excluded from the analysis. Finally, some descriptive statistics were conducted on the data in order to check the assumptions of parametric statistics. The decisions in relation to the analysis of the quantitative data will be explained in the findings chapter.

#### **8.8.1.2 Reduction & analysis of the quantitative data**

Data reduction involved ensuring the 406 variables were condensed into more meaningful data. The first step in this process was refining and reducing the

number of items. This mostly involved calculating the mean of each of the existing subscales. The particular process of analysis will, again, be more fully outlined in the findings chapter.

#### **8.8.1.3 Decision to use parametric tests and analysis from the quantitative data**

There is some debate in the literature regarding the use of parametric statistics with Likert style questions. Norman (2010) suggests that Likert data can be analysed using parametric tests. The decision to proceed with parametric statistics was on the basis of several factors. Firstly, and most importantly, there are no non-parametric alternatives to some of the statistical tests required in order to address the research questions, for example regression, and therefore for the purposes of consistency across the thesis a decision was made to use all parametric tests.

In addition, some authors suggest that questionnaires that have scales, allow parametric statistics to be more robust compared to conducting parametric statistics on individual items. Carifio & Perla (2008) contend that those who have an “ordinalist” view of Likert scales are not considering the large amount of empirical research that has supported the view that it is acceptable to use summed scales to conduct parametric tests. This is on the basis that scales are more likely to be normally distributed than single items. Pell (2005) agrees with the use of parametric statistics on summed scales provided that the assumptions are clearly stated and the data is of the appropriate size and shape. All of the questionnaire data considered within the thesis is based on subscales and therefore is more likely to be normally distributed than single item measures. Further, most of the measures are standardised measures (e.g. Minimarkers personality scale).

Analysis of the data therefore involved a combination of ANCOVA, MANCOVA and regression techniques. From this graphs and tables were created and conclusions were drawn.

## 8.8.2 Qualitative Analysis

### 8.8.2.1 Preparation for analysis of the qualitative data

When using phenomenographic research it is important to consider that one of the criticisms of this approach is that the variations it identifies are often organised into hierarchical categories and/or binary opposites (Cousin, 2009). In doing this, more nuanced and complex understandings are lost (Webb, 1997). As the act of supervising is complex and the resulting relationship is therefore complex, organising and analysing data in this way would be detrimental to the process. In addition, phenomenography is often concerned with conceptions of learning and conceptual understandings of things. As a result, often the emotional aspects of learning are missed. Due to the nature of this study, in which working relationships were being investigated, it was anticipated that the emotional aspects of learning would be influential and would require careful consideration. Therefore, in order to ensure that sufficient richness would be evident within the interviews the method of analysis was inspired by the work of various authors, for example Charmaz (2006), Corbin & Strauss (2008) and King (2004) rather than following phenomenographic methods of analysis.

The interviews were transcribed in full before being analysed. All interview transcripts were read by the researcher and some transcripts were shared with the research supervisors. Using a form of thematic analysis, a coding template (see Appendix I) was created which summarised themes identified by the researcher as important in a data set and organised them in a meaningful and useful manner. So, *a priori* themes, which were strongly expected to be relevant to the analysis, were already in place before coding took place. However, these themes were not fixed and they were added to and expanded/broken down into smaller themes or dispensed with altogether during the course of the analysis if they did not prove to be useful or appropriate to the data.

### 8.8.2.2 Reduction & analysis of the qualitative data

Firstly, broad themes were coded and then reduced, encompassing successively narrower, more specific ones. Once any *a priori* themes were defined, the first step of the analysis was to read through the data, marking segments that were relevant to the research questions. So, when any of the text related to an *a*

*priori* theme it was coded as such. New themes were also defined to include all the interesting and significant findings within the research. These were then organised using the *a priori* coding structure. This initial coding structure was then applied to the whole data set and modified in the light of careful consideration of each transcript.

The qualitative analysis package QSR NVivo (Richards and Richards, 1994) was used to manage the analysis of interview data. Using NVivo allowed for this process to occur without necessarily removing fragments of information entirely from their context. Additionally fragments could be allocated to more than one theme, allowing multiple interpretations of the material (Atkinson, 1992). The analysis involved the deconstruction of the transcripts into fragments which were then re-constructed under thematic headings (Lofland, 1971). Each of the transcriptions was read systematically in relation to identification of these themes. The first step in analysis was to select all of the data, within these themes, relating to students' and supervisors' accounts of their experiences of supervision and in the case of students, the effects that this had on their learning. Extracts were coded and enough of the surrounding text to put the students'/supervisors' comments into context was provided. All interviews were read systematically and this ensured that all the text appropriate to a given theme was coded.

The interviews were then re-read and other themes that had been missed were added to the analysis. This allowed the research to move on to the next stage in which broad themes and sub-themes were initially identified and refined. The relative importance of each factor the students and supervisors discussed was decided by considering: how many students/supervisors talked about it and how important the students/supervisors thought it to be during their interviews. During the data analysis the main task was to reduce the large number of broad themes and sub categories down to a smaller number of themes which still allowed a coherent overview of the students' and supervisors' responses.

Once the data had been organised into thematic sets it was important, again, to give consideration to the initial research questions and data was reorganised in order to provide a meaningful response to these. Using Nvivo ensured that this process could occur without removing information from the context in which it

was meant. Further themes could be arranged and coded as sub-sets (Tesch, 1990). Here the work of Corbin & Strauss (2008) became particularly influential as an integral part of the research process was ensuring that although some of the themes emerged unexpectedly they could still be placed and considered meaningfully within the main analysis.

### **8.8.3 Quality Checks in the data analysis process**

In order to ensure the research was of high quality a decision was made to include quality checks. For the quantitative aspects of the project this was less problematic. Quantitative research is associated with well-known criteria for judgment based on validity and reliability and therefore the checks for quality and accuracy surrounded meeting the assumptions of the tests conducted. In more recent years there has been interest and attention given to the criteria that might be employed in relation to qualitative studies (e.g. Lincoln & Guba, 1985; Spencer et al, 2003), with the main conclusion being that qualitative research should be judged on credibility, trustworthiness and dependability (Hamberg et al, 1994). However, with two very different criteria for judgement of quality there was the question of the appropriateness of these criteria for mixed methods research or, indeed, if different kinds of criteria should be put in place for this. This was something the researcher considered in depth during the research process.

The approach taken was similar to the work of Sale and Brazil (2004) who came to the conclusion that four criteria could be used to evaluate the quality of the combined quantitative and qualitative research: truth value; applicability; consistency; and neutrality. These four words took different meanings in the quantitative and qualitative aspects of the data analysis. Truth value refers to internal validity for the quantitative and credibility for the qualitative aspects and this was achieved through piloting of the measures for the quantitative and ensuring that the views of the participants were taken into consideration in the interviews- the semi structured phenomenographic method of interviewing was the most suitable method for ensuring this. Applicability can be demonstrated through external validity for quantitative methods and transferability for qualitative methods. For the quantitative aspects of the work, external validity was considered as the questionnaires were given to students in a wide range of

disciplines in order to ensure the results were as generalizable as possible. For the qualitative aspects of the work transferability was achieved as the research context and the assumptions of the researcher were outlined and therefore information regarding how transferable these findings are to other contexts is able to be judged by the reader. Consistency in research is demonstrated through reliability for quantitative methods and dependability for qualitative methods. In order to ensure reliable results in the quantitative aspects of the project, where possible the researcher selected research instruments (e.g. the Mini Markers personality measure) that had strong support within the literature. In order to ensure dependability in the qualitative aspects of the work there was an acknowledgement of the importance of context for the interpretation of the qualitative findings. Finally, neutrality is objectivity for quantitative methods and conformability for qualitative methods. Conformability in the qualitative analysis was achieved as steps were put in place, through cross checking of the data, to ensure that the findings emerged from the data and were not solely shaped by the researcher's own thoughts and predispositions.

In order to ensure quality and rigour in the analysis of interviews several different elements were considered. Firstly, in order to ensure that several people agree with the findings a form of independent analysis of the research was implemented. Independent scrutiny is useful and relatively easy to incorporate into the process of thematic analysis. As this research is being conducted as part of a PhD thesis and not as part of a large research team there are clear limitations on capability to cross-check all of the transcripts. However, during the analysis the researcher and research supervisors met in order to review sample transcripts and check emerging themes. On the first occasion a sample of 2 transcripts were read by the researcher and supervisors. Following this there was a discussion about the themes arising from the data. After this discussion the researcher reviewed all of the transcripts and created a coding template. The researcher and research supervisors then met again and each person was given sample transcripts and asked to code them using the *a priori* codes identified by the researcher, noting themes they found difficult to employ, aspects of the texts not covered by the template and any other issues that struck them in the process. Discussions of such observations then lead to further revisions of the themes. The coding template was then revised and

everyone met again, on one more occasion to independently code another transcript. This allowed a final thematic template, upon which all agreed, to be created and this template was used to thematically code all of the transcripts.

Given that this was a PhD and therefore the researcher had little experience of qualitative research it was important to learn from more experienced researchers. The creation of a coding template for the qualitative data, which was adapted several times, aided in checking the accuracy and quality of the coding. This process of cross-checking was important for two reasons. Firstly, it allowed the researcher to think very carefully about coding and the process of this. Discussions with more experienced researchers resulted in careful consideration being given to the coding and this was important to the final outcome. In addition, the coding template and cross-checking of ensured that there was agreement in the coding of the data and increased confidence in the findings.

In addition to the process of cross checking, to ensure agreement of the findings was reached a variety of quality checks were put in place during the research process. Using NVivo for the analysis was important in ensuring quality in the qualitative analysis. While coding the qualitative data, examples and counter-examples were coded within the template. This ensured both positive and negative aspects of the phenomenon were investigated and explored. The use of Nvivo also ensured completeness of coverage of the transcripts.

Further, a detailed audit trail (Miles & Huberman, 1994) of the analysis was kept in order to ensure that the research was clear and transparent. As a result a documentary record of the steps undertaken and the decisions made in moving from the raw transcripts to the final interpretation of the data was kept. Finally, the research was reflected on critically and compared to other research and findings within the area.

## **9 Findings for Theme 1: Difference between students at different levels of study.**

### **9.1 Introduction to the findings chapters**

The following findings chapters present the main findings from both the qualitative and quantitative analysis. The findings are presented in 4 different chapters. Each of the chapters addresses a different theme within the research. Chapter 9 is concerned with differences between students at different levels of study who are engaged in the process of conducting a project. The next chapter, chapter 10, moves on to address the theme of student development over the course of conducting a research project. In the third findings chapter, chapter 11, good supervision is addressed. Finally, the findings section of the thesis will address the theme of match or mismatch between students and supervisors and the implications of this.

Within each of these themes several research questions are addressed. These research questions are both qualitative and quantitative in nature. A decision has been made to integrate the qualitative and quantitative data within the same chapters as this was the most coherent way of addressing the research questions. Within the individual chapters a discussion of the specific data used and the specific analysis techniques are explained.

Overall, the findings chapters of this thesis include questionnaires from 580 students and 60 supervisors. Many of the students (157) completed the questionnaire before and after completion of their project, however, the remainder completed the questionnaires at only one time point. The 60 supervisors were supervisors of the students who completed the questionnaires and many of them had multiple students. The qualitative analysis includes analysis of the interviews from 30 participants; 20 students and 10 supervisors. Where possible these students and supervisors were “paired”, that is the supervisors and students, who were working together were both interviewed, and so in total 15 interviews with student and supervisor “pairs” have been conducted and analysed.



## **9.2 Description of data used for theme 1**

When analysing the differences between students at different levels, both qualitative and quantitative data have been used to answer the research question. In terms of qualitative data the interviews from the 20 students and 10 supervisors was coded and included in the analysis. For the quantitative aspect of this theme only the student data was analysed. All factors that may have changed over time were considered in the analysis. As a result emotional intelligence and personality were not considered in the differences between undergraduate and masters students as these have been found, as previously outlined, to be stable over time. The data from 455 students (186 masters students and 269 undergraduate students) was collected at the start of the process and this was used to investigate differences in students in different levels of study at the start of the process. In addition to this, data from 247 students (92 masters students and 155 undergraduate students) was collected at the end of the process and this was used to investigate differences in students at different levels of study at the end of the process.

## **9.3 Research Question 1: Are there differences between undergraduate and masters students doing a project?**

For the purposes of clarity this broad research question is divided into two main sub-questions. The first sub-question addresses the quantitative aspects of the question for students at the start of the process and then again at the end of the process. This analysis included the data from all students who completed a questionnaire at either time 1 or time 2. The second sub-question gives consideration to the qualitative aspects of the question.

### **9.3.1 Are there any differences between UG and masters students when they start and end the process of conducting a project in relation to measures of autonomy, self-efficacy, expectations and theory of intelligence?**

#### **9.3.1.1 Start of the process**

This part of the first research question investigated if there were differences between undergraduate and masters students on various psychological factors

before starting their projects. Descriptive statistics in table 11 show that masters students had slightly higher mean scores, for all of the variables, than the undergraduate students. Higher scores are associated with higher expectations of what the supervisor should do at the start of the process, higher self-efficacy, a more incremental view of intelligence and higher autonomy.

<b>Psychological measure</b>	<b>Masters Students (N=186) Mean (S.D)</b>	<b>UG Students (N=269) Mean (S.D)</b>
<b>Total expectations (scale range 1-5)</b>	3.70 (.59)	3.66 (.58)
<b>Total self-efficacy (scale range 0-100)</b>	65.11 (14.92)	63.54 (13.67)
<b>Total theory of intelligence (scale range 1-6)</b>	4.06 (1.03)	3.89 (.93)
<b>Total autonomy (scale range 1-5)</b>	3.62 (.47)	3.53 (.46)

Table 11- Mean score and standard deviation for undergraduate and masters students on each of the psychological measures at the start of the process

A one-way between groups multivariate analysis of variance (MANOVA) was performed to investigate differences between undergraduate and masters students in all of the psychological factors at the start of the process of conducting a project. Four dependent variables were used: autonomy, self-efficacy, expectations and theory of intelligence. All of the masters students had previous experience of completing a project and all of the undergraduate students were completing a project for the first time. Therefore the independent variable was year of study.

Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance- covariance matrices and multicollinearity. The normality assumption of MANOVA is that data should be normally distributed. However, in practice MANOVA is reasonably robust to violations of this assumption. According to Tabachnick and Fidell (2007, pg 251), a sample size of at least 20 in each cell should ensure the data is robust and this was the case within this dataset. Multivariate normality was checked through calculation of the Mahalanobis distances. This allows for multivariate and univariate outliers to be identified and removed from the

dataset if necessary. In order to check for linearity, that is a straight line relationship between each pair of dependent variables, a matrix of scatterplots between each of the variables was generated. Multicollinearity was checked by looking at the correlations between each of the dependent variables. In this dataset the variables were only moderately correlated with each other and therefore no multicollinearity was identified. Finally homogeneity of variance-covariance matrices was tested using the Box's M test of Equality of Covariance Matrices. As there were no serious violations of any of these assumptions the MANOVA was conducted.

The results revealed that there was no statistically significant differences between undergraduate and masters students on the combined dependent variable,  $F(4, 453) = 1.58$ ,  $p = .179$ ; Wilks' Lambda = 0.99; partial eta squared = .014. When the results for the dependent variables were considered separately, using a Bonferroni adjusted alpha level of 0.0125, there were no significant differences between undergraduate and masters students for any of the dependent variables.

#### **9.3.1.2 End of the process**

The second part of the first research question investigated if there were differences between undergraduate and masters students on various psychological factors (autonomy, self-efficacy, expectations and theory of intelligence) at the end of their projects. Descriptive statistics in table 12 show differences in the means for each of the groups. The masters students had slightly higher means scores than the undergraduate students for self-efficacy and theory of intelligence. This meant that masters students had slightly higher self-efficacy and a more incremental view of intelligence. The undergraduate students had slightly higher mean scores than the masters students for expectations and autonomy, so undergraduate students expected more of their supervisor than the masters students did and felt more autonomous in their learning than the masters students.

Psychological measure	Masters Students (N=92) Mean (S.D)	UG Students (N=155) Mean (S.D)
Total expectations (scale range 1-5)	3.68 (.61)	3.87 (.59)
Total self-efficacy (scale range 0-100)	70.81 (12.65)	70.14 (11.50)
Total theory of intelligence (scale range 1-6)	4.01 (1.07)	3.75 (.93)
Total autonomy (scale range 1-5)	3.61 (.44)	3.70 (.46)

Table 12- Mean score and standard deviations for undergraduate and masters students on each of the psychological measures at the end of the process

Following the descriptive statistics, another one way between groups multivariate analysis of variance (MANOVA) was performed to investigate differences between undergraduate and masters students in psychological factors at the end of the process. As with the start of the study the same four dependent variables were used: autonomy, self-efficacy, expectations and theory of intelligence at the end of the process of conducting their projects. The independent variable was year of study. At this point all of the masters students had completed two projects and all of the undergraduate students had completed a project for the first time. As with the previous analysis, preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance- covariance matrices and multicollinearity. As there were no serious violations of any of these assumptions the MANOVA was conducted and it revealed that there was a statistically significant difference between undergraduate and masters students on the combined dependent variable,  $F(4, 245) 3.57, p = .008$ ; Wilks' Lambda = 0.94; partial eta squared = .056. However, when the results for the dependent variables were considered separately, using a Bonferroni adjusted alpha level of 0.0125, none of the dependent variables were found to be statistically significant.

### 9.3.2 Are there any differences in the perceptions of doing a project between undergraduate and masters students?

During the analysis of the qualitative data there was considerable evidence that undergraduate and masters students' perceptions of doing a project were very similar to each other, in some respects. This is in line with the findings of the quantitative data; however there was subtle evidence to suggest the masters students engaged in the process in a different way from the undergraduate students.

For undergraduate students it was clear that there was some variation between students regarding their feelings about doing a project. Two groups, which had approximately equal numbers of students, emerged from the analysis. Around half of the undergraduate students were apprehensive and felt unsure about their abilities to conducted research. This was due to the fact they had never engaged in the experience before and therefore were unsure of their potential in the area.

“Near the end of my 3rd year, where I was still like quite unsure of my ability to research [...] and like I was still quite unsure about my potential” (Psychology UG student Y). <sup>1</sup>

The other half of the undergraduate students were confident before beginning the process. However, often on reflection, at the end of their project, these students felt that they had been over-confident at the start as they had underestimated the difficulty of the task and what was expected of them.

“In 3<sup>rd</sup> year before this whole process started, I was really keen on doing research and [...] I was really looking forward to doing my research and was sure I could do it and up until I was collecting my data and doing my analysis, it was actually quite- sadly- exciting! And I was like yippee I have got another questionnaire back and by the end of it I was like, I never want to see this again! My project is [expletive language], my design is so basic, how could I have not known this when I started, it was a complete waste of time, its utter [expletive language] and I am just so glad to finish it. And I just feel that it was a bit crap and it's not a reflection of my ability. I feel it's like a first year report but at the start I was sure it was going to be wonderful!” (Psychology undergraduate student I)

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<sup>1</sup> All of the quotations throughout the findings chapters have been edited in order to allow for fluency. [...] indicates the removal of repetition or disfluencies in speech.

However, with the masters students there was less variation in the responses to how they felt about the process. Perhaps this was due to the fact the masters students had engaged in the process before and therefore their self-efficacy surrounding the task was more likely to be in line with their actual abilities.

Many of the masters students decided to study a different topic for their dissertation than they had at undergraduate level and therefore they felt they were learning a whole new process again.

“Interviewing was new to me, the literature reviewing was new to me because as I said the studies I had done before had been quantitative and they were normally set out for me, they were normally sponsored by a [name of type of company] company so basically here is the protocol and you might have some input into adjusting that protocol but that’s all you do, it’s not the creative part of it and the rest of it is data collection. So as a data collector that is totally different from being involved in every step of the process, transcription- tell me about it! So the process was great from that point of view and I am waiting to see what the outcome is.” (Sociology Masters student N)

Often undergraduate students were unable to articulate what they had learned from the process, with some of the undergraduate students believing they had not developed any skills beyond those that they had already developed over the course of their degree.

“I didn’t learn anything that I didn’t already know from doing mini-projects and labs in 1st and 2nd year- lab reports- that’s what I feel about my project, to me didn’t seem very hard and maybe I should have picked something more challenging. Other than the fact there was more of it I didn’t feel more challenged. Again, maybe that was my own fault I didn’t make it hard enough. Maybe someone else would disagree with me and I have just not realised that there has been a change in my learning over the period of time, but I don’t feel there has been” (Psychology UG student I)

This student acknowledges that perhaps she is just unaware of the learning that had taken place over the course of her project. This is a theme which was common across many of the undergraduate interviews. Many students discussed that they did not learn how to do research as this was something they already knew how to do. However, other comments within their interviews were suggestive that they had learned a great deal, but, they were less aware of their learning.

“I knew how to do research. Research was quite easy for me, as my dad’s a researcher and my mum’s a researcher, and I’ve been through a whole degree so I didn’t really learn how to research but I learned how to [...] write a lit review, I learned how to write a methods, I learned how to conduct an experiment, I learned how to construct an experiment. I learned e-prime, I learned SPSS. Everything, there isn’t anything I didn’t learn really.” (Psychology Undergraduate student Y)

This did not seem to be the case with the masters students who were interviewed. They seemed to have quite different conceptions of the research process and were more able to articulate what they felt they had learned and taken from the experience. Many of them reflected on the differences they felt between doing an undergraduate dissertation and doing a masters dissertation. In these reflections students seemed more engaged with the process of research at masters level and had a better sense of what they wanted to achieve from the project.

“I mean I did my undergrad, I graduated from that six years ago. So I was quite young and, I think, quite immature when I did that. So my undergrad dissertation seemed to be [...]it wasn’t really thought out and stuff like that. And [...] I didn’t really have sort of well-formed ideas about what [...] I thought about things and [...] where I’d like to go from what I was doing and stuff. So I think in my masters dissertation it was a lot more directed and sort of related to experiences I’d had and stuff.” (Sociology Masters student E)

Masters students seemed to engage more deeply with the experience than undergraduates and indeed many of them discussed changes in the way they thought about knowledge and approached learning due to their experiences of conducting their masters project.

“Which was good [...] I liked doing it and it was good to learn a completely different way of looking at knowledge which was good and you feel a lot more controlled as well which was nice. Because research, like arts research you have no control over it, it’s just it’s there and you can interpret it how you want but it’s there and other people can say you’re completely wrong and there is no, but with science you can say- no this is what I found and people can say, people can disagree with how you found that, but they can’t disagree with your findings. And as long as you are sound in the methods they can’t really disagree with how you found it either. So, it’s that’s good. The amount of control you get over it is good” (Psychology Masters student B)

“It’s definitely changed how I go about understanding it [the world]. and definitely how I go about researching it. I mean it is just completely different [...] and it was good. Yeah, that was the most valuable part, as I said of doing the whole kind of experiment”. (Engineering Masters student K)

In addition, masters students were less focused on outcome than the undergraduate students. For the undergraduate students their feelings about the experiences were based around how well they thought they had done, however for the masters students there was a greater focus on the process.

“I wasn’t really so much concentrating on the outcome, I was concentrating more on the process and how I could learn through the process”. (Sociology masters student N)

Many of the masters students reflected on the process more holistically than the undergraduate students. These masters students did not believe knowledge about the content of their dissertation was as important as the other skills they had developed from conducting their research.

“I did learn in terms of knowledge about things and about the subject I was looking at. I definitely did learn things. But I think probably the most useful things to me that I’ve learned have been just discipline and project management things.” (Sociology masters student E)

In addition to having a greater focus on process rather than outcome, masters students were more reflective about their own weaknesses and the impact this had on both the research process and the way they wished to be supervised. However, none of the undergraduate students discussed their weaknesses in relation to what they needed from supervision. Some of the masters students were aware that they required support and therefore this was influential in what they needed from their supervisor.

“I’d had her for a class on [name of course] and I just knew that she was involved in the [name of research centre] as well and I just felt like she would be the kind of right person to kind of support me...I recognise in myself that I need someone that is quite supporting otherwise I just freak out, to be quite honest, so I kind of recognised that and I thought she would be the best choice for me and also because of her background in the studies.” (Sociology Masters student H)



Another student was aware his weakness was his ability to manage time. He believed that being open and honest with his supervisor from the beginning of the process was the best way for him to try and overcome this problem.

“My main problem, I think it is a problem that many people have and it’s time and that’s always been a big problem for me. I always find it hard. What I have learned about myself is I find it hard to keep to deadlines and I would normally run out of steam so I explained that to her and she said well this is what I expect from you and I expect a degree of communication and so the first thing that we covered [...] was the ground rules and I listened and I heard what she said [...] Coming to the dissertation you know I was really asking for help. That’s all I was really asking. I will do the work, just help me a bit but in order to help me she needed to know that I am poor for deadlines, I am poor for communication... I am when I write things down it can be annoyingly verbose and use 10 words instead of 1. And these are all recurring defects that I was hoping in the process to try and eliminate. Not eliminate totally, I don’t know if you can ever do that but trying to eliminate as much as possible so I had to be open, otherwise what am I going to get? I am just going to be me and I am kind of useless at this and I have never done it before. So, I needed to be that way to get as much out of it because I felt I had won a watch getting [name of supervisor]. You know I thought that is absolutely fantastic. So I thought I might as well have that little bit of honesty with her about what I think my defects might be.” (Sociology masters student N)

It was clear there were some differences in the perceptions of the value of the project between undergraduate and masters students. Undergraduate students had a tendency to focus on the transferable skills and concrete discipline-specific skills that they had developed during the course of their project. Many of these skills related to practical skills such as data analysis skills.

“I learned how to do the stats quite well. So, I ended up actually helping some of the other girls do the stats that she didn’t really have time to sit and go over how to do it all with them.” (Psychology UG C)

However, in contrast, perhaps due to the fact the masters students had already developed many of these skills, the masters students concentrated on the development of “deeper level” skills such as critical thinking and critical engagement with the literature.

“It was brilliant [the process of doing a project], yeah. I really enjoyed the whole course but I enjoyed doing the dissertation and I enjoyed doing things that were really sort of outwith what I thought I

was going to learn from the course. I did a lot of critical analysis and critical writing but we did a lot about philosophy which I wasn't expecting to do and actually something I had never looked at before. So, from that perspective it was enjoyable." (Sociology Masters student N)

This is something none of the undergraduate students explicitly discussed. While it might have been the case the undergraduate students had developed in this regard it was not something they articulated. The reasons for this could be related to undergraduates' lack of awareness of the development of these skills. Alternatively, perhaps these skills are less important than practical skills to undergraduate students and therefore they are less likely to discuss them. It could also be the case that undergraduate students do develop less in critical thinking skills as it is possible critical thinking skills only develop after more broad practical and discipline specific skills. It is also possible that critical thinking is a discipline specific skill but takes longer to develop. These possible reasons will be discussed, in more detail, in the discussion chapter.

## **9.4 Summary of findings for differences between undergraduate and masters students.**

In relation to research question 1, which looked at the differences between undergraduate and masters students in the process of conducting a project, both the quantitative and qualitative aspects of the work provided insights into potential differences between students and the reasons for this.

The quantitative aspect of this chapter investigated differences in expectations, self-efficacy, theory of intelligence and autonomy between masters and undergraduate students at the start and the end of the process. From the results of these investigations it was found that there were no significant differences between undergraduate and masters students on the combined or separate dependent variables at the start of the process. At the end of the process there was a statistically significant difference between undergraduate and masters students on the combined dependent variable. However, when the results for the dependent variables were considered separately there were no statistically significant differences between undergraduate and masters students for any of the dependent variables.

The interviews augmented the quantitative findings. From the interviews, it is clear there are some subtle qualitative difference between these undergraduate and masters students in their conceptions of doing a project and what they were learning from the experience. It seems that the undergraduate and masters students engaged with the process in different ways. For the undergraduate there was some variation between students in how they felt about the process and their abilities. One group of undergraduate students were apprehensive and unsure about their abilities to conduct research. However, another group of undergraduate students reflected on their confidence before they began the process and the difficulties they faced due to their underestimation of the difficulty of the task. With the masters students there was less variation in responses to their feelings about the process. All of the masters students had been through the process before and therefore knew what the challenges would be. It seemed from the interviews that they had a more realistic view of the process of conducting research and so it is possible that their self-efficacy surrounding the task was in line with their abilities. These master students seem to have a greater awareness of the challenges associated with the process as well as their own weakness.

The masters students were also more reflective about the whole process. It seems to be the case, from the qualitative data, that masters students were perhaps more realistic, from the outset, about the scope of their project and what they could achieve from it. They were also more aware of their weaknesses and therefore the level of support they would need, which is potentially, therefore, related to their expectations of the process. As a result it potentially could be the case that at the start of the process undergraduate students had inflated self-efficacy and autonomy scores, however, the masters students perhaps had scores that were closer to reality than to their perception. In relation to there being no statistically significant differences between undergraduate and masters students for any of the dependent variables at the end of the process, the qualitative data did not indicate why this may have been the case, however possible explanations for this will be discussed in the Discussion Chapter.

In terms of learning from the process there were also some differences between undergraduate and masters students. Often the undergraduate students were

unable to easily articulate what they had learned from the experience. Some of the undergraduate students had the conception they had learned very little from their experience, beyond what they already knew. However, masters students were more articulate in the interviews and could discuss what they had learned and taken from the process.

## 10 Findings from theme 2: Student Development

### 10.1 Description of data for theme 2

For the second theme, which focused on student development, both qualitative and quantitative data have been used to answer the question. In terms of qualitative data the interviews from the 20 students and 10 supervisors was coded. For the quantitative aspect of this question only the data from students who had completed questionnaires *at both time points* (pre project and post project) was analysed. The data from 157 students (79 masters students and 78 undergraduate students) were analysed to investigate student development over the course of their projects.

### 10.2 Research Question 2: How do students develop over the course of their project and what evidence is there of this development in relation to autonomy, self-efficacy, expectations and theory of intelligence?

For the purposes of clarity this broad research question is divided into two main sub-questions. The first sub-question addresses the quantitative aspects of the question addressing how students develop over the course of their projects in terms of the quantitative variables measured. The second sub-question gives consideration to the qualitative aspects of this and considers students comments within the interviews which indicates development.

#### 10.2.1 How do students (undergraduate and postgraduate) develop over the course of their project (time 1 data compared to time 2 data), in relation to measures of autonomy, self-efficacy, expectations and theory of intelligence?

This research question is different from the first research question, which looked at differences between undergraduate and masters students, because student development was look at, by analysing the data from *the same students* at the start and end of their projects. Descriptive statistics for each of the variables, for undergraduate and masters students are outlined in table 13 below.

Psychological measure	Level of Study	Mean T1 (S.D)	Mean T2 (S.D)
<b>Total expectations (scale range 1-5)</b>	Masters	3.69 (.06)	3.74 (.06)
	Undergraduate	3.86 (.06)	3.92 (.06)
<b>Total self-efficacy (scale range 0-100)</b>	Masters	65.99 (1.58)	70.82 (1.40)
	Undergraduate	65.31 (1.59)	71.35 (1.41)
<b>Total theory of intelligence (scale range 1-6)</b>	Masters	4.19 (.11)	4.10 (.11)
	Undergraduate	3.91 (.11)	3.89 (.12)
<b>Total autonomy (scale range 1-5)</b>	Masters	3.59 (.05)	3.63 (.05)
	Undergraduate	3.54 (.05)	3.64 (.05)

Table 13- Mean scores and standard deviations for undergraduate and masters students on each of the psychological measures across time (Masters N= 79, Undergraduate N= 78)

A mixed multiple analysis of variance (MANOVA) was conducted to explore undergraduate and masters students perceptions of autonomy, self-efficacy, theory of intelligence and expectations at two time points: prior to their projects and then after completion of their project. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance- covariance matrices and multicollinearity. As there were no serious violations of any of these assumptions a repeated measures multivariate analysis of variance (MANOVA) analysis was conducted (within subjects measures: time one compared to time 2 for each of the variables: autonomy; self-efficacy; theory of intelligence and expectations; between subjects measures: undergraduate and masters students). This analysis confirmed that there were significant multivariate effects for level of study, which compared undergraduate to masters students (Pilai's Trace= 0.064,  $F(4, 156) = 2.577$ ,  $p < 0.05$ ). This represented a partial Eta square effect size of .064. In addition there were significant multivariate effects for time (Pilai's Trace= 0.0179,  $F(4, 156) = 8.267$ ,  $p < 0.001$ ) which investigated pre and post project measures. This represented a partial eta squared effect size of .179. The interaction effect between level of study and time was not statistically significant, (Pilai's Trace= 0.010,  $F(4, 156) = .375$ ,  $p > 0.05$ ), which

represented an effect size of 0.010. Each of the dependent variables, tested over time, are presented graphically in figures 2-5 below. These graphs show the change in each of the dependent variables over time. Both undergraduate and masters students have been plotted on the same graphs in order to allow for comparison.

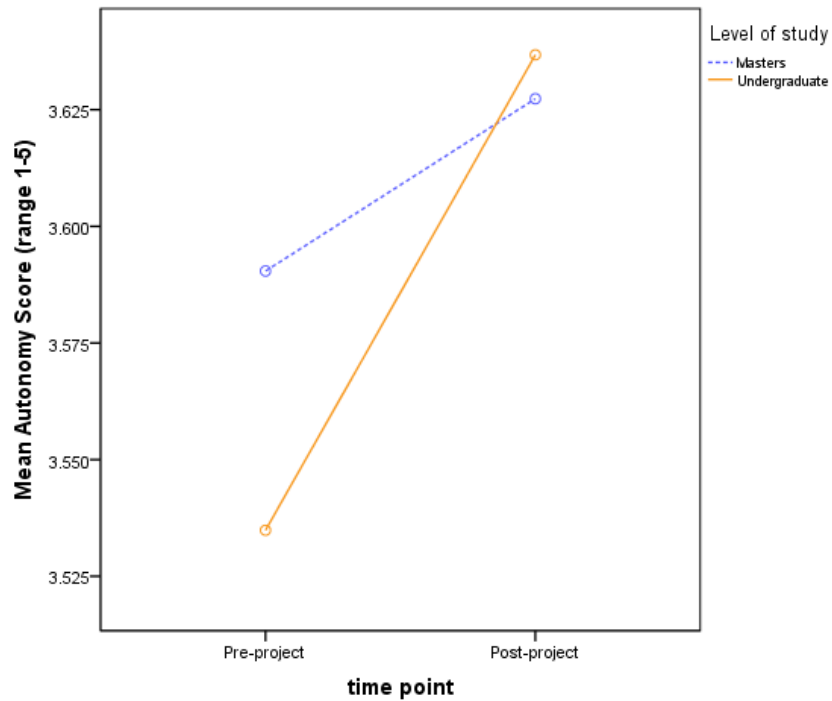


Figure 2- Graph of pre and post project measures of autonomy for undergraduate and masters students (higher scores are related to higher levels of autonomy)

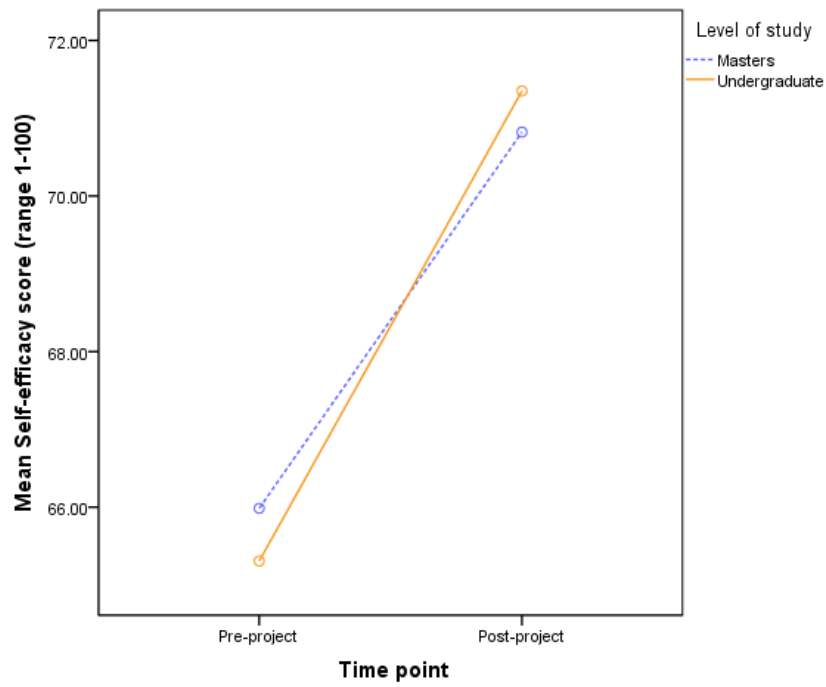


Figure 3- Graph of pre and post project measure of self-efficacy for undergraduate and masters students (higher scores are related to higher levels of self-efficacy)

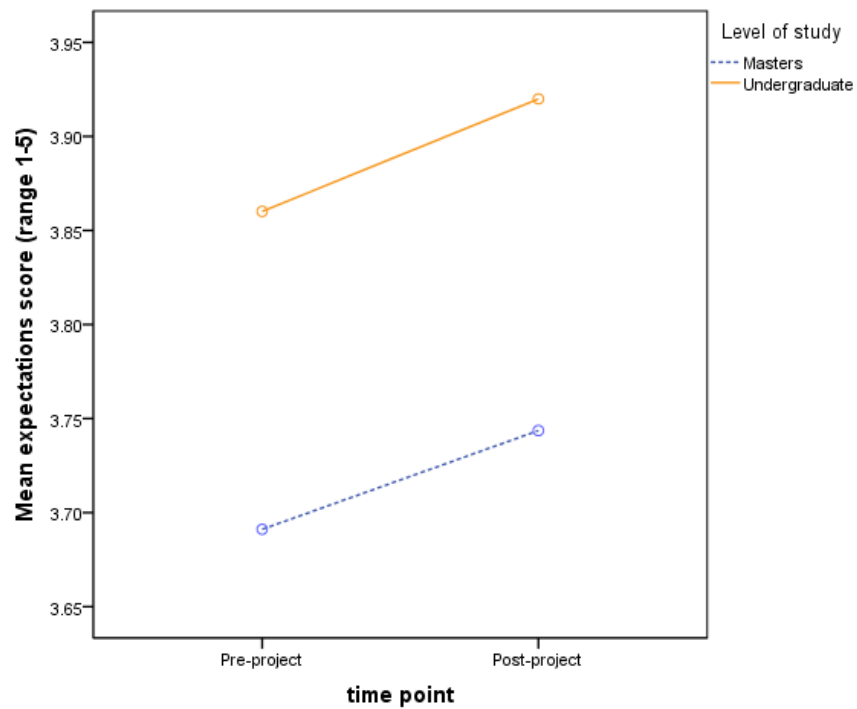


Figure 4- Graph of pre and post project measure of expectations for undergraduate and masters students (higher scores are related to students expecting more of their supervisors)



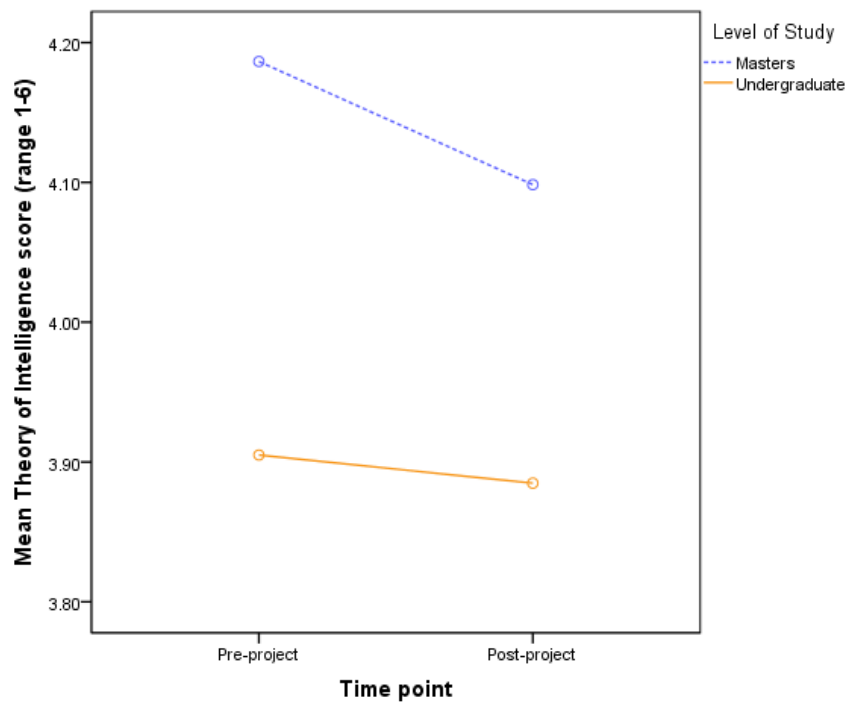


Figure 5- Graph of pre and post project measure of Theory of Intelligence for undergraduate and master students (higher scores are related to more incremental views of intelligence)

Following this the univariate effects of each of the dependent variables over time, collapsed over level of study, were considered. When the results for the dependent variables were considered separately, using a Bonferroni adjusted alpha level of 0.0125, self-efficacy was found to increase (Mean T1= 65.65, Mean T2= 71.09) significantly over time ( $F(4, 156)=29.243, p < 0.001$ ). In addition, autonomy increased (Mean T1= 3.40, Mean T2= 3.63) over the course of the project and this change approached significance ( $F(4, 156)= 5.685, p = 0.018$ ). There were no significant changes in expectations or theory of intelligence.

When interpreting the pre-project and post-project measures for the quantitative data caution should be exercised when thinking about the nature of the transition between time 1 data and time 2 data. As data was only collected twice the graphs displayed make the transition look like a straight forward one. However, as will be outlined in the qualitative data below, this may not be the case- particularly for autonomy and self-efficacy.

### **10.2.2 What do students and supervisors say that indicates development of autonomy, self-efficacy, expectations and theory of intelligence over the course of their project?**

#### **Autonomy**

In line with the quantitative findings there was very clear evidence throughout the interviews that students felt they had been given greater levels of autonomy and also developed skills as autonomous learners during the process of conducting a project. Throughout the interviews with the undergraduate and masters students it was very clear that by the beginning of their final year and their masters year project students felt ready to have a large amount of autonomy over their studies. Almost all of the students reflected that they were ready for the challenge and were, on some level, excited by the prospect of it and many of the students enjoyed being given the opportunity to create what they perceived to be new knowledge.

“One of the problems I have always had with university projects at lower levels is that because they are teaching you something they can’t sort of make you do ground breaking science. And so you end up doing something they already know the answers to. So like if you do experiments in lab work, whenever you hit a problem or your data doesn’t look right they instantly know that because there is 100 students doing that same thing every year. And I find that very annoying because it feels completely pointless. And in a similar way, with that structure where you are just told do that experiment and the supervisor really knows where it is going to end up, I don’t know, I think I would have had the same problem really. I would have just thought why am I doing this because clearly he already knows the answers. Because it is a masters project and by definition he won’t really know the answers, but in the same way if you are just being told what to do and you don’t have any involvement in it, it just becomes work for work, as opposed to try and understand things.”  
(Engineering masters student O)

While it was clear students relished the opportunity to be autonomous, the level of autonomy development which occurred during the process seemed to be dependent on both the student and the supervisor. There was large amounts of variation in the amount of autonomy students were given and also the times they received help and support from their supervisors. For many of the students they believed they became more autonomous throughout the process, and viewed autonomy as a set trajectory. For these students they perceived that

they received a relatively larger amount of help and support to get their project started, however, as they developed as learners this gradually reduced. These students believed they needed less help because they were more able to complete tasks on their own.

“I think it was really just coming up with an idea and like brainstorming about what we could do and also what was practical to do at the start was the point when I needed most help [...] yeah it was mainly kind of sort of [name of supervisor] and his creative ideas and I had several ideas [...] I came to him with several ideas and he was like yeah, that sounds really good but because he has been doing research for so long he came up with other ideas and I was like- they sound much better! So, I went along with his ideas but also they did change slightly with different meetings because I was more able to input. So, I was like oh maybe it's more feasible to do this and we'd change what we were doing with the stimuli and yeah it just became me kind of figuring out how to do the experiment.” (Psychology Undergraduate student D)

For other students this was not the case, and they sought assistance at the parts of the process they found most challenging. This, for many of the students, was the results section of their project which was often very close to the end of the process.

“He was more heavily involved in the end bit than he was at the start, so in the results bit. He wasn't at all involved in the discussion because well we discussed a bit about the discussion... so he wasn't at all involved in that and then in the beginning bit he was just like this is okay what you want to do but he wasn't involved, in the actual structure of the argument or the research or anything, he didn't really do much on that but then in the results section he was involved a lot, so he took my results and then he fiddled with them and I fiddled with them and he fiddled with them and we had a look, he had a look at my structuring, how I structured the results. I guess I just needed more help at the end than I did at the beginning” (Psychology Masters student B)

The reason for these two different views of autonomy can, in some ways, be explained by the comments from the students within the interviews. All of the students who received more help at the difficult parts of the process still believed they had developed in autonomy over the course of their project. However, they also described the process as being much more flexible than needing high levels of support at the start which gradually reduced throughout the process.

“It was more like peaks of assistance. I didn't need more then less.”  
(Engineering masters K)

While students enjoyed the freedom to pursue their own project many of the students felt they had been given too much freedom, and perhaps they would have done more work had the experience been more tightly controlled. While this was more noticeable in the undergraduates many of the masters students also felt the same.

“That is one of the keys, I think, about how our project went was that they made us have check-points throughout the year, maybe not enough to be honest. I did no work at all then I suddenly did a full week of work to hand in a literature review and then I did virtually no work at all and then sort of started picking up after Christmas because it was time to get a move on. But then again it would have kind of been good to have something else to hand in in January because it would have got me going earlier”. (Engineering masters O)

Supervisors were very mindful of the need to develop students as autonomous learners throughout the course of their project. Many supervisors, who selected projects for their students, discussed the need to try to take students “outside their comfort zone” in order to allow them to develop.

“I knew him very well. So the work that he was intending to do, or we wanted him to do, was slightly out of the comfort zone for him which is unusual because I didn't think he had a comfort zone. So he was a [...]high flyer. You know, really no problem at all with maths or anything like that. [...] This project was actually quite daunting for him because he hadn't studied the precise topic area that was coming up. So it was all very new to him. So the approach I try to take with a lot of students is, basically say, ‘well look this is your project. And, you know, it's okay, I might have come up with the idea. But really the idea needs developing. And you just happen to be the person doing it’ and you can do it! So with all of them I tend to present them with a sort of [...] ‘you are my consultant or I am your consultant depending on which way you want to view it. And I'm really here to assist you but, and to direct you strategically but not, you will make the decisions’. So he very much fell into that mould. And I would, with those students and with him in particular I largely let them manage me. So I tell them, ‘hey [expletive language] off and just figure this out. And come and talk to me when you need to’”.  
(Supervisor G)

Supervisors encouraged students to take projects on and make them their own in order that they could become autonomous learners who believed they would be able to do research in the future.

## Self-efficacy

In addition to developing in autonomy students also developed in self-efficacy and comments within the interviews indicated this development. In line with the quantitative findings there was very clear evidence throughout the interviews that students felt they had learned from the experience and felt they would be more able to conduct another project in the future. Indeed, in many of the undergraduate interviews students discussed the project as being a very formative experience that had changed their ideas about what they wanted to do on leaving university. Often this change was due to changes in their self-efficacy about research. From the quote below it is clear that the project had been a transformative experience for this student.

“I always thought I would go into something educational like kind of support work, teaching assistant kind of and work up from there. Maybe educational psychologist eventually, but now I am kind of much more swayed towards academia and wanting to do more research and stay within that because now I know I can do it. I have seen how someone can be a really positive influence as a supervisor so maybe that’s something to aspire to in the future and apply for PhDs and masters and things. No, maybe not masters because I would have to be taught again [laughs], but definitely PhDs and seeing what a positive experience it is and seeing how you can make a difference with your research as well because I always thought it was something that was quite dry and dull and I didn’t really feel like it was something I would want to be involved with or something I could do. Like stuck behind your desk for 3 years, whereas I can like see it is more than that now. So, it’s something I want to go forward with.”  
(Psychology Undergraduate F)

Supervisors seemed to have a key role to play in the development of research self-efficacy in students.

“Being able to come up with ideas and stuff and to be able to approach him with like this idea I had and for him to go- that’s great, let’s go with that! Like that really boosted my confidence as well. It kind of gave me that confidence to be like actually maybe I could do this. And like obviously the positive experience then with the final year project and stuff and it’s meant that I know how to, well not quite, but like I am learning how to interact with like people in academia and like how I can adapt my ideas to make them good for people who want to be interested in my work.” (Psychology UG student Y)

Although students had more self-efficacy in research there was still an awareness that they only felt confident about the specific techniques they had used within their project.

“I feel confident about the specific things that I use. So I’m confident with t-tests and ANOVAs [laughs] and that sorta stuff. But if I had to go into like regression analysis or anything like that, I’d probably be back to Google and a stats book [...] . You can always only be comfortable with what you’ve done can’t you?”. (Psychology Masters A)

### Theory of Intelligence

Throughout the process the students commented on a change in their theory of intelligence. While there was no evidence of significant change in theory of intelligence in the quantitative analysis, it seem that there was subtle evidence in the qualitative interviews to suggests students were moving towards a more incremental view of intelligence. For many students this was displayed through comments which highlighted they did not believe doing well was related to only being intelligent anymore, but rather they had become aware that in order to do well they had to be engaged in the process and want to succeed.

“I realised quite early on in the masters project that it was kind of a bad idea to do it. Like I’ve always thought that I was an academic person cause I’ve always kind of got good marks and things. I went to Uni straight after school and got quite a good degree and stuff. And then I always thought that at some point I would do a masters. And then quite soon after it, like a couple of months into it I was just like not enjoying it at all and I realised it wasn’t about being clever, it was about wanting to do something. And I’m a, I’m an artist, I’m a photographer. And I kept finding myself like just trying to write essays but like on art school websites looking at their courses and stuff. And so I just got to the point where I was like actually, like the thing I’m really passionate about is art. And like I can just sit for hours and work on stuff. And like do stuff that’s really challenging. And I’ll just have the motivation to do it. But I just don’t have the motivation. Like every essay is just a massive struggle. And even though I get good marks in the end I just don’t really enjoy any of it. So I kind of always just thought that’s like what hard work is like. But then from doing art I realised that work can be hard but also enjoyable at the same time. And I just don’t feel like that with academic work.” (Sociology masters E)

Over the course of their projects some students changed the way they thought about intelligence. Some of the students, before the project, had a very set

view of intelligence and considered it as being related to doing well in exams. However, through the process of the project, for some students, this conception changed and they had a wider view of what it meant to be intelligent.

“Yeah, I think this had made me realise you can learn dates and stuff like that for the exam and you can get really really good grades but that doesn’t make you smart it’s about whether you can apply that... I think research is like you applying that knowledge and being able to like see how it works with everything and yeah, I think it is a different skill set that you need which is why I think some people hated it because it was like so unsure. Like, going forward with your own project there is so much uncertainty, it might not work. I think a lot of people didn’t like that whereas I learned to quite enjoy it.”  
(Psychology Undergraduate N)

For these students, who moved away from this idea that being able to memorise dates and intelligence were the same thing, it seemed that the development of an incremental theory of intelligence was important and this also seemed to have strong links to autonomy and self-efficacy. Students who made this move in their thinking discussed engaging with the process more, and the more they engaged the less help they needed and they realised they were beginning to be able to do things by themselves.

“It was kind of a combination of I am persevering more so I didn’t need as much help because I was willing to persevere and then because I was persevering and then actually getting somewhere it made the next time I did it I then persevered more so again I actually learned, that actually, I could sit in the library by myself for hours and get to the point that I wanted to get to and that, that was fine and that everything at some point would actually work, so yeah!”  
(Psychology undergraduate C)

This student went on to explain reasons she persevered more, and for her this was related to having a perception that her opinions mattered and that she was able to share new knowledge with her supervisor.

“I think one of the things that was quite useful for persevering was that actually your opinions were actually useful if that makes sense. “So, especially when we were talking about the discussion because I’d read things that obviously she hadn’t read, you know I was then mentioning things and we were having conversations of things that she hadn’t thought about, so instead of just, rather than feeling you were just constantly meeting an expectation of your supervisor saying this is where I am and her trying to lead you to get to it, it was much more a you’re doing something useful and you’re getting ideas of your own

and your ideas are actually good. So, that kind of really helped on the learning thing of actually being, when you read all this stuff you are actually picking things up that people don't know about and even you can pipe up and say actually I read so and so and what do you think about that idea? So, that, that kind of helped quite a lot in terms of keeping going." (Psychology undergraduate C)

However, from some of the students, this development was not evident. Some of the students, even at the end of the process, still retained an entity view of intelligence in which they believed there were certain things they were limited in their ability to do. For these students there seemed to be a tendency to have a reliance on their supervisor for the "correct" answers.

"I've never done this before [...] So, it was good that he was there to tell me either that something was right or wrong and what I should have done to make it right." (Psychology Masters B)

### **Expectations**

Students also display evidence of development in terms of the expectations they had of themselves and of the process more generally.

"So it was pretty intense and I have learned quite a lot. I think at the at the beginning when I learned, when I heard I was going to do a dissertation I was basically going to go to the person and say "tell me what to do". Just write it all down for me, I'll do it. Just you tell me the title, what's good, tell me the style I am going to use, tell me the font, everything. Tell me everything and I will do it. I think that was my expectations at the beginning" (Sociology Masters student N)

Again, for many students at the start they expected to be told what to do and then they would just carry out the appropriate steps. However, this was not the case and this had an impact on student development. For example this student goes on to explain why not being told what to do, and having conversations about learning with his supervisor, was important for him in practice beyond the degree.

"Well the most enjoyable thing was the conversations that we had face-to-face, I enjoyed that because it was more like a collaboration, it was more like a partnership, as opposed to being prescriptive and being told what to do. And, I don't know, I mean I'm, most of my education has been the latter and that is what I expected at the start. It has been do this, and there is no conversation about how you do it, the best way to do it, it is just do it. Learn it, learning being



memorise it. Memorise these facts. You don't need to understand them, you just need to know them, okay. Which is great in the learning process but then in practice a lot of that is useless you have to almost restart your education again in the practical side and in the clinical side and try and adapt what's that knowledge and make it of some use. This almost was running side by side" (Sociology Masters student N)

Supervisors were also aware of this expectation students had that they, as the supervisor, would know the answer and be able to help them. However, for some this was a challenging process in which they had to find the correct balance of ensuring the student felt they as the supervisor knew what they were doing, but also wanted to give the student time and space to work through challenges on their own.

"It's trying to find an appropriate balance between showing them you know what you are doing as a supervisor and letting them work out what they are doing isn't it really because trying to demonstrate that, you have a lot of knowledge, that whole point of what you're doing. And the stuff that I try and get them to do is actually research rather than you go [...] run a few things through an experimental set up. It's really just to get them to develop it. And quite often we don't know what the answer is, we have an idea but we don't know what the answers will be. And up till the end we don't know what the answers are. So, it's much more open ended. And I think that's a little bit like the sort of, the realisation the staff are merely human. The realisation that there is truly no single answer but more of a million ways to go at it. And which are more or less right. And I think that's good training for them because it just, it means that they don't behave linearly. Cause there's very little chance of them doing it outside. Certainly if they want to do, if they want to go and do research." (Supervisor G)

Feedback from the supervisor was something that all students expected and this did not change throughout the process. Students had a belief that this feedback was the driving force behind their development.

"But in terms of development like...yes that was important because like feedback. That's, what builds. Like you can get, gain skills but, like you can learn how to draw but unless someone told you your drawing is terrible you are not going to go to improve that [...]. So like that feedback is what drives the development, I believe." (Engineering masters K)

All of the students interviewed view feedback as essential for improvement of their own performance. However, while most students did not interpret the feedback as a personal criticism, some students found this more difficult.

“I think like on a personal level the only thing that ever gets me is I don’t take criticism well [laughs]. So I think I am always... I am always surprised. I always get surprised in myself because obviously that’s what supervisors are there to do is like critique your work and a lot [...]. But that’s me, that’s not anything about the supervision process [...] I take on board what people have to say to me and I know that supervisors are generally right, like no, really they are and they want the best for the work. But I think for me I just, my confidence gets knocked a bit so it takes me maybe about a week before I am ready to kind of take it on again [...] for me actually the criticisms I got I think made the work so much better. It wasn’t like, I wouldn’t have been at the same standard had I not, do you know? I don’t know about being criticized because I always think that pushes me to do better but it takes me a wee while to get there.” (Sociology Masters student H)

In summary, on the basis of the qualitative analysis it seemed to be the case that students had developed in relation to autonomy, self-efficacy, theory of intelligence and expectations. This augments the findings from the qualitative data on development of autonomy and self-efficacy. In addition it is suggestive that the development of Theory of Intelligence and expectations were more subtle and were not being picked up by the questionnaires. The possible explanations of this will be outlined in the Discussion Chapter.

### **10.3 Research Question 3: What are students' perceptions of their skill development over the course of the project? What shapes these attitudes towards their perceptions of their skill development?**

The qualitative aspect of research question 2 addressed student development in relation to the 4 developmental measures of autonomy, self-efficacy, theory of intelligence and expectations. This question build on this by addressing student skill development more broadly and assessing students' perceptions of their skill development over the course of a project and what shapes their views of their skill development.

Again, for the purposes of clarity this research question is divided into two main sub-questions. The first sub-question addresses the quantitative aspects of the question about students' perceptions of their development as measured in the quantitative questionnaires. The second sub-question gives consideration to the qualitative aspects of this and considers students' perceptions of their development and the mediating factors that shape these attitudes towards their perceptions of their development.

#### **10.3.1 Do any psychological factors predict student perceptions of skill development and what is the relevant importance of these psychological factors to perceived student development?**

Research questions 3- 8 use regression techniques in order to analyse the data. For each of these analyses a decision was made to use backwards stepwise regression as it was thought to be most appropriate for the research given the exploratory nature of the investigation (Field, 2009). Field (2009) also emphasises that if stepwise regression is going to be used backwards methods is the most appropriate. The backwards method is preferable to the forward method as forward method runs a higher risk of committing a Type II error (the risk that a test will incorrectly report that a result was not detected, when in fact it was present). In stepwise regression decisions about the predictors are based on mathematics. In the backwards method of regression all of the variables are entered to begin and then the contribution of each one is calculated. Variables not making a statistically significant contribution are

removed from the model and the model is reassessed on the basis of the remaining variables. In each of the regression analysis that follows preliminary analyses were conducted to ensure there were no violations of the assumptions of normality, linearity, multicollinearity and homoscedasticity.

Backwards method stepwise multiple regression was conducted to assess the ability of the psychological characteristics of the students (predictor variables: Emotional Intelligence; Openness; Agreeableness; Conscientiousness; Emotional Stability; Extraversion; Autonomy at start; Self-efficacy at start; Expectations at the start; Theory of intelligence; Autonomy support) to predict students' perceptions of skill development as measured by a series of questions which measured students perceived enjoyment and skill development in the process. In total 9 different regression models were generated using SPSS. After variables had been removed from the model the total variance explained by the model as a whole was 34%,  $F(12,170) = 38.742$ ,  $p < 0.001$ . In the final model, only one measure, autonomy support was significant recording a standardized beta value of 0.539,  $p < 0.001$ . In addition theory of intelligence approached significance and therefore remained in the model. There was a positive relationship between both of these variables and the outcome variable, so as theory of intelligence became more incremental (moved from a fixed view on intelligence to a growth view of intelligence) and as perceived autonomy support increased so too did student perceived outcomes.

### **10.3.2 What are students' perceptions of their skill development over the course of the project? What shapes these attitudes towards their perceptions of development?**

In addition to developments in autonomy, self-efficacy, theory of intelligence and expectations students also perceived development of key transferable skills and development as learners over the course of their projects. Indeed, the experience of doing a project was formative and changed some students' views of understanding the world.

“It's definitely changed how I go about understanding it [the world]. So, and definitely how I go about researching it. I mean it is just a completely different, it's just different and it was good. Yeah, that was the most valuable part, as I said of doing the whole kind of experiment”. (Engineering Masters student K)

Perhaps one of the reasons for this shift in perception with regards to how to understand and how to research things in the world were related to students being able to have an organic learning experience. In this context an organic learning experience means the students were able to learn what they wanted, at their own pace and in the style they wished to learn. Often within the projects, the organic learning experience meant students had the opportunity to apply their learning to a practical context. It seemed, through this experience, students realised that perhaps the application of certain skills and techniques were slightly different outside of the university environment.

“Yeah and this is the first time, like we have done [name of area] engineering before but this is the first time within an industry setting and so this is all the types of things, like when I did it before it’s all like example stuff and then you actually talk to them- can we get the details and they are like this is commercially sensitive, that is commercially sensitive and we are not sharing this, we are not sharing that and everything is based on economics and money and stuff so you have to realise how it works in the wider world so it was much more different than like the previous academic stuff that we had been doing. “ (Engineering UG Z)

In addition the experience of doing a masters was beneficial to students in that it allowed them the opportunity to decide if they wanted to do further study or not.

“No I don’t want to go on and do a PhD [both laugh]! I don’t, yeah definitely, I don’t think so. Maybe, I don’t know. There’s a small chance like maybe after a few years or something. But I really don’t think I want to do a PhD. I really didn’t enjoy my masters very much so I think I’m done with academia.” (Sociology masters E)

Students believed these project experiences had given them an insight into what PhD study would be like. Although many students perceived they had developed as learners and had the skills required to engage with further study this was something they did not wish to do.

There was a feeling amongst supervisors that projects are important, not because they teach the student about the specific project area, but rather they are important in the development of transferable skills and more general discipline skills. Often they believed the project was part of teaching students about thinking and practicing of the discipline in which they were specialising.

“I don’t think the content knowledge is at all an important feature of it because they get loads of that elsewhere they don’t need any more of that. No, it’s about that this is the kind of research that the whole of psychology is based on and this is their one attempt to put all the bits together and feel it from the inside. So, it’s about finally grappling with the meaning of the whole discipline in some sense.”  
(Supervisor S)

“I think it’s the going out of the academy and being a representative of the university and then executing that well. Let’s say they’ve done it well [laugh]. I think that’s a huge boost because, we don’t...we are not very good at treating students like they are on an individual journey [...] We don’t treat students like that, but within their dissertation that is their chance to be this is who I am, this is who I am as a thinker or as an intellect and that...that self-definition I think must impact hugely on their career and where they go to after this. So it’s, yeah, it’s more...it’s more than just them getting a grade.”  
(Supervisor J)

Many of the students perceived development in transferable skills and discipline specific skills. For many of the students this was the main thing they would take away from the project. Often students made decisions about what they wished to study in their project on the basis of the skills they could develop during the process.

“I also struggle to see how much impact a masters project can actually have because I mean PhDs publish papers all the time but... I don’t know, with a master project I don’t know how many actual papers would be used by, I don’t know, by researchers. I don’t know how much impact it has. So I guess on the one hand you can do so called ground breaking stuff but whether or not anyone will take it seriously is another question. Again if you set a task it just feels like if it doesn’t get taken seriously then you have just completely wasted 3 months of your time. Whereas at least in my case I ended up with more knowledge towards work because now I know, more or less, how the software works because I have looked into it. Which I would have wanted to do anyway and so rather than spend, you know, time doing that and then also do a project just made sense and that was that really.” (Engineering masters O)

Attitudes to their development were shaped, in part by the level of control students believed they had during the process. Students who were given higher levels of control believed they had developed more than students who felt their project was very structured. This fits with the quantitative data which found that as autonomy support increased, so too did students perceptions of their success.

“Yeah well the freedom was nice and really aided my development as a learner. I did like being treated as an adult, which has been a difference with university compared to things like high school [...] the freedom of the project not being sort of too structured was very good”. (Engineering masters student O)

Students valued the opportunity to interact with other people, often external to their institution. They felt this was something that was missing during the course of their undergraduate degree and that learning experiences which allowed them to practically apply some of the theories and skills they had been learning at university would have developed them even further as learners. One student suggests placements, which were similar to projects earlier on in her studies would have benefited her.

“I mean I think in here if they had arranged placements or something like the projects as well for you I think it would be good and would have developed us because it is good to have that. It’s relating your memories to what you’re writing and things like that.” (Psychology UG M)

Being given the opportunity to interact with other people developed students’ communication skills and most of the students believed that as they had done this once they could do it again.

“Well there were quite a few new skills. Like I had to learn the new program and all these kind of things, but also just like communicating with the companies because there was a lot of calling up uh [name of company] and having to talk to their customer representatives and trying to get all this help and stuff and all of that was quite new and going along with these special forms and asking for help all of that was stuff I knew you could do but I never really bothered to do because I didn’t really have the chance but now that I have the, I guess it counts as experience now, because I have done it before I could do it again”. (Engineering UG student Z)

#### **10.4 Research Question 4: Do any psychological factors predict students' perceptions of attainment and what is the relative importance of these psychological factors to perceived student success?**

As this research question is addressing issues surrounding students' assessment of their success based on psychological factors the only appropriate method of analysis was quantitative and therefore there are no qualitative elements to the analysis for question.

Backwards method stepwise multiple regression was conducted to assess the ability of the psychological characteristics of the students (predictor variables: Emotional Intelligence; Openness; Agreeableness; Conscientiousness; Emotional Stability; Extraversion; Autonomy at start; Self-efficacy at start; Expectations at the start; Theory of intelligence; Autonomy support) to predict students' perceptions of their attainment as measured by the proxy measure of attainment. In total 7 different regression models were generated using SPSS. After variables had been removed from the model the total variance explained by the model as a whole was 19%,  $F(12,170) = 8.673$ ,  $p < 0.001$ . In the final model three of the variables showed statistically significant effects. The autonomy support scale recorded a higher beta value ( $\beta = 0.214$ ,  $p < 0.05$ ) than total conscientiousness ( $\beta = 0.177$ ,  $p < 0.05$ ) and self-efficacy ( $\beta = 0.155$ ,  $p < 0.05$ ). There was a positive relationship with all of these variables and the outcome variable, so as perceived autonomy support, student conscientiousness and self-efficacy increased so too did student's proxy measure of attainment.

#### **10.5 Summary of findings for student development over the course of the project**

This chapter began by investigating how students develop over the course of their project by comparing their scores at the beginning to their scores end of their project, in relation to measures of autonomy, self-efficacy, expectations and theory of intelligence. From the results of these investigations it was found that there was a significant effect of level of study and also of time on student development. When the univariate effects of each of the dependent variables



were investigated there was a significant change in self-efficacy, and a change in autonomy which was approaching significance, over the course of a project.

Development over the course of a project was also supported by evidence from the interviews. Students enjoyed the freedom to control their own studies, however, for some students this was a challenging experience. Interestingly there was variation in the ways students discussed the development of autonomy. For many of the students they believed they became more autonomous throughout the process, and viewed autonomy as a set trajectory from less autonomous to more autonomous. However, for other students this was not the case, and they view their development as autonomous learners in a more flexible way.

In addition, certain psychological characteristics, namely, theory of intelligence scores and autonomy support scores that were significant in explaining variance in student perceptions of their development. There was a positive relationship with both of these variables and the outcome variable, so as theory of intelligence became more incremental and as perceived autonomy support increased so too did student perceived outcomes.

The qualitative interviews were also suggestive that students perceived development of key transferable skills and development as learners over the course of their projects. Indeed, the experience of doing a project was formative and changed some students' views of understanding the world. Often students made decisions about what they wished to study in their project on the basis of the skills they could develop during the process.

Psychological factors were also able to predict student perceptions of their perceived success. There were certain characteristics that were significant in explaining variance in student perceptions of their success: Autonomy support, conscientiousness and self-efficacy. There was a positive relationship with all of these variables and the outcome variable, so as perceived autonomy support, student conscientiousness and self-efficacy increased so too did students' proxy measure of attainment.

## **11 Findings from Theme 3: “Good” Supervision**

### **11.1 Description of data for theme 3**

For the third theme, which focused on “good” supervision and if this was something that could be profiled, both qualitative and quantitative data have been used to answer the question. Research question 5 relies on qualitative data, and research question 6 is both qualitative and quantitative.

### **11.2 Research Question 5: When students pick their supervisors what factors do they consider in making their choice?**

As this research question is addressing issues surrounding students’ choice in their selection of supervisors only the qualitative interviews are used in the analysis. This is due to the complex nature of the decision making process and the ability of qualitative data to more effectively capture this complexity than the quantitative data. The interviews from the 20 students and 10 supervisors were coded and analysed.

Of the students interviewed it became very evident that there were differences in the way supervisors were allocated to students. One of the disciplines allowed their undergraduate students to select their supervisor. In this case, these undergraduate students often considered the qualities of the person they were considering working with as well as their research interests before making their selection. Within this discipline some of the students selected supervisors with set projects, and some of the students picked supervisors who would allow them to do their own project. The students were aware of which supervisors had set projects and which supervisors expected them to come up with their own project before they made their final selection. In the second discipline students were asked to write proposals and then on the basis of this they were “matched” to a supervisor who had similar interests to them. Within this discipline there was some flexibility for students requesting certain supervisors and when this happened this was on the basis of personal characteristics. In the final discipline studied students had very little choice over the selection of their supervisor and also the selection of their research topic. These students were

given a list of 60 different research topics with associated supervisors and ask to select 8, in no order of preference that they would like to work on. These students reflected that they were able to avoid certain supervisors, however, they were unable to make choices regarding who they would like to supervise them.

From analysis of the interviews it became clear that choice in selection of supervisor was something that all undergraduate and masters students thought was important; students who got to select their supervisor thought this was important and so did students who were given a supervisor to work with. Students believed that having a choice in supervisor was important in future life in academia and therefore something they should have a say in from undergraduate level.

“I think there is definitely a few people you see and you’re- I do not want to work with you. Like even thinking about some of the lectures I attended this year. One of our lecturers was particularly keen on giving us stories from her research background and one of them was like she was say she went to this conference and they were talking about data and it was to do with [name of research area], and the speaker was like unfortunately we had to give it to all the participants so it contaminated the sample and the lecturer was like - I do not want to work with you and stuff, so I think there’s, like even at that level someone who is a lecturer and does their own research and that, they can tell who they want to work with and stuff and I think being able to do that as an undergraduate as well is quite valuable as well if you want to go into academia.” (Psychology UG Y)

Indeed, people who did not get a choice in the selection of their supervisor emphasised that this was something they would have liked to have been able to have a say in.

“I couldn’t believe it when we didn’t have, we weren’t able to give an order of preference. That was just a real killer because it was just well what do you mean? At least with the order of preference if they put you in a different one it was because everyone else had already picked those. But with the just pick a few and see what happens then they are not even trying to get anyone in the one that they want and so you could end up with 8 people wanting 8 different ones but just being scrambled up because no one ever asked them what they really wanted to do.” (Engineering masters student O)

The remainder of this section will focus on student and supervisor data from only one discipline, as only one of the disciplines allowed the students full choice

over the selection of their supervisor and research and therefore one group of students was able to discuss the reasons they had for selecting their supervisors.

### **Based on research interests**

Some of the students interviewed selected their supervisor purely on the basis of their research interests. As students were allowed to pick both topic and supervisor some of the students selected only on topic and gave personal aspects of supervision very little thought.

“And, I picked my supervisor... kind of... randomly... because.... I was originally going to do a kind of slightly different topic and I knew that my supervisor had an interest in [name of research area] and because I found I am quite interested in stats so I thought we might have the same outlook on things. So, that was my rationale.”  
(Psychology UG student I)

Often these students had a very set idea of what experiences they needed from the project and this guided their decisions. These students had clear vocational plans after university and therefore made choices on the basis of this.

“I was planning on doing a Masters in [name of masters course] so I looked at which lecturers had done neuropsychology and were interested in neuropsychology. So, then I seen that [name of supervisor] was interested in that so I contacted her, I didn't have any ideas for a project so I just said, basically do you have anything that you want me to do, so she did.” (Psychology UG student P)

### **Based on personal qualities**

However, this was not the case for all students. Some students were more aware of the personal issues that might be important in supervision. Some students, who had an idea of the area they would like to research, found that they wanted to find a supervisor who would be open to their ideas. An illustrative example of this is student Y who knew her supervisor did not research the same area as her, however, she selected him based on her perception of him being open.

“My supervisor [...]seemed like the most open minded from the staff I had been exposed to and from the profiles that I had read to approach him with my ideas and he took me on for summer research and he

took me on for my project [...] Like I picked him because I knew he would be open to the types of projects I wanted to do, if that makes sense. I didn't pick him particularly on his area because I ended up doing something completely outside his area of research. But I knew that he would be, like going from what he had put on his profile and what I knew of him, I knew he would be open-minded to my ideas and he would take them on-board and adjust them and like help me create something really cool. So yeah, which we did, I think.”  
(Psychology UG student Y)

### **Based on an interaction of research interests and personal qualities and availability**

The final criteria for selection seemed to be based around an interaction between the student's research interest and also the supervisor's personal qualities. Some student had an awareness that working in an area of research they were interested in was important, but they were also aware of the need to be able to communicate and work with their supervisor on a personal level.

“I didn't know very much about her before but when I met her, like it was kind of, one of the good things is an awful lot of the supervisors you went “oh no, I don't want to work with them!” [laughs]. So, it was a sort of oh, I don't know who this is like, and when I went to see her she seemed pretty cool. So, like I think if I had met up with her and though I can't communicate to this person then I might have, I might have said oh no there is lots of other interesting things. But you know once you kind of ruled out, I sort of started off with the these are the projects I want to do and who does that for the supervisor and then I went, well I don't want these supervisors, so I am left with this group and which project out of this group ... something I was interested in and it just happened to be [name of supervisor].”  
(Psychology UG student C)

This student went on to expand on the factors she took into account in considering her supervisor.

“So you've got some supervisors who in my experience, who are much, are much more kind of are hard to follow their lines of thinking, so, you kind of get a kind of aspect of a) what they're interested in and b) what they're like as a person. So, there's some supervisors who go at a lightning speed through stuff. Especially, a lot of the guys who do the [name area of psychology] you sort of sit there a bit lost [...]” I think the thing with [name of her supervisor] as well was, because I knew she didn't teach, she had an awful lot more time, so it was much more kind of this is a supervisor who I'll actually be able to get a hold of. And you know people feedback and say don't pick this person because they're never available and so I know about quite a lot of people who I know who had quite a hard time actually

getting their supervisor to be involved when with [name of supervisor] you could just kind of walk in and see her, so that kind of idea of .... This is a supervisor who doesn't have that much other stuff going on, who doesn't have you know lectures and this going on and that going on, it was kind of quite a good feeling as well." (Psychology UG C)

Within this example it is clear there are issues surrounding supervisor availability that are also considered by students. Other students made fewer considerations about personal characteristics and availability and made choices about the selection of their supervisor based on admiration for them.

"Cause I mean, yeah I have always thought [name of supervisor] was cool, he was like the idol [laughs] because he just knows everything!" (Psychology UG student D)

### **Based on level of support: Could choose own topic**

In addition to selecting their research area and topic students were also given a choice of creating their own topic, or being given a more set topic and this was another mediating factor in students' decisions. Some of the students interviewed selected people they knew would let them completely define their research question, whereas other students were attracted to people who were going to give them a topic to research.

Some of the students felt choosing their own research question gave them ownership over their research and felt that the supervision process allowed them to feel supported while at the same time encouraged them to develop their own research skills.

"Yeah, definitely [picking my research question was important] because it was much better than just [...] someone handing you a project and being like here you go! And I didn't feel like, like on the rocks on my own [laughs] and not knowing what to do with my project because obviously when you've not really done research, I mean I did do a bit a little bit of a summer project, but, you don't have that much experience of how to exactly do an experiment and for it to all flow well and know where you would necessarily start in that process so, yeah, that was good to have, to have support but not like domineering kind of you have to do this, sort of thing. So yeah, it was good!" (Psychology UG student D)

### Based on level of support: Was given a topic

In contrast, for some students, the task of being given the opportunity to design their own research was not one they particularly relished. Some of the students interviewed felt that they needed guidance in order to be able to define a research area and viewed being given a project as less demanding than having to create their own research question. All of the students who were within this category had also had a choice over the selection of the research area and therefore the specific research question within that area was of less importance to them.

“I think it was just because the projects came out just after we have done a lot of the 3<sup>rd</sup> year exams and that kind of stuff and I think I’d just got to the point where I was just like, I don’t want more work to do [laughs]. Will somebody just tell me what to do! [laughs], and I think it was just the panic of if I have to come up with a project, what, what am I going to do. And that kind of big blank, I am not capable of working out what I want to do and I think I’d have really struggled to say well I want to do this or I want to do that, so I think it was just a matter of thinking it would just be easier to... for there to be a project and to say right I am just going to do that project. Rather than spend the summer trying to wrestle with it when all I wanted to do was have a break [laughs]. So, yeah and I think it was more just kind of I have had enough, I just want something easy and I want an easy life!” (Psychology UG C)

Supervisors reflected on the advantages and disadvantages associated with students either being given a very set topic or being encouraged to design and create their own topic.

“There is also a lot of variability in the project. So, some of them will, not the ones I get... but some of them will have been handed the whole design by their supervisors so they get no real experience of experimental design. On the other hand they do get the experience of eh...producing high quality data that is probably going to get published which is a thrill, which doesn’t often happen to my students. So, there are many different kinds of em... completion. So, the student maybe has to make a decision then about what is important to them if they want to go for a project that’s their own [laughs] and that is basically true but I don’t think any of them are really aware that that’s the choice they are incidentally making when they settle on a supervisor and a project.” (Supervisor S)

“Yes, and there are advantages of both [students selecting their own topic and students being given one]. I mean, I guess, it really wouldn’t

be my own preference just to design an experiment for students just to give it to them. I think in one way they are being robbed of the opportunity of working that out for themselves. However, for those that do want to just get their degree and get out of there I think it's fine. But for those that actually want to work as part of a big lab group, then that's quite often the way it is, so they're getting a richer experience of the kind of bigger research environment in a funny kind of way. And so, yeah, their own project has been, kind of predetermined and given to them, but they are hearing about other people's work as well and they're one cog in the system. So, yeah I guess there are pros and cons." (Supervisor L)



### **11.3 Research Question 6: What, if anything, are the characteristics of a “good” supervisor and do any of these predict student success? How does this relate to staff and student perceptions of good supervision?**

For the purposes of clarity this broad research question is divided into a quantitative question and a qualitative question. The quantitative aspects of the question addressed if “good” supervision is something that can be defined and profiled. The qualitative aspects of the question gave consideration to the students’ comments within the interviews which indicate what they perceive to be the qualities of a good supervisor.

#### **11.3.1 What, if anything, are the characteristics of a “good” supervisor in relation to student success?**

For the quantitative aspect of this question only the data from supervisors was analysed. For this analysis 3 outcome measures were included in order to investigate “good” supervision in relation to student success. These were: the supervisors own ratings of each of the students they supervised (supervisor proxy measure of attainment); each of the students’ they supervised ratings of their perceived success (student proxy measure of attainment); and finally, the students’ own rating of their skill development and perceived enjoyment in the process (student outcome questions measure). As many of the supervisors had supervised multiple students their data was included in the analysis once for each of the students they supervised as they had different outcome measures (their own proxy measure of the student, the students own proxy measure of themselves and the students measure of skill development).

##### **11.3.1.1 Student proxy measure of attainment**

Backwards method stepwise multiple regression was conducted to assess the ability of the psychological characteristics of the supervisor (predictor variables: supervisor Emotional intelligence; supervisor autonomy support; supervisor personality; supervisor theory of intelligence; supervisor expectations) to predict students’ perceptions of their attainment as measured by the proxy measure of

success. In total 7 different regression models were generated using SPSS. This regression model was not significant ( $\beta = -.154$ ,  $p > 0.05$ ).

#### **11.3.1.2 Student outcome questions**

Backwards method stepwise multiple regression was conducted to assess the ability of the psychological characteristics of the supervisors (predictor variables: supervisor emotional intelligence; supervisor autonomy support; supervisor personality; supervisor theory of intelligence; supervisor expectations) to predict students' perceptions of their attainment as measured by the student outcome questions. In total 3 different regression models were generated using SPSS. After variables had been removed from the model the total variance explained by the model as a whole was 17.3%,  $F(12, 170) = 4.442$ ,  $p < 0.005$ . In the final model all four of the variables had a statistically significant effect. Total conscientiousness recorded a higher beta value ( $\beta = -0.472$ ,  $p < 0.001$ ) than autonomy support scale ( $\beta = 0.295$ ,  $p < 0.05$ ) and total theory of intelligence ( $\beta = 0.281$ ,  $p < 0.05$ ) and total expectations ( $\beta = -0.266$ ,  $p < 0.05$ ). Supervisor conscientiousness, autonomy support and expectations were negatively associated to student perceived outcome and supervisor theory of intelligence was positively associated with student perceived outcome. So, as supervisor conscientiousness scores increased, their perceived autonomy support increased and when supervisor expectations moved towards the student doing more, students' perceptions of their outcomes decreased. However, as supervisors moved from an entity (or fixed) view of intelligence towards an incremental (or growth) view of intelligence students' perceptions of their development increased.

#### **11.3.1.3 Staff proxy measure of attainment**

Backwards method stepwise multiple regression was conducted to assess the ability of the predictor variables (supervisor emotional intelligence; supervisor autonomy support; supervisor personality; supervisor theory of intelligence; supervisor expectations) to predict supervisors' perceptions of their student's attainment as measured by their proxy measure of student success. In total 4 different regression models were generated using SPSS. After variables had been removed from the model the total variance explained by the model as a whole

was 11.4%,  $F(12,170) = 8.673$ ,  $p < 0.005$ . In the final model two of the variables had a statistically significant effect. The emotional stability scale recorded a higher beta value ( $\beta = 0.254$ ,  $p < 0.05$ ) than total conscientiousness ( $\beta = -.203$ ,  $p < 0.05$ ). Emotional stability was positively correlated with their rating of student outcomes, so as the supervisor increased in emotional stability they rated students as doing better. However, supervisor conscientiousness was negatively correlated with student outcome, so as supervisors became more conscientious they rated students as doing more poorly.

### **11.3.2 What are student and staff perceptions of good supervision?**

#### **Identification of scope**

In general there was a conception amongst students that supervisors played a key role in helping them find the scope for their project. This was something undergraduate students felt they really needed guidance with. Many of the undergraduate students interviewed felt they were too ambitious at the start of their project and their supervisors were important for reassuring them.

“He was like you’re a BEng, stop trying to do something more novel, so, yeah apparently I wasn’t sure what my scope was and he like made it more clear to me”. (Engineering UG Z)

Indeed, scope was something that many of the students struggled with throughout the course of their projects.

“I still feel I wish I’d actually accomplished something a bit more. I mean that’s why the professor kept telling me, like his exact words were “don’t doubt yourself it took a PhD student two years to get to where you are right now”, so I mean like that seems good, but I just feel like I didn’t accomplish as much as I wanted to because like half of it was like walking down one road, getting blocked. Then trying something else, getting blocked. So, I just felt really disappointed because I wanted something that I could do a bit more because like right now, yeah I solved the grid but I didn’t really work it out all the way, so I wish I had accomplished more.” (Engineering UG Q)

All of the students interviewed discussed challenges associated with the scope of their project and they viewed the one of primary roles of the supervisor as being to ensure the scope achievable.

“I think that’s what supervisors are useful and helpful for is guiding you into what’s actually important to be researched and what the aims of the topic are when sometimes your ideas can be quite loose they help you kind of firm, make them more firm I think is what I am trying to say.” (Sociology Masters student H)

During the interviews with the undergraduate students it was apparent they always took the advice of their supervisor about the size and scale of their projects and what they could feasibly achieve within the constraints of the project. However, with the masters students, this was more variable. In the example below this student decided that her project scope could not change and in discussion with her supervisor she kept the scope of her project larger than was advised.

“I guess...well we just talked, the first time we met we talked about...sort of how to, how to deal with my research question. Cause to start with like it was, I kept, when I was like submitting my proposal, [name of course organiser] kept writing back saying, ‘like this is far too wide and big to be a masters project so you need to make it smaller’. And I kind of kept trying to do that but I didn’t really make it much more limited. So I think eventually he was like, ‘right I’ll just give you a supervisor [both laugh]. Stop emailing me PhD proposals and talk to her about it [laughs]’. And she, yeah so I’m, I met her and talked to her about it. And I think the first...the first meeting we had, like she just really wanted to find out exactly what it was that I wanted to look at and where I was coming from. And then I think from doing that she sort of...like...learned how important it was, well it made sense to her then from finding out where I was coming from, how important it was to keep all the stuff in that I, that I wanted to keep in and how I couldn’t really make it any narrower. So then we just talked about how to, how to manage it in a sort of masters project then.” (Sociology masters student E)

As students believed a key aspect of good supervision was help with defining the scope of the project they also believed that this may be a time consuming process and therefore students discussed supervisor availability as one of the key aspects of good supervision.

“Yeah, yeah definitely [I think the time and availability of being able to walk in helped a lot], like I was really happy, like especially when

it got to writing it up. Em, I was one of the people who was like I am stuck I'm going to go and see my supervisor and I could just go in and more times than not she would just be in her office and fine with me walking in and going "I'm stuck can you help me with whatever?" (Psychology Undergraduate student C)

However, there was some recognition of the workload issues surrounding supervisors

"I do think the university should give more time for the supervisors who are also doing other stuff. They should give them more allocated time to help out the students because that's what the point is really. Because if you give someone who has already got a 40 hour week 3 students to look after well of course he isn't going to look after them. They are going to have to chase him up and hope for the best". (Engineering masters student O)

While students appreciated availability, they acknowledge that perhaps issues of availability were not related to the supervisor per se. However, they were also able to identify some "core" traits that supervisors needed and these were things they believed were within the control of the supervisors. These traits, which students attributed to good supervisors, were based on two main areas. Students discussed both the personal qualities good supervisors possessed and also that good supervisors required excellent research knowledge and expertise in the subject area.

### **Qualities of a good supervisor: Personal Qualities**

Characteristics which were commonly associated with good supervisors included good communication skills

"I think she is a good communicator and she is a good communicator one to one and that is vital" (Sociology UG student R)

In addition students perceived supervisor approachability to be key to their feelings through the process.

"Yeah and he was smiling when he saw me and he was, I don't know if he was happy to see me or not, but it was, I felt that, I felt that I wasn't out of place going to his office every week. I felt welcome in there and that was good" (Psychology UG F)

Another key aspect of good supervision which was strongly evident in all of the interviews was the need for supervisors to have the ability to understand and relate to things from the students' perspective.

"At the moment I don't have a car so transport was a problem. So she limited the, the contacts, or face-to-face contacts to 3 cause I was working in [name of city] at the time as well so I was happy that we communicated more on emails and she was very prompt about replying to the emails" (Sociology Masters student N)

Students also commonly discussed a supervisors' ability to listen and engage with them as being an important consideration. Many students felt that listening and responding to them was one of the most important aspects of supervision.

"I just liked that my supervisor engaged with me. They listened to what I was saying and responded to that" (Psychology Undergraduate student F)

Some students had problems with this aspect of supervision and felt that while their supervisor was good in many regards listening to the student was one of the things that could have been improved upon.

"I mean coming back to my supervisor- he was very good in terms of guiding me, but he was very much a talker and not so much a listener. Which it played on both ways; one the one hand it was good because I could just take a lot from what he was saying and just sort of, because he would talk a lot then we would cover a lot and so I could pick out the information I needed; but at the same time for specific questions it didn't always work out. Yeah, I think maybe listening a bit more might have been useful for him sometimes" (Engineering masters O)

When students perceived they were being listened to, they perceived that their supervisor was open to student input and this was another important aspect of what students considered to be effective supervision.

"Plus there was the fact that I came up with a couple of, I came up with a couple of ideas and she didn't totally poo poo them and they eventually got incorporated into them so I was quite happy. Em and one of the ideas came out of a conversation we had in the second interview and I thought-you know that's a really great thing that's come out." (Sociology masters student N)

Finally, in terms of personal qualities, students viewed supervisors being able to judge the correct amount of support to give students as a desirable quality. Often this assistance was related to the practical aspects of the process, which relates to the importance of the supervisor to the scope of the project.

“Oh, yeah,[I was given] assistance when I needed it and encouragement when I needed it. I mean a lot of the assistance was, it was essentially very practical. I mean how would I have coped with 30 interviews for a start? Do you know what I am saying and there was me thinking it was all feasible and it was all possible and all the rest of it and she is saying I think you should just do 12 and I was like well what about 18. It was like bargaining and, so that type of assistance probably was fairly profound in my actually getting through it and me not going mad.” (Sociology masters student N)

Some students believed effective supervisors were supervisors who were able to adapt to a range of students.

“Well she was a good supervisor. I think, because I know other people that were supervised by her as well. And they saw her more often and that sorta stuff. So I think she kind of took everybody’s measure and was like, ‘this is what each person will need’.” (Psychology Masters student A)

This was something that was echoed by the supervisors who were interviewed.

“An ideal supervisor would be one who can adapt themselves to the widest range of students I guess.” (Supervisor S)

### **Qualities of a good supervisor: Knowledge, research experience and professional qualities**

In addition to discussing the personal qualities good supervisors possessed, students also reflected on the importance of excellence in research. While students often perceived they needed someone who was an expert in the research they were doing, this often did not happen and students, on reflection found this was not too problematic.

“Well ideally I wanted a supervisor that was in the same area so that he could tell me what kind of research I needed to look at and what I needed to know and what I needed to do and whether what I was doing was okay, which actually didn’t turn out that way. But it was okay, so, so, yeah I just wanted, ideally I thought it would be some sort of research support. So, they would know the area. So say I

wanted to do perception they would be like oh I know this you read these things and then these people have done these things maybe you should do something like this, but that didn't happen." (Psychology Masters B)

From this quote it is clear the student had set expectations of the role of a supervisor before embarking on his project and his experience was slightly out of line with what he received. This may have been down to the fact that the supervisor had a different view of what supervision should be than he did. Indeed, many of the students, similar to student B, discussed the importance of the supervisor in terms of telling them what to do at the start of the process.

"I think at the beginning when I learned, when I heard I was going to do a dissertation I was basically going to go to the person and say "tell me what to do". Just write it all down for me, I'll do it. Just you tell me the title, what's good, tell me the style I am going to use, tell me the font, everything. Tell me everything and I will do it." (Sociology Masters N)

However, in contrast many of the supervisors discussed good supervision in relation to the facilitation of autonomy. However, these supervisors acknowledge that sometimes this is a challenging process.

"Yeah, the biggest difficulty I have with my way of doing things, which I have been describing- trying to facilitate autonomy, is that, I guess, students, especially at the early stages of the project, maybe don't understand how big a task it is and so, their, this is relevant to the project, so their self-efficacy is really quite high at that stage and so they say "oh, yeah, I'll do it all over the summer, I'll have this done by the start of term" I say "great!" and very few of them do." (Supervisor L)

While some of the students did underestimate the process at the beginning other students were less confident about their abilities and in these situations the supervisor played an important role in encouraging the student.

"Like near the end of my 3rd year, where I was still like quite unsure of my ability to research and like you had only been given projects basically, em and like I was still quite unsure about my potential and like being able to come up with ideas and stuff and to be able to approach him with like this idea I had and for him to go- that's great, let's go with that! Like that really boosted my confidence as well. It kind of gave me that confidence to be like actually maybe I could do this. Like, em, and like obviously the positive experience then with the final year project and stuff and it's meant that I know how to,



well not quite, but like I am learning how to interact with like people in academia and like how I can adapt my ideas to make them good for people who want to be interested in my work.” (Psychology UG Y)

After consideration of the broader issues surrounding “good” supervision a more detailed analysis revealed differences in individual student and staff perceptions of what supervision was. Interestingly, student perceptions of what supervision was related back to their perceptions of a good supervisor.

### **An academic learning experience**

Some students and supervisors viewed supervision purely in terms of an academic learning experience and gave very little attention to the personal aspects of supervision. These students and supervisors were very outcome-focused and gave little consideration to the process and the development of the student as a whole. These students used their supervisor primarily for research support and guidance.

“I mean because it was mine he wasn’t that involved, so it was more guidance. He was just trying to help me see where I could go with it. Then, I mean, he had to... well they paired me up with him because he had that sort of knowledge base and so I don’t know... yeah, there was guidance from him helping me pick.” (Engineering masters student O)

These students valued their supervisors input and feedback on their academic work as they believed this allowed them to improve the final outcome of their project.

“So someone who is like you can do what you want and I’ll just make sure you don’t do it wrong, that’s what my role is rather than some overbearing one and they’re someone who tells you when it’s wrong. Because I know a friend of mine had a supervisor that wouldn’t, that would just be like- oh you can just do whatever you want, that’s okay. And that’s good to a certain extent but then you want someone, they are a supervisor they are not like a yes man, so you want them to say you’ve done this wrong. That’s what they’re there for. So, you need someone who lets you do what you want to do and then tells you when you have done it wrong. That’s what I would value.” (Psychology Masters student B)

## An emotional interpersonal experience

Other students and supervisors found it more difficult to focus on the academic side of the supervision relationship only and viewed supervision as an emotional and interpersonal relationship. Indeed, some students explicitly voiced that they were able to deal with the academic side of the project and the key role of their supervisor was to provide pastoral support.

“I think I’m more knowledgeable in the actual subject area maybe than she was. But yeah the sort of personal aspects were very important. I mean the sort of, just her like talking about like, like the actual content of what I was writing was really really important as well. And talking about, you know, how to connect things and stuff. Like that sort of guidance is definitely there. And it was really important as well. But yeah I think the, I found the personal side of it just to be, yeah definitely the most important thing” (Sociology Masters student E)

Some students reflected on the fact they had not considered this at the start of the process, however, in hindsight this is something they consider to be of higher importance.

“I remember saying to one of my friends after a meeting with my supervisor, saying that I’ve really made a mistake here in who I have selected for my supervisor. And it’s purely my own mistake, nobody else’s, it’s my responsibility and one of my other friends said, oh I picked a supervisor because I thought I would be able to sit down and chat to him and I would get on with him! And that hadn’t really occurred to me, I just thought- who do I think is likely to be organised and will get things sorted and will get back to me and all that sort of thing. I looked at it very much from a practical point of view and that was maybe short-sighted of me.” (Psychology Undergraduate I)

Some of the students who viewed supervision in this way had experienced problems outside of university and therefore their supervisor became a support mechanism and this was important to them and their progress.

“And also I think...that...yeah it, [name of supervisor] was just really good, I think, especially after...after I’d had like the problems with having to get the extension and stuff. And then I started working on it and like getting started on things. She was just so supportive. Like she just said that I could go and see her any time I wanted or like however many times I wanted. And I could just send her drafts of things. And I could like talk to her over email or phone or in person or

whatever. So I think sort of...yeah her, her realising, her just being really supportive was really good.” (Sociology masters student E)

Even students who had encountered less challenging issues still found the process of conducting research difficult and appreciated their supervisors’ personal support during these times. Students felt being able to share the emotional highs and lows of the process was important to their progress.

“I think he was a very active part of the process and how I felt about it. Like, like I said when I had my little cry I did get an email afterwards being like are you alright like, feel free to come and see me and like, usually when I came in to see him on my own as well like I’d come in and sit down and he’d be like do you want some tea? He’d like get some tea for me, so, he was very much an involved part of like the things which were really good and the things that were bad as well. Because I remember when I’d go in and be like **this happened it was great!** And he be like **oh that’s great I am so glad!** [laughs] he was kind of enjoying it with you, it was quite nice”. (Psychology UG Y)

Encouragement and confidence in their abilities is something all students valued in their supervisor.

“I think as well just the sort of, like she was just really encouraging. And it was just whenever I sent her something she would just sort of make me feel really good about it. And like she would sort of tell me things that she thought could be, should be changed and stuff. But she would also just be so positive about it. And that, I think I really needed that because I was quite like worried I wasn’t, I wasn’t doing it well. Especially when I wrote the first chapter, I thought it was just like, it was just a sort of psychotic rant. But like [name of supervisor] was just like so positive about it. And I think that gave me confidence to sort of finish the whole thing [laughs].” (Sociology Masters student E)

### **Complex interaction between academic and personal**

A third group of students and supervisor found it more difficult to disentangle the interpersonal aspects and the academic aspects of supervision and discussed them as an interaction.

“Cause I guess I’ve been talking about my experience with, with [name of supervisor] and like how important the personal aspects of it was. So...cause I guess if you, if you ask me that I would just say supervision would be sort of overseeing a project in a sort of purely like work or academic sense. But actually what it was for me was much more like the sort of supervision I got in work. So, I don’t know.

I think it is important that it includes that because you can't just...you can't just do sort of, you can't separate things like that, I don't think. So I think it's important to, to not just have it as the sort of academic thing if the person, well yeah everyone's different but if the person needs sort of more personal support. I think that's an important aspect of it." (Sociology Masters student H)

However, when students expressed a preference for one over the other personal aspects of supervision were of the utmost importance.

"I mean I did appreciate the sort of, the academic side as well. But...I think yeah it definitely wasn't...yeah it's, yeah it's definitely fair to say that I mostly appreciated the personal aspects and sort of mostly got on with the academic stuff myself. Not mostly, largely. I mean she did, she did, she was really helpful in the academic sense as well. But yeah I think I ended up when I, when I started doing it I ended up being much more independent in that side of things than I'd expected to be." (Sociology masters student E)

Often students believed the interpersonal aspects of supervision became magnified when things weren't going as well. However, the academic side of supervision became more important when things were going well again.

"I like really wanted her to, you know, give me her academic perspective on it and tell me what could be better and stuff like that. So I think when I actually got into writing it, it became much more about the, like the academic support again [...] Like maybe when I was having a hard time, it was more sort of, the personal aspects were really helpful. And they were still definitely there while I was writing it. But then like the sort of academic sides sort of kicked in again." (Sociology masters student E)

When discussing what they thought supervision was these students often changed the word supervisor to something else as they did not believe supervision was a good description of what they were receiving.

"So, you know, if you, if you get rid of the word supervisor and you replace it with mentor it changes the whole idea about it because yes I have had a supervisor, but I have also had a sort of mentor if you know what I mean who has not necessarily been there to wait for me to trip up and has the expectation of me tripping up on stuff. She had a knowledge of the topic and also treated me as an equal. So, your question was what does supervision mean to me? Well I think what supervision means in the context of this project is a collaboration more than anything else. It is, there is a much more equal footing, but there is a responsibility on both sides. Responsibility for your mentor and supervisor, statutory responsibilities almost in that they have to follow a process but in enabling that it is pretty much up to

the individual and that's the way it should be, you know." (Sociology masters student N)

### **Shared process between staff and students**

Almost all of the respondents believed that "good" supervision was, to some extent, a shared process which relied on the interaction between staff and students.

"I think it was really just coming up with an idea and like brainstorming about what we could do and also what was practical to do. So I think we just built on ideas of [name of research topic area] and different interpretations of stimuli and then, we kind of, yeah it was mainly kind of sort of [name of supervisor] and his creative ideas and I had several ideas I came to, I came to him with several ideas and he was like yeah, that sounds really good and then he, but because he has been doing research for so long he came up with other ideas and I was like- they sound much better! So I went along with his ideas but also they did like change slightly with like different meetings. So, it was like oh maybe it's more feasible to do this and we'd change what we were doing with the stimuli and [...] yeah it was just kind of figuring out how to do the experiment. Yeah."

(Psychology Undergraduate D)

Students and supervisors believed that working together required both people in the relationship to contribute and therefore students often viewed supervision as different to teaching.

"Yeah, it's a discussion, it's not I am telling you something because I know. I mean we both didn't really know where we were going, we both had vague ideas. I mean the real key is that no one knew what the results were going to be, which yeah, that was a big part of it. I definitely enjoyed the fact that it was cooperation as opposed to teaching." (Engineering Undergraduate student Z)

However, students acknowledge that although supervision was slightly different to teaching their supervisor still played a key role in "showing them the way" due to the fact that they are more experienced and are able to direct students in appropriate ways.

"Supervision is, I guess, they are watching over you basically. Because I mean I guess it is such a big thing and you don't really know what you are doing and are like lost. So they are showing you the way. I think that is what supervision is, they are telling you go here or go there. They should be giving you directions basically and making sure you don't go off the track." (Engineering UG student Z)

## 11.4 Summary of findings for good supervision

In relation to research question 5, which investigated the things students consider when deciding on a supervisor, it seems that students took 3 main areas into consideration. Some of the students interviewed selected their supervisor purely on the basis of their research interests. For other students they made the decision on the basis of the personal qualities they believed their supervisor possessed. The final criteria for selection seemed to be based around an interaction between the student's research interest and also the supervisor's personal qualities. Some students had an awareness that working in an area of research they were interested in was important, but they were also aware of the need to be able to communicate and work with their supervisor on a personal level.

The quantitative aspects of research question 6 investigated what, if anything, were the characteristics of a "good" supervisor in relation to student success. In this case there were three outcome variables - student proxy measure of attainment, staff proxy measure of attainment and student outcome questions. For the student proxy measure of success no characteristics of the supervisor were able to predict outcome. For the staff proxy measure of attainment the model was significant and emotional stability and total conscientiousness of the supervisors were significant predictors of how they rated their students. As supervisors increased in emotional stability they rated students as doing better. However, supervisor conscientiousness was negatively correlated with student outcome, so as supervisors became more conscientious they rated students as doing more poorly. Finally, for the student outcome questions the model was again significant. The significant variables in this model were supervisor conscientiousness, supervisor autonomy support, supervisor theory of intelligence and supervisor expectations. As supervisor conscientiousness scores increased students' perceptions of their outcomes decreased. As supervisors perceived autonomy support increased students' perceptions of their outcomes decreased and when supervisor expectations moved towards the student doing more students' perceptions of their outcomes decreased. However, as supervisors moved from an entity view of intelligence towards an incremental view of intelligence students' perceptions of their development increased.

In relation to the qualitative findings of research question 6, in general there was a conception amongst students that supervisors played a key role in helping them find the scope for their project. This was something undergraduate students felt they really needed guidance with. Many of the undergraduate students interviewed felt they were too ambitious at the start of their project and their supervisors were important for reassuring them.

Students defined good supervision in terms of the personal qualities of the supervisor and also as being related to the supervisor's research knowledge and expertise. Different students, during the interviews, placed differing importance and emphasis on personal qualities and research knowledge and expertise. Firstly, some of the students discussed supervision purely in terms of an academic learning experience. For other students the emotional aspects were more important and they reflected on the emotional interpersonal experience of supervision. The third group of students reflected on supervision as a complex interaction between academic and personal. These students and supervisors found it more difficult to disentangle the personal aspects and the academic aspects of supervision and discussed them as an interaction. The nature of these personal and emotional aspects of supervision were also of high importance and impacted on the way the students perceived the process, and also how they felt about their success and skill development.

## **12 Findings from Theme 4: Match or Mismatch of psychological characteristics between student and supervisor**

### **12.1 Description of data for theme 4**

For the fourth theme both qualitative and quantitative data have been used. In terms of qualitative data the interviews from the 20 students and 10 supervisors was coded. During the process of coding, the pairing of students and supervisors was considered and used in order to create the themes, however, quotes in this chapter are not presented in paired format in order to protect the anonymity of both the students and supervisors. For the quantitative aspect all student and supervisor “paired” data was used in the analysis. The data from 140 pairs of students and supervisors was used to investigate the impact of match/mismatch between student and supervisor for student development.

### **12.2 Research Question 7: What effect does match/mismatch between student and supervisor have on student success? If it has an impact, what is the relative importance of each of the factors of “matching” between student and supervisor?**

For the purposes of clarity this broad research question is divided into two main sub-questions. The quantitative question looks at the implications of match or mismatch in terms of students’ perceived success and skill development and supervisors ratings of student success. The qualitative aspects give consideration to the implications of match or mismatch between students and supervisors.

#### **12.2.1 Does the match/mismatch between student and supervisor predict student success? If so, what is the relative importance of each of the factors of “matching” between student and supervisor?**

For the quantitative aspect of this question the data from student and supervisors pairs was analysed to investigate if match or mismatch (as measured through calculation of difference scores) on a range of psychological variables (predictor variables: Emotional Intelligence difference scores; Personality



difference scores; Expectations difference scores; Theory of intelligence difference scores; Autonomy support difference scores) were able to predict student success. For this analysis 3 outcome measures were included in order to investigate student success in relation to match or mismatch. These were: the supervisors own ratings of each of the students they supervised (supervisor proxy measure of attainment); each of the students' they supervised ratings of their perceived success (student proxy measure of attainment); and finally, the students' own rating of their skill development and perceived enjoyment in the process (student outcome questions measure).

### **12.2.1.1 Influences on student proxy measure of attainment**

Backwards method stepwise multiple regression was conducted to assess the ability of the match/mismatch on a range of psychological variables (predictor variables: Emotional Intelligence difference scores; Personality difference scores; Expectations difference scores; Theory of intelligence difference scores; Autonomy support difference scores) to predict students' perceptions of their overall success during the course of their project as measured by a proxy measure of attainment. In total 6 different regression models were generated using SPSS.

After variables had been removed from the model the total variance explained by the model as a whole was 32%,  $F(9,139) = 6.157$ ,  $p < 0.001$ . In the final model three of the variables had a statistically significant effect. The total openness difference scores recorded a higher beta value ( $\beta = -.347$ ,  $p < 0.005$ ) than total expectation differences scores ( $\beta = -.257$ ,  $p < 0.05$ ), which was higher than total extroversion difference scores ( $\beta = -.254$ ,  $p < 0.05$ ). The Dweck difference scores remained in the model and were approaching significance ( $\beta = -.220$ ,  $p = 0.06$ ). Students perceived best outcomes when they were higher than their supervisor on each of the significant variables. Best perceived outcomes, for the students, were associated with students having a more incremental (or growth) view of intelligence than their supervisor, being more extroverted than their supervisor, having higher expectations of what their supervisor would do at the start of the process than their supervisor, and having higher openness scores than their supervisor. Lowest perceived outcomes were associated with supervisors having a more incremental (or growth) view of

intelligence than their student, supervisors being more extroverted than their student, supervisor having higher expectations of what they, as supervisors, would do at the start of the process than their student, and supervisors having higher openness scores than their student.

### **12.2.1.2 Student outcome questions**

Backwards method stepwise multiple regression was conducted to assess the ability of the predictor variables (Emotional Intelligence difference scores; Personality difference scores; Expectations difference scores; Theory of intelligence difference scores; Autonomy support difference scores) to predict students' perceptions of their overall development during the course of their project as measured by a series of outcome questions. In total 6 different regression models were generated using SPSS. After variables had been removed from the model the total variance explained by the model as a whole was 36%,  $F(9,139) = 7.314$ ,  $p < 0.001$ . In the final model four of the variables had a statistically significant effect. The total autonomy support difference scores recorded a higher beta value (beta= -4.48,  $p < 0.001$ ) than total expectation differences scores (beta= -.299,  $p < 0.05$ ), which was higher than total emotional intelligence difference scores (beta= -.291,  $p < 0.05$ ), which was higher than theory of intelligence difference scores (beta - .283,  $p < 0.05$ ). Students perceived best outcomes when they were higher than their supervisor on each of the significant variables. Best perceived outcomes were associated with students having a more incremental view of intelligence than their supervisor, having higher autonomy support scores than their supervisor, having higher expectations of what their supervisor would do at the start of the process than their supervisor, and having higher emotional intelligence scores than their supervisor. Lowest perceived outcomes were associated with supervisors having a more incremental view of intelligence than their student, supervisors having higher autonomy support scores than their student, supervisors having higher expectations of what they would do at the start of the process than their student, and supervisor having higher emotional intelligence scores than their student.

### 12.2.1.3 Staff proxy measure of attainment

Backwards method stepwise multiple regression was conducted to assess the ability of the predictor variables (Emotional Intelligence difference scores; Personality difference scores; Expectations difference scores; Theory of intelligence difference scores; Autonomy support difference scores) to predict staff measures of student success during the course of their project as measured by a staff proxy measure of student attainment. In total 9 different regression models were generated using SPSS. This regression model was not significant ( $\beta = -.227$ ,  $p > 0.05$ ).

### 12.2.2 What are student and staff perceptions of the impact of match or mismatch on student experience and success?

It was clear from the interviews that “matching” with their supervisor was something students considered at the start of the process. Often the students reflected that they were apprehensive on meeting their supervisor in case they may be encouraged to change their research ideas. As their research ideas were important to them they felt it was important they were matched with someone who would also see the significance of these research ideas. For these students it was important they felt their supervisor viewed the world the way they viewed it.

“I had to do a dissertation outline and I had a title and a dissertation outline before I met my supervisor and essentially I had no idea how to go about it because I had never done a qualitative study before. It was all quantitative studies I have done. So that, that was in my mind and I was quite scared, not jumping ahead, but I was quite scared that particularly the first few times that I met my supervisor that I would be dissuaded in some way from that. I was like terrified because I had made up my mind that this is what I was wanting to do and I could see the difficulties involved in that and I was hoping that, you know, we would be singing from the same hymn sheet, instead of saying rip it up and start again type thing because that would have been quite... I wanted to do it, I wanted to go through the process of doing it. I liked the idea of it and actually even contemplating something else would have been very very difficult actually”. (Sociology Masters student N)

In addition to match and mismatch being something students were aware of, and gave consideration to in many of the interviews with students and supervisor, it was clear that the interaction between student and supervisor was in fact of

greater importance than the individual characteristics of a “good” student or the individual characteristics of a “good supervisor”. Indeed, as supervisor S highlights many of the students and supervisors shared views that perhaps supervision was not something that should be discussed in terms of the individual traits of students and supervisors, but rather the “complementary” skills and abilities that together the students and supervisors have.

“I really don’t think this is about traits of individual students, I think in a supervision relationship, this is even more true of a PhD. It’s about whether the supervisor and student together have all that’s needed for the project and if there is a deficit that neither one covers then it’s going to be in trouble! ” (Supervisor S)

Throughout all of the interviews this theme of match/mismatch was evident. In particular it seemed to relate to three main aspects of the supervision process. Firstly students and supervisor discussed match in relation to their personality and their personal characteristics. Secondly, issues surrounding match/mismatch on research interests were discussed, and finally, students and supervisors discussed match/mismatch in terms of their expectations of the process.

### **Personality/Personal Characteristics**

This theme was created to capture the students’ and supervisors perceptions of the implications of match or mismatch in terms of their personality and personal characteristics. Nearly all of the participants talked explicitly about this sub-theme. Different students reported differences in their perceived match with their supervisor within this and three main types of match/mismatch arose. Firstly, some of the students viewed themselves as being similar to their supervisor, secondly, complementary personality characteristics were discussed and thirdly clashing personality characteristics were discussed. In terms of outcome for the student all of the students who had similar or complementary perceived personality/personal characteristics with their supervisor reported enjoyment in the process and discussed their learning and skill development positively. Students who believed they had clashing styles to their supervisor in this domain were more negative about both their experience and their perceived success and skill development.

## Similar

Many of the students perceived their supervisor to be similar to themselves in their personality/personal characteristics. Some of the students, who had a choice in the selection of their supervisor and who knew their supervisor, often in the capacity of a lecturer, before they began working with them reflected on this perceived similarity as being influential in their selection of their supervisor.

“Yeah, yeah I would say that actually because I was creative it was important for me to work with someone who was also creative. Like, just thinking about the diversity of the topics that we actually covered within our lab group. Yeah, it was important that I felt someone else was like, my supervisor was creative and could kind of work on that with me as well [laughs].” (Psychology Undergraduate student Y)

While not all students had a choice in their selection of supervisor it seemed that similarity between personal characteristics and approaches to working was important throughout the whole process. Masters student B had no choice in the selection of his supervisor, however, he believed they had a similar way of approaching tasks which resulted in him receiving feedback that he viewed as beneficial.

“He gave me a lot of feedback on the stuff that I was struggling with and then didn’t give me much feedback on the stuff I was obviously okay, he just told me it was okay, which was nice because it meant that it wasn’t a lot of nit-picking which I don’t like either. So he kind of focused not on the un-important stuff which I would probably do in proof-reading anyway but on the important stuff. [...]that was probably the best part. It was that he didn’t focus on, he would tell me if it was wrong or he would tell me if it was right. He wouldn’t, he wouldn’t, go overboard on it. He answered my questions and obviously I structured it with the questions and he’d answer them all which was good.” (Psychology Masters student B)

## Complementary

Other students highlighted the need for their supervisor to be slightly different from themselves and believed that being similar may have been detrimental to the process. This theme was most evident in students who discussed anxiety and lack of confidence in their ability. Often these students were able to identify weaknesses in their approach to things and felt their supervisor was able to “balance out” these perceived weakness.

“I am quite neurotic and highly strung, like I am quite willing to admit that about myself so it’s good to have a person who is working with you who is much more relaxed. It kind of balances out with the way I behave so it’s good.” (Sociology masters student H)

From the analysis of the data it seems that students have a positive experience during the process if they perceive their personality/personal characteristics as being complementary to their supervisor or if they perceive their personality/personal characteristics as being similar to their supervisor. The explanations for this variation are complex and a number of factors could account for this, however, one possible explanation which became evident within the interviews is that there seems to be different types of students and so these may be down to individual differences between students. Supervisors seemed to have a perception of the possibility that there might be different “types” of students, and reflected on the differences in the support they need and also in the rewards associated with supervising these different “types” of students.

“So, there would be two groups of rewarding students I think. The first one I think is the kind of student who actually needs very little help, and so, with the flexibility of the system, they can literally do whatever they want. As long as I feel I can supervise it [...] yeah there are a lot of students who actually really know what they are about and they just need to be resourced and encouraged to pursue that. And so, they are absolutely rewarding to teach. The second group would be people who really aren’t high in confidence at all and really need quite a lot of support, but none the less do something better than they ever thought they could.” (Supervisor L)

Indeed, as already outlined, the students who perceived complementary personality/personality as being important were the students who reported lack of confidence in their own abilities and they were the students who were more open about their own perceived strengths and weaknesses. On the other hand, the students who discussed being similar to their supervisor were more open about the positive skills and qualities they had and therefore felt they needed to work with someone who also displayed these positive characteristics.

### **Clashing**

The final group of students were the students who had poor perceived outcomes. Student who felt the process did not go well and could have been improved

often attributed this to perceived differences between the personality/personal characteristics of themselves and their supervisor.

“I don’t know if it was just a clash in personality or whatever but it just, it did it really put a downer on the project as a whole. I don’t feel I did as well as I could have because a lot of the time I didn’t really know what I was doing. And when I asked for help it just, I mean in the long term it will probably help me, but at the end of the day if I don’t get a good enough mark then there is no point, I am not going to get any further on. I even went and asked if I could change my supervisor but it was, everyone was full and it was too late, so... I was stuck.” (Psychology Undergraduate student M)

Often these students believed the process would have been more enjoyable, and importantly more beneficial to their learning, had they been “matched” with someone else.

### **Research interests/research ideas**

The second sub theme, similar to the first, was created to capture the students’ and supervisors perceptions of the implications of match or mismatch in research interests or research ideas. Again, this was something nearly all of the participants talked explicitly about. Again, as with personality, different students reported differences in their perceived match with their supervisor within this and three main types of match/mismatch arose; similar, complementary and clashing. In terms of outcome for the student all of the students and supervisor who had similar or complementary research interests and ideas reported enjoyment in the process and discussed their learning and skill development positively. Students who believed they had clashing styles to their supervisor in this domain were more negative about both their experience and their perceived success and skill development.

### **Similar**

Again, as with personality and personal characteristics, perceived similarity in terms of research interest/research ideas was important. This theme was prominent when students had a choice in the selection of their supervisor as many of the students discussed wanting to work with them because they perceived them to be similar to themselves.

“[I wanted to work with her because] She’s, she seems really political. Like she seems really passionate about things. Whenever she’s giving lectures about things she gets, you know, you can see that she’s, she’s like genuinely really angry about injustices and the stuff that she’s, that she works in. And she, she’s sort of, like I’ve just always really got from her that she sees, it’s not, she doesn’t see sort of academic research as being something that should be separate from sort of political action and stuff. And that’s, well yeah, that’s the way I feel about it. And I think, I think that’s a really really key thing to have in common, like even more than, you know, how much knowledge, specific knowledge she has in the area that I was studying and stuff.” (Sociology Masters student E)

Some of the students interviewed had interesting perspectives on why a supervisors research interests were so important to them. Indeed one of the students felt that a persons’ research interest reflects a lot about a person and what is important to them, they discussed that this is particularly important for people who have made the decision to base their career around research.

“I think a person’s research interests sort of show you what they are like as a person. Like I think like my research interests definitely mirror what is important to me. So, I don’t see like why it would be any different for someone who’s chosen to do that as a career. You know if you are going to spend, so, so many years like doing this one area of research like you’ve got to be passionate about it and that surely has to say something about you as a person, I would say!” (Psychology UG student Y)

Again, while not all students had a choice in their selection of supervisor it seemed that similarity between research interests/research ideas was important to students who had been matched with a supervisor. Sociology student R had no choice in the selection of her supervisor, however, believed that having someone who had similar research ideas to them was the “perfect match”.

“I was happy [with the supervisor I got] because, as I say, she knows quite a bit...about like [name of research area] and that. So...so it was kind of a perfect match almost!” (Sociology UG student R)

### **Complementary**

As with the personality/personal characteristics other students highlighted the need for their supervisor to be slightly different from themselves. This was never discussed in relation to research interests, however, was discussed in



relation to ideas about research and the research process. Often it was associated with issues surrounding when things should be done.

“You know I am quite strict at setting deadlines on stuff and I’d be like oh I’ll have this chapter written by whatever date and I’ll send it to you and [name of supervisor] would always be like, I think she was more realistic than I was [laughs] about how long research takes and she was like well you know if it’s a week after that or a couple of days after that then that’s fine. You know it doesn’t need to be in on that day and that was useful that she was quite relaxed on when she saw certain chapters or when I wanted to come up and discuss things. So, I think for me even although I wanted to like really I’ll do this then and this then it actually was more realistic and it worked out much better for me, in that way and I think that was more, like I think the more relaxed approached to research works better with me anyway.” (Sociology masters student H)

This student clearly appreciated the relaxed and more realistic approach to research that her supervisor displayed and felt this aided the process.

Other students and supervisors reflected on how their research interests and ideas “fitted together”. Supervisors in particular found that often they were able to provide a context, related to their own research interests that allowed the student to conduct their research.

“So, this particular student came to me and said she had seen that I was interested in the area of [...] and that she had an interest in a particular context, a particular context that she was interested in looking at, but she couldn’t think of a particular condition that this could be linked to and that’s when I said “well I might have just the condition that we can take your idea and fit it around”. So, we actually pieced together a bit like a jigsaw” (Supervisor J)

### **Clashing**

Students who perceived they clashed with their supervisor in terms of research interest found the whole process very difficult. These students discussed the implications of thinking differently from their supervisor. One student discussed the problems of clashing with her undergraduate supervisor on research ideas and described the experience like a “battle”. While it is possible that a “battle” may be a good learning experience, this experience as an undergraduate

influenced the way she approached her master thesis as she had concerns that her supervisor, again, did not understand where she was coming from.

“I think at the start I maybe took, I felt like it took her a little while to, even though we sort of went over it and talked about where I was coming from, it took her a wee while to actually get what I wanted to focus on. So yeah like maybe took a couple of conversations. But that is just, yeah I didn’t really see that as a, I guess I saw it as a problem at first cause I was thinking like I’m gonna, she’s gonna keep trying to like steer me into talking about something I don’t want to really. And I’m just gonna have to, well I’m just gonna have to show her that I don’t want to do that [laughs] by not doing it. But then sort of, and that’s what kind of, that’s what happened in my, when I did my undergrad dissertation. I really clashed with my supervisor and we just thought so differently about everything. And he was always, he was always like trying to get me to just change basically my entire argument and stuff. And so the whole process that time was just like a battle. And I, I just felt like I had to be really defiant and just write what I wanted to just show him that it was my project and whatever. But, so kind of when, at the start when I felt like [name of supervisor] wasn’t really getting exactly what I wanted to talk about, I kind of got a bit scared that that was gonna be the way it was again. ” (Sociology masters student E)

As well as clashing in terms of research ideas other student’s discussed research methodology as being a potential area for clashing between students and supervisor. This theme was not evident in students who were studying Science, but was more evident in students who were choosing topics more closely related to Social Sciences. Student discussed differences between supervisors in their willingness to engage with qualitative research.

“A lot of people wanted to do qualitative, qualitative research and a lot of supervisors just straight up said, ‘I’m not doing qualitative research. Like I’m not supervising qualitative research. You have to change it to quantitative. Or at the very least you could do mixed methods’. But so a lot of people, a lot of people that wanted to do that were kinda like, ‘well it’s not my project anymore.’”(Psychology Masters A)

The final area of clashing was related to student’s sense of autonomy in relation to their project. This particular student felt their autonomy was being interfered with by her supervisor who requested frequent meetings and she felt these meetings were not required and not in line with the way the research should have been approached.

“I mean my supervisor wanted to have meetings with me, at the beginning she wanted them every week, and... I had said that because of my timetable and the way my classes were spread out that most of my work would be done on... at the beginning of the second semester, because I only had one class then and would have more free time. So, I didn’t feel that it was really necessary for me to have meetings every week. I feel I should have been more in control of what was happening. Eh... obviously it did make a difference to how well I prepared, but I felt there was a few things that I did more than once. Em.. for example, I had collected my data early on due to the nature of my project and... I had done, sort of done, or had looked at my analysis. Then, quite a while later I had got an email from my supervisor asking me to fill in details of what my analysis would be... and I had already done it! And then, when we had a meeting she was like “oh I send that to all my students”. And, it’s like, yeah, wouldn’t it have been better sending it just to the students who needed it, rather than just sending it to them all. So, to me that came across as somebody checking up on me, rather than giving me the opportunity to work to my own deadlines. And... that approach might work well with other students, but all it did was [explicative language]!”  
(Psychology undergraduate student I)

## Expectations

The final sub-theme in terms of match/mismatch was created to capture the students’ and supervisors’ perceptions of the implications of match or mismatch in expectations. Again, this was something nearly all of the participants talked explicitly about. Again, as with the first two sub-themes different students reported differences in their perceived match with their supervisor within this and in this occasion only two main types of match/mismatch arose; similar and clashing. None of the students and supervisors believed they had experienced complementary expectations during the process of conducting/supervising projects. In terms of outcome for the student, all of the students and supervisors who had similar expectations reported enjoyment in the process and felt the process had been well defined. Students who believed they had clashing styles to their supervisor in this domain were more negative about both their experience and their perceived success and skill development.

Both undergraduate and masters students were aware that there seemed to be a lack of clear expectations of what they had to achieve from their projects. Students felt projects were quite a different learning activity from other forms of course work. They believed coursework had clear learning objectives,

however, they were unclear about the learning objectives associated with their projects.

“Maybe there wasn’t like so sharp an expectation as for normal course work, like okay this one is for this and you have to do this, this, this. And at the end you have to get this result. And it wasn’t like that. It was more like fluid boundary between those.” (Engineering masters student K)

However, while students were unclear about the expectations of the project they had an awareness that this was due to the broad nature of the task and that everyone was doing very different kinds of research. They felt these unclear expectations were related to these differences.

“It’s not like the prescribed exercise from the previous years when everybody knew how it was going to end up and you just had to produce the result. It was more like decent research”. (Engineering masters student K)

### Similar

Perceived similarity in terms of expectations was again important to outcome. Students who had shared expectations with the supervisor felt it was easier to communicate with them and they were more open and honest about what they could achieve. One student commented on her supervisor having similar expectations to herself and attributed to her supervisor being young and therefore able to remember what it was like being a student.

“I think because... because she wasn’t, because it’s not been that long since she was a student herself she was much more kind of aware of like practicalities. So, you know, if I turned round and said you know this week I have too much going on I am not going, I am not going to get this done then she was fine with it. So, it was much more, you know you were able to communicate a lot more so she sent me a thing saying, you know can you get this analysis done and I could send back no I am not going to get it done this weekend, I’ll deal with it next week, I have x, y and z going on this weekend. So, you know it helped with your honesty of I could turn round and honestly say I am not going to get this done and she was kind of fine with that because she kind of remembered what it was like to be a student herself [laughs].” (Psychology Undergraduate C)

In terms of being similar, it seemed that many of the supervisors aimed to share their expectations with students at the beginning of the process. These

supervisors made it clear what they expected the student to achieve during the course of their project and what their role, as a supervisor, would be in the project. From the analysis of the data, therefore, it became clear that while match/mismatch was important, mismatch was something that was perhaps implicitly avoided during supervision meetings. Some of the supervisors discussed expectations and their ideas of timescales with the students at the beginning of the process. Often students reflected that open and honest communication with their supervisor allowed their supervisor to gauge and discuss expectations with them.

“Well the thing [we covered at the start] was really sort of ground rules, because [name of supervisor] said to me, more or less this is what I think you need to be doing and obviously I had read a wee bit, you know, and sort of self-help manuals about how to get through a dissertation and stuff like and sort of read through it, but she simplified it for me, she simplified it”. (Sociology Masters student N)

### Clashing

When there was no such understanding between students and supervisors often it resulted in students perceiving that their expectations of the process were conflicting with their supervisors. The main aspect of clashing of expectations seemed to come from issues surrounding support. Most of the time, when this happened students believed their supervisor gave them less support than they expected during the process.

“My supervisor was probably more involved at the beginning and it lessened as the time went on. Which I feel it should have been more... less at the, well obviously a wee bit of input at the beginning, a lot in the middle like in the results section and then left to your own devices for the write up. I think the results section is obviously the full body, you need to know that you are doing that right. Especially when you have emphasised on several occasions that you are not confident. My supervisor obviously had different ideas!” (Psychology undergraduate Student M)

Some students also had different expectations regarding the scope of their project from their supervisor. While most students found their supervisor important for defining the scope of their project some of the students interviewed felt they expected to achieve more from the process and their supervisor was resistant to this.

“I was also keen to collect other information, so I was pushing towards trying to get something other than questionnaire data and I feel like maybe that side of my project wasn’t seen as particularly important.”  
(Psychology undergraduate I)

### **12.3 Research Question 8: How does masters supervision compare with undergraduate supervision in terms of the importance of the “fit” between student and supervisor?**

For research question 8 the same analysis as research question 7 was run, however this time undergraduate and masters students were analysed separately. This was in an attempt to investigate if there were any differences between undergraduate and masters students in terms of the importance of the fit between undergraduate and masters students and their supervisors.

#### **12.3.1 Student proxy measure of attainment: Undergraduate**

Backwards method stepwise multiple regression was conducted to assess the ability of the predictor variables (Emotional Intelligence difference scores; Personality difference scores; Expectations difference scores; Theory of intelligence difference scores; Autonomy support difference scores) to predict undergraduate students’ perceptions of their overall success during the course of their project as measured by a proxy measure of attainment. In total 7 different regression models were generated using SPSS. After variables had been removed from the model the total variance explained by the model as a whole was 34%,  $F(9,139) = 6.104$ ,  $p < 0.005$ . In the final model two of the variables had a statistically significant effect, however 3 variables remained within the model as expectations were approaching significance. The total openness difference scores recorded a higher beta value ( $\beta = -.112$ ,  $p < 0.05$ ) than total emotional intelligence differences scores ( $\beta = -.182$ ,  $p < 0.05$ ). Students perceived best outcomes when they were higher than their supervisor on the variables that remained in the model. So in this case the best outcomes were associated with students having higher expectations of what their supervisor would do at the start of the process than their supervisor, having higher openness scores than their supervisor and having higher emotional intelligence scores than their supervisor. Worst perceived outcomes were associated with supervisors having higher expectations of what they, as supervisors, would do at the start of the

process than their student, supervisors having higher openness scores than their students and supervisors having higher emotional intelligence scores than their students.

### **12.3.2 Student proxy measure of attainment: Masters**

Backwards method stepwise multiple regression was conducted to assess the ability of the predictor variables (Emotional Intelligence difference scores; Personality difference scores; Expectations difference scores; Theory of intelligence difference scores; Autonomy support difference scores) to predict masters students' perceptions of their overall success during the course of their project as measured by a proxy measure of attainment. In total 10 different regression models were generated using SPSS. This regression model was not significant ( $\beta = -.375$ ,  $p > 0.05$ ).

### **12.3.3 Student outcome questions: Undergraduate**

Backwards method stepwise multiple regression was conducted to assess the ability of the predictor variables (Emotional Intelligence difference scores; Personality difference scores; Expectations difference scores; Theory of intelligence difference scores; Autonomy support difference scores) to predict undergraduate students' perceptions of their overall skill development during the course of their project as measured by a series of student outcome questions. In total 8 different regression models were generated using SPSS. After variables had been removed from the model the total variance explained by the model as a whole was 30%,  $F(9, 139) = 7.544$ ,  $p < 0.005$ . In the final model 2 of the variables had a statistically significant effect. The total autonomy support difference scores recorded a higher beta value ( $\beta = -.430$ ,  $p < 0.005$ ) than total expectation differences scores ( $\beta = -.288$ ,  $p < 0.05$ ). Students perceived best outcomes when they were higher than their supervisor on all of the variables that remained in the model. So in this case the best perceived outcomes were associated with students having higher autonomy support scores than their supervisor and having higher expectations of what their supervisor would do at the start of the process than their supervisor and having higher emotional intelligence scores than their supervisor. Worst perceived outcomes were associated with supervisors having higher autonomy support

scores than their student, supervisors having higher expectations of what they, as supervisors, would do at the start of the process than their students and supervisors having higher emotional intelligence scores than their students.

#### **12.3.4 Student outcome questions: Masters**

Backwards method stepwise multiple regression was conducted to assess the ability of the predictor variables (Emotional Intelligence difference scores; Personality difference scores; Expectations difference scores; Theory of intelligence difference scores; Autonomy support difference scores) to predict undergraduate students' perceptions of their overall skill development during the course of their project as measured by a series of student outcome questions. In total 6 different regression models were generated using SPSS. After variables had been removed from the model the total variance explained by the model as a whole was 70%,  $F(9,139) = 7.034$ ,  $p < 0.005$ . In the final model 3 of the variables had a statistically significant effect. The total Theory of intelligence difference scores recorded a higher beta value ( $\beta = -4.25$ ,  $p < 0.05$ ) than total autonomy differences scores ( $\beta = -.409$ ,  $p < 0.05$ ), which was higher than total conscientiousness difference scores ( $\beta = -.433$ ,  $p < 0.05$ ). Students perceived best outcomes when they were higher than their supervisor on all the variables that remained in the model. So in this case the best perceived outcomes were associated with students having higher autonomy support scores than their supervisor, having higher conscientiousness scores than their supervisor, having a more incremental view of intelligence than their supervisor and having higher extroversion scores than their supervisor. Worst perceived outcomes were associated with supervisors having higher autonomy support scores than their students, supervisors having higher conscientiousness scores than their students, supervisors having a more incremental view of intelligence than their students and supervisors having higher extroversion scores than their students.

#### **12.3.5 Staff proxy measure of attainment: Undergraduate**

Backwards method stepwise multiple regression was conducted to assess the ability of the predictor variables (Emotional Intelligence difference scores; Personality difference scores; Expectations difference scores; Theory of



intelligence difference scores; Autonomy support difference scores) to predict staff proxy measures of student success during the course of their project as measured by a staff proxy measure of student attainment. In total 10 different regression models were generated using SPSS. This regression model was not significant ( $\beta = -.215$ ,  $p > 0.05$ ).

### **12.3.6 Staff proxy measure of attainment: Masters**

Backwards method stepwise multiple regression was conducted to assess the ability of the predictor variables (Emotional Intelligence difference scores; Personality difference scores; Expectations difference scores; Theory of intelligence difference scores; Autonomy support difference scores) to predict staff proxy measures of student success during the course of their project as measured by a staff proxy measure of student attainment. In total 8 different regression models were generated using SPSS. After variables had been removed from the model the total variance explained by the model as a whole was 49%,  $F(9,139) = 6.616$ ,  $p < 0.05$ . In the final model two of the variables had a statistically significant effect. The total openness difference scores recorded a higher beta value ( $\beta = -.607$ ,  $p < 0.05$ ) than total agreeableness difference scores ( $\beta = .544$ ,  $p < 0.05$ ). Best perceived outcomes for the staff, in terms of their student's performance, were associated with supervisors having higher agreeableness scores than students and supervisors having lower openness scores than the students. Worst perceived outcome were associated with students having higher agreeableness scores than supervisors and students having lower openness scores than the supervisor.

## **12.4 Summary of findings for match or mismatch**

The quantitative aspect of research question 7 investigated if the match/mismatch between student and supervisor predicted student success (OV, measured by student proxy measure of attainment, staff proxy measure of attainment; and student outcome questions) and if so, what is the relative importance of each of the factors of "matching" between student and supervisor.

From the results of these investigations it was found that for the student proxy measure of success- openness difference scores, expectation differences scores, extroversion difference scores and theory of intelligence difference scores were predictors of outcome. Best perceived outcomes, for the students, were associated with students having a more incremental (or growth) view of intelligence than their supervisor, being more extroverted than their supervisor, having higher expectations of what their supervisor would do at the start of the process than their supervisor and having higher openness scores than their supervisor. Lowest perceived outcomes were associated with supervisors having a more incremental (or growth) view of intelligence than their student, supervisors being more extroverted than their student, supervisor having higher expectations of what they would do at the start of the process than their student and supervisors having higher openness scores than their student.

For the student outcome questions the significant variables in this model were autonomy support difference scores, expectation differences scores, emotional intelligence difference scores and theory of intelligence difference scores. Best perceived outcomes were associated with students having a more incremental view of intelligence than their supervisor, having higher autonomy support scores than their supervisor, having higher expectations of what their supervisor would do at the start of the process than their supervisor and having higher emotional intelligence scores than their supervisor. Lowest perceived outcomes were associated with supervisors having a more incremental view of intelligence than their student, supervisors having higher autonomy support scores than their student, supervisors having higher expectations of what they would do at the start of the process than their student and supervisor having higher emotional intelligence scores than their student.

For the supervisor proxy measure of attainment the model was not significant. That is none of the match/mismatch variables were able to predict the ratings supervisors would give to their students. This is all summarised in table 14 below

	<b>Best outcomes: When student &gt; supervisor on the following variables:</b>
<b>Student proxy</b>	<ul style="list-style-type: none"> <li>• Incremental (or growth) view of intelligence extroverted</li> <li>• Higher expectations of what their supervisor would do at the start of the process</li> <li>• Openness</li> </ul>
<b>Student outcome</b>	<ul style="list-style-type: none"> <li>• Incremental view of intelligence</li> <li>• Autonomy support</li> <li>• Higher expectations of what their supervisor would do at the start of the process</li> <li>• Emotional intelligence.</li> </ul>
<b>Supervisor proxy</b>	Model was not significant

Table 14- summary of match and mismatch data for research question 7

For the qualitative aspects of the work it was clear from the interviews that “matching” with their supervisor was something students considered at the start of the process. Throughout all of the interviews this theme of match/mismatch was evident. In particular it seemed to relate to three main aspects of the supervision process. Firstly students and supervisor discussed match in relation to their personality and their personal characteristics. Secondly, issues surrounding match/mismatch on research interests were discussed, and finally, students and supervisors discussed match/mismatch in terms of their expectations of the process. Within each of these broad categories students and supervisors perceived themselves as being similar, complementary or clashing. From the analysis of the interview data it seemed that the perception of both similar and complementary skills was beneficial. However, students who

perceived they had clashing characteristics/research/expectations always perceived poor outcomes and poor skill development.

For research question 8, which was quantitative the same analysis as research question 7 was run, however this time undergraduate and masters students were analysed separately. This was in an attempt to investigate if there were any differences between undergraduate and masters students in terms of the importance of the fit between undergraduate and masters students and their supervisors. This research question was quantitative and investigated if the match/mismatch between student and supervisor predict student success (OV, measured by student proxy measure of attainment, staff proxy measure of attainment; and student outcome questions) and if so, what is the relative importance of each of the factors of “matching” between student and supervisor. However, this time differences between undergraduate and masters students were taken into consideration.

The main differences identified between undergraduate and master students were that, firstly, for the student proxy measure of attainment for undergraduates was significant. Students perceived best outcomes when they had higher expectations of what their supervisor would do at the start of the process than their supervisor, had higher openness scores than their supervisor and had higher emotional intelligence scores than their supervisor. Students perceived worst outcomes when their supervisor had higher expectations of what their supervisor would do at the start of the process, when their supervisor had higher openness scores and when their supervisor had higher emotional intelligence scores. However, for the masters students the regression model was not significant. In addition, for the staff proxy measure of attainment for the undergraduates the regression model was not significant. However, for the masters students the total variance explained by the model as a whole was 49%. Supervisors perceived best outcomes when they had higher openness scores than their student and when they had higher agreeableness scores than the student. Supervisors perceived worst outcomes when their student had higher openness scores than the supervisor and when students had higher agreeableness scores than their supervisor. This is all summarised in table 15 below.

	<b>Best outcomes: When student &gt; supervisor on the following variables:</b>
Student proxy- UG	<ul style="list-style-type: none"> <li>• expectations of what their supervisor would do at the start of the process</li> <li>• openness</li> <li>• emotional intelligence</li> </ul>
Student proxy- PG	Model was not significant
Student outcome-UG	<ul style="list-style-type: none"> <li>• higher autonomy support</li> <li>• expectations of what their supervisor would do at the start of the process</li> <li>• emotional intelligence</li> </ul>
Student outcome- PG	<ul style="list-style-type: none"> <li>• Autonomy support</li> <li>• Conscientiousness</li> <li>• Incremental view of intelligence</li> <li>• Extroversion</li> </ul>
Supervisor proxy-UG	Model was not significant
Supervisor proxy- PG	Supervisors perceived best outcomes when they had higher openness scores than their student and when they had higher agreeableness scores than the student.

Table 15- summary of match/mismatch data for research question 8

Therefore, overall it can be concluded from this data that the relationship between *student perceptions of their success* and “match/mismatch” between them and their supervisor was directional. Some forms of mismatch were better for perceptions of success than a match. However, other forms of mismatch were worse from perceptions of success than a match.

## 13 Discussion

The main aims of this thesis were to investigate the psychological characteristics of students and of supervisors, both independently and in combination, that have an important impact on student skill development and success over the course of a project. In order to fully investigate this, the thesis looked at 4 main research themes. The first theme looked at the difference between undergraduate and masters students; the second addressed the characteristics of “good” students; the third “good” supervision; and finally the fourth theme investigated the interaction of the student and supervisor and in particular the significance of “match” or “mismatch” of psychological factors in supervisor-student partnerships. For each of these themes a mixed method approach to data collection was taken. This involved pre- and post-dissertation questionnaires with students and questionnaires at the end of the student projects for supervisors. This was complemented by interviews with 20 students and 10 supervisors. This chapter aims to integrate the qualitative and quantitative findings and literature in an attempt to interpret and understand the findings. It will then consider the implications of these findings and discuss directions for further research.

### 13.1 Theme 1: investigating differences between students at different levels of study - Summary and interpretation of the results

Chapter 9 aimed to evaluate the differences between undergraduate and masters students conducting a project. The quantitative aspect of the work investigated if there were differences between undergraduate and masters students on various psychological factors at the start and end of the process of conducting their projects. The qualitative aspect of the chapter gave consideration to the differences in perceptions of doing a project between undergraduate and masters students.

The quantitative aspect of chapter 9 investigated differences in expectations, self-efficacy, theory of intelligence and autonomy between masters and undergraduate students at the start and the end of the process. From the results of these investigations it was found that there were no significant differences

between undergraduate and masters students at the start of the process. At the end of the process there was a statistically significant difference between undergraduate and masters students on the combined dependent variable. However, when the results for the dependent variables were considered separately there were no statistically significant differences between undergraduate and masters students for any of the dependent variables.

It is important to consider the quantitative findings in the context of the interviews with the students. The interviews with students suggested evidence of more subtle differences between these undergraduate and masters students on aspects of perceptions about the learning experience that would not have been picked up in the questionnaires.

The data from the qualitative aspect of chapter 9 suggested that undergraduate and masters students engaged with the process of their projects in different ways. For the undergraduates there was some variation between students in how they felt about the process and their abilities. One group of undergraduate students was apprehensive and unsure about their abilities to conduct research. However, another group of undergraduate students reflected on their confidence before they began the process and the difficulties they faced due to their underestimation of the difficulty of the task. With the masters students there was less variation in their feelings about the process. All of the masters students had been through the process before and therefore knew what the challenges would be. It seemed from the interviews that they had a more realistic view of the process of conducting research and so their self-efficacy surrounding the task was in line with their abilities. However, when interpreting this it is important to consider the nature of the sample of students that were interviewed. The majority of the masters and undergraduate students, who volunteered to be interviewed, were from Western countries. It is possible that if more international students had been included in the masters sample then the findings may have been different. It would be of interest to conduct more interviews with international masters students, due to the increasing numbers of these students who come to study in the UK, on the topic as this could provide valuable information about the support these students require.

One possible explanation for the lack of quantitative differences in the data, and more in line with the qualitative findings, is that the majority of undergraduate students were more likely to over-estimate their autonomy and self-efficacy at the start of the process. The possible reasons may be, it could have been very difficult, at the start of the process, for undergraduate students to effectively rate their abilities and autonomy because they lacked knowledge of the material, and they lacked awareness of the knowledge that they did and did not possess. Indeed, research (e.g. Hacker et al, 2000) has found that undergraduate students tend to overestimate their performance on upcoming exams. If undergraduate students had over-predicted at the start of the experience, due to lack of awareness, and masters students had not, due to the fact they had engaged in the process before, then this would explain the lack of quantitative differences at the beginning of the process. It would also explain why there were evident differences in the qualitative data. In relation to the end of the process, there were no significant differences between the groups. One plausible explanation for this, and an area for future research, may be that by the end of the process undergraduate and masters students are similar in their autonomy, self-efficacy, theory of intelligence and expectation and therefore the questionnaires are not sensitive enough to pick up subtle differences between the groups.

In terms of learning from the process, there were also some differences between undergraduate and masters students. Often the undergraduate students were unable to easily articulate what they had learned from the experience. Many of the undergraduate students stated they had learned very little from their experience, beyond what they already knew, however their other comments suggested that this may have been a misperception. Masters students were more articulate in the interviews and could discuss what they had learned and taken from the process. This could be important for undergraduate students' capacity to articulate their graduate attributes to employers and it seems there may be important implications here in terms of the importance of giving undergraduate students good advice at the start of their projects about what they should expect from the process, the skills they should aim to develop and the importance of them being aware of the development of these skills.



In relation to the differences between undergraduate and masters students, as outlined in the previous paragraph, the potential explanations are threefold. Firstly, it could have been the case that, for various reasons, there were differences in the way masters students engaged with the experience and engaged with the learning process. Secondly, it could also be the case that masters students and undergraduate students engaged with the process in similar ways, however, the masters students were more able to articulate their experience than the undergraduate students. It is possible that the masters students and undergraduate students did develop similar skills through the process, however, the masters students had the language and vocabulary to discuss their skills. This could have been because the masters students had thought more carefully about this. Many of the masters students interviewed had experienced working life and were returning to studying in order to enhance their career prospects, and so for them they had a very clear focus on the skills they need to develop through the course of their studies. This was not the case for the undergraduate students, most of whom were finishing their first degree.

Another possible explanation for the findings regarding the qualitative differences between these undergraduate and masters students is that these undergraduate and masters students may have had differing levels of motivation, and this had an impact on their experience. Research suggests that graduate students may be more intrinsically motivated to learn (Schunk et al., 2008). Schunk explains that the reasons for this seem to be related to the fact that masters students have made the decision to pursue an advanced degree. Other research has found that mature students, in general, tend to score higher in intrinsic motivation scales as compared with traditional younger students (Justice & Dornan, 2001) and present no differences in terms of extrinsic motivation (Bye et al., 2007). There is a growing body of evidence to support the notion that as students get older their perception of goals, of the meaning of material, and learning strategies may change as result of their own cognitive development (Alexandre et al., 1997; Gadzella et al., 2002; Macpherson, 2002). This relates to the findings of the current study. The findings of this research suggest that the master students had different perceptions of goals than the undergraduate students. For the undergraduate students, they were focused on

the outcome of their projects. However, the masters students were more focused on the process and learning experience.

As already outlined in the findings chapters, the masters students seemed to be more aware of their learning than undergraduate students and seemed to be more critically engaged in the process. This apparent difference in engagement between undergraduate and masters students could perhaps in part be explained by their goal orientation. Goal orientation is a concept that is related to motivation. Goal orientation represents an integrated pattern of beliefs that leads to students having different ways of engaging with and responding to tasks and in turn this affects their motivation (Ames, 1992) and this has an influence on their motivational, cognitive, and behavioural outcomes (Pintrich & Schunck, 2002). There are two main types of goal orientation; mastery and performance approach. A mastery goal implies the development of competence and task mastery. However, in contrast a performance-approach goal is characterised by attaining competence relative to others. This explains the qualitative findings of this theme to some extent because masters students often spoke about the importance of the process and this is how they defined how much they had learned, so for them perhaps part of what motivated them was their mastery goals. However, for the undergraduate students they were very focused on outcome, which are more closely related to performance goals.

Investigating if there were differences between undergraduate and masters students during the process of doing a project was an important starting point for the research. The mixing of qualitative and quantitative methods was beneficial as the qualitative research aided the interpretation of the quantitative data and also provided rich detailed data about the students' experiences. Having considered if there were differences between undergraduate and masters students, the next findings chapter, chapter 10, went on to investigate student development over the course of a project.

## **13.2 Theme 2: investigating Student Development- Summary and interpretation of the results**

Chapter 10 investigated student development over the course of the project. The quantitative aspect of the work investigated if students developed over the

course of their dissertations in relation to measures of autonomy, self-efficacy, expectations and theory of intelligence. The qualitative aspect of the chapter gave consideration to students' perceptions of their development as learners.

From the quantitative findings of research questions 2-4, there is evidence to support the idea that students develop in many capacities over the course of their project. From the results of these investigations it was found that there was a significant increase in self-efficacy over the course of the project. In addition, the increase in autonomy over the course of the project was approaching significance. It is notable that a significant change was detected over a relatively short period of time. This highlights that the final year/masters project is potentially very influential on student learning and development. This was perhaps because the final year/masters project was an opportunity for students to exercise higher levels of autonomy than other parts of their learning (White 2000; Snively & Wright 2003; Todd et al, 2006; Todd et al, 2004), and as autonomy increased, due to the fact that they were doing more on their own, this could explain the increase in self-efficacy also.

In terms of the development of autonomy, Bean (2001) argues that the writing of a dissertation provides a vehicle for students to reflect on their thinking and learning and suggests that activities such as projects are of high importance in developing students to move from a mechanical approach to writing towards a more analytical approach to writing. It seems that such a shift, from teacher-directed to student-directed learning, means that students have to take charge of their own learning (Perumal, 2008). The findings of this study support the work of Perumal (2008), and found that projects seemed to be an effective way to advance autonomy amongst students, a finding that is supported by other research (e.g. White, 2000; Snively, & Wright, 2003; Todd et al, 2006; Todd et al, 2004).

As outlined by Bandura (1997), self-efficacy is important because regardless of actual abilities, individuals need to be confident that they have the required skills in order to engage and persist in tasks. This is particularly important when they are encountering difficulties. Indeed, research conducted with undergraduates has indicated that students with higher self-efficacy tend to procrastinate less often than others (Ferrari et al, 1992; Wolters, 2003), which in

turn would produce higher productivity and therefore this could potentially explain the reasons this research identified a positive link between higher levels of self-efficacy and student success. Another possible explanation for the correlation between self-efficacy and students' perceptions of success is that success predicts high self-efficacy, rather than high self-efficacy predicting success. If this was the case, students who were doing well would perceive they were doing well and would have high self-efficacy because of their success and as a result this would lead to further engagement and persistence in the task, which in turn would lead to still greater outcomes.

As with the previous section, on the difference between undergraduate and masters students, the qualitative interviews were important for the interpretation of the quantitative data and they provided further support to suggest student development in many capacities over the course of the project. It was clear from the qualitative data that students had developed in autonomy, self-efficacy and theory of intelligence over the course of their projects. In relation to autonomy however, it seemed that the data was more nuanced than the trajectory that the quantitative data suggested as there was variation in the ways students discussed the development of autonomy.

While it was clear all students enjoyed the freedom to control their own studies to some extent, for some students this was a challenging experience. Many of the students believed they became more autonomous throughout the process, and viewed autonomy as a set trajectory from less autonomous to more autonomous, which is what would be concluded from the quantitative data. Although the quantitative data showed that by the end of the experience students had higher levels of autonomy, the qualitative data allowed a deeper investigation into the trajectory of this development. For some students it seemed they started with lower levels of autonomy and developed in a linear way throughout the course of their project. This concept supports the work of Gurr (2001) whose work indicates the trajectory from dependence to independence during the research process. However, for other students this was not the case, and they viewed their development as autonomous learners in a more flexible way, believing they needed more help and support at different stages of the process. These students discussed differing levels of support at different stages of the process.

In relation to self-efficacy, the qualitative data allowed for a fuller and richer picture of the students' experiences. Students felt they had learned from the experience and felt they would be more able to conduct another project in the future. Interestingly, the qualitative data picked up subtleties that were missed in the quantitative data collection, and were suggestive that the development of self-efficacy, as well as autonomy, was not a straightforward trajectory. The undergraduate students talked about their self-efficacy being high at the start of the process and changing throughout. So, although, as with autonomy, it seemed from the quantitative data to be a straight forward trajectory, there is evidence from the qualitative data to suggest self-efficacy may dip and become lower at some points during the process. This finding is in line with another study about 24 graduate students' dissertation experiences. Demb and Funk (1999) found that the students they interviewed had a similar experience and described their engagement with their thesis as 'not one smoothly continuous experience' but as involving movement through 'identifiably different phases, much like passing through rapids on a river, with each phase bringing different challenges and learning outcomes' (pg, 21).

Although the quantitative data did not pick up changes in theory of intelligence, during the interviews students made comments that suggested subtle changes in their theory of intelligence. For many students this was displayed through comments which highlighted they did not believe doing well was related to only being intelligent anymore, but rather they had become aware that in order to do well they had to be engaged in the process and want to succeed. It is possible that the Theory of Intelligence questionnaires used were too general and the questionnaires were not specific enough to student learning in higher education and more specifically to the project.

Chapter 10, in research question 3, also looked at students' perceptions of skill development and what the relative importance of these psychological factors were to perceived student development. This quantitative analysis revealed that there were certain characteristics - theory of intelligence scores and autonomy support scores - that were significant in explaining variance in student perceptions of their development. There was a positive relationship between both of these variables and the outcome variable, so as theory of intelligence became more incremental and as perceived autonomy support increased, so too

did student perceived outcomes. This link between success and incremental views of intelligence is in line with other work where an incremental view of intelligence has been demonstrated to have a positive effect on academic performance (Ablard, 2002; Aronson, Fried, & Good, 2001; Blackwell et al, 2007; Dweck, 2000). This thesis provides evidence to suggest that, as well as there being a link between actual success and incremental views of intelligence, there is also a link between *perceptions* of success and incremental views of intelligence. Perhaps the reasons for this are that students with an incremental view of intelligence realise dedication and persistence, especially during challenges, are important to success and achievement (Ericsson et al, 2006). These students would therefore have had the advantage of having an incremental mindset, but also, as a result of this, the ability to persist even during challenging times in the process. However, it is also possible that persistence leads to the development of an incremental view of intelligence, rather than an incremental view of intelligence leading to persistence.

The qualitative aspects of research question 3 found that in addition to developments in autonomy, self-efficacy, theory of intelligence and expectations as shown by the quantitative data, students also perceived development of key transferable skills and development as learners over the course of their projects. Indeed, the experience of doing a project was formative in that it changed some students' views of understanding the world and had a profound impact on their development as learners. For some students this experience changed their mind about what they wanted to do on leaving university. For example, some of the students interviewed reflected on the experience and commented that it had changed their perceptions of research. Prior to the experience many of the students reflected on the point that they thought research was not for them as they did not see the direct relevance of it. However, after the project experience many of the students had changed their perceptions and viewed research as a career they would consider. For these students this was the main thing they would take away from the project. Often students made decisions about what they wished to study in their project on the basis of the skills they could develop during the process.

In the interviews, students reflected on the need to feel challenged, but also supported. It seems that the autonomy support the students discussed as being

important for their learning is in line with Vygotsky's (1978) theory the Zone of Proximal Development (ZPD). In this model Vygotsky proposes that learning is driven forward when learners are pushed from their current knowledge and understanding and into their ZPD. Within this zone learners are given the opportunity to challenge themselves, however are supported to do this by a more knowledgeable other. Learning cannot occur effectively when the learner stays within the bounds of what they already know, or if they are asked to do something that is currently out of their reach, without any support. By helping learners, through scaffolding, effective learning will occur and learners will pass through all 3 levels of the model (see figure 6 below).

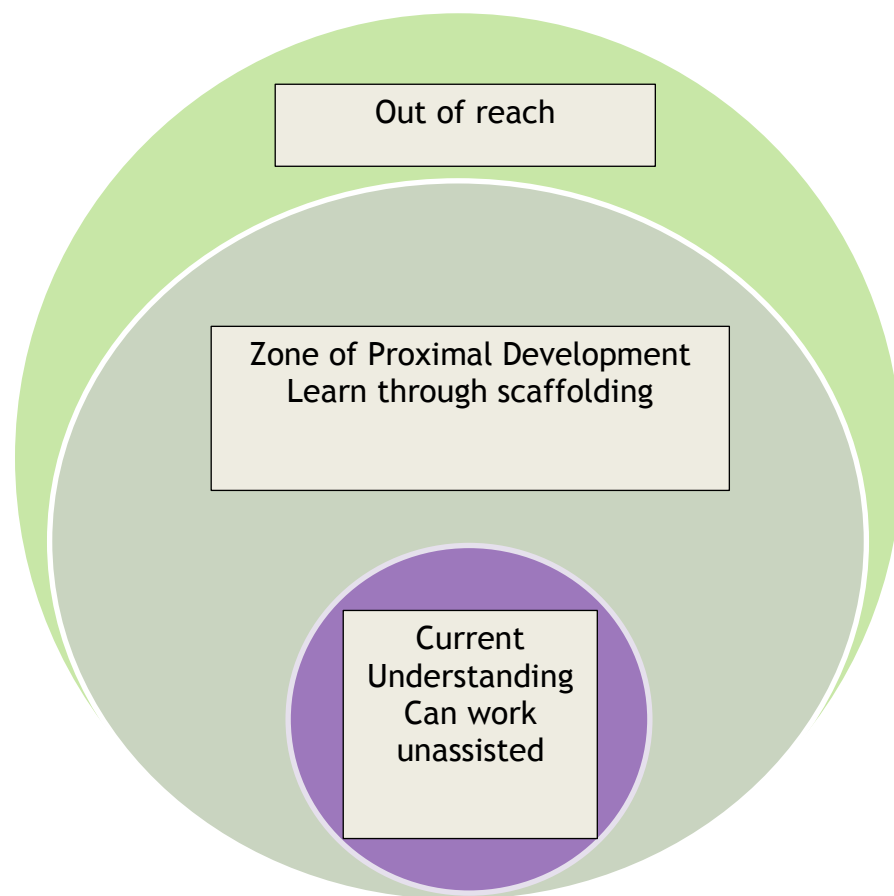


Figure 6-Vygotsky's (1978) Zone of Proximal Development

In many ways, it seemed like the supervisors were scaffolding the learning of their students. Through the interviews with the supervisors it was clear many of them felt that the project had an important role to play in the development of autonomy in students. Many of the supervisors discussed that often students need to be moved “outside their comfort zone” in order to learn from the

experience. However, they acknowledged that moving the students too far outside their comfort zone would result in the student feeling lost. Students also discussed being pushed by their supervisor, however feeling supported. It seems therefore, through discussion with the students and supervisors, that many of the students were learning through a scaffolded process, in which they were supported to some extent, however, they were moved outside what they knew and felt comfortable with.

The final quantitative question in this chapter, research question 4, aimed to investigate if any psychological factors could predict student perceptions of their perceived success and what the relative importance of these psychological factors were to *perceived* student success. This analysis revealed that there were certain characteristics that were significant in explaining variance in student perceptions of their success: Autonomy support, conscientiousness and self-efficacy. There was a positive relationship with all of these variables and the outcome variable, so as perceived autonomy support, student conscientiousness and self-efficacy increased so too did students' proxy measure of attainment.

While it was clear that all students developed, it was also evident from the quantitative data that some students perceived their development to be greater than others. Personality characteristics, and in particular conscientiousness seemed to be a factor in this. Other research has found that conscientiousness correlated positively with academic achievement (de Fruyt & Mervielde, 1996; Furnham & Chamorro-Premuzic, 2004; Chamorro-Premuzic & Furnham, 2003; Laidra et al, 2007; O'Connor & Paunonen, 2007). This thesis indicates that conscientiousness is also positively correlated with *perceived* academic achievement.

The final factor which seemed to be influential in students' perceptions of their success and development was autonomy support. Autonomy support from university teachers has been associated with active participation from students in academic activities and becoming more motivated by personal growth and development than by grades (Black & Deci, 2000; Williams & Deci, 1996). As a result of this increase in intrinsic motivation it has been suggested that autonomy support also leads to greater engagement in learning activities, more



effective coping strategies for dealing with setbacks and failures, and better academic performance (Black & Deci, 2000; Williams & Deci, 1996; Vansteenkiste et al, 2004). Furthermore, autonomy support enhances persistence and academic success because this type of learning environment cultivates greater efficacy and competence (Black & Deci, 2000; Williams & Deci, 1996).

The findings of this chapter are in agreement with the work of Perry (1968) who suggests that Higher Education Institutes should be supporting students through a developmental progression from a simplistic to a mature view of what knowledge is. In his work, Perry concludes that intellectual development occurs in a series of different stages and that the student moves from acceptance of authority, to gradual acceptance of uncertainty and the idea that there may be different opinions, all of which have merit. The next stage in student development means the student recognises that differing perspectives are important and that these competing ideas can be evaluated. Once students reach this stage they learn to think and act differently depending on the context. The final stage in development involves making choices and decisions. Additionally, it involves the ability to transfer knowledge from one context to a different situation. In addition to the work of Perry, other authors have concentrated on changes in students' beliefs about knowledge and how it is acquired through learning. Keegan (2000) suggests that students can experience what he calls "transformational learning", which he argues results in new ways of knowing, or as Merzirow (1991) suggests, some learning experiences can give the students "new frames of reference". It seems that final year and masters projects are, for some students, experiences such as this in which they change their ways of thinking and seeing the world and as a result this research found that many of the students viewed the dissertation a transformational experience, and this finding is supported elsewhere in the literature (e.g. Derounian, 2011). If, as Freire (1998) suggests, the prime purpose of a university education is the transformation of the individual and of society, then final year and masters projects are of great importance, as these projects encourage students to move through different stages of development. Arguably through the course of their dissertation, students move into the self-authorship stage of intellectual development (Baxter Magola, 2009). In line with the work

of these authors this thesis provides evidence that suggests that even in later stages of study, such as honours level study and masters study, student driven practical projects provide an excellent platform for student learning and development.

The first sections have focused only on the students in relation to their outcomes. The first analysis chapter looked at differences between undergraduates and masters students and this chapter addressed their development over the course of a project. It is very clear from the results that students do develop many skills and abilities over the course of their project. However, as was outlined in the Introduction and Literature Review, they do not do this in isolation and are aided along the way with the help of a supervisor, who may be influential in their perceptions of their experience and outcome and therefore it is important to give consideration to the supervisor, and also the relationship between student and supervisor. Indeed, the supervisor has been directly linked to the factors that have been found in this chapter to be important in development of the student. This is a finding that is echoed within counselling training programmes, where more positive appraisals of students' training environment and supervisory relationship are associated with greater research self-efficacy and, in turn, greater interest in research and productivity (Bishop & Bieschke, 1998; Brown et al., 1996; Kahn & Scott, 1997; Hollingsworth & Fassinger, 2002; Phillips & Russell, 1994). Paglis et al (2006) also found that more nurturing mentoring from supervisors predicted greater research self-efficacy over time. Therefore, it is also important to give consideration to the supervisor and the impact they have on student success and development. The next section focuses on the supervisor and if "good" supervision was something that could be profiled.

### **13.3 Theme 3: Investigating good supervision- Summary and interpretation of the results**

Chapter 11 focused on "good" supervision and if this was something that could be profiled. The quantitative aspects investigated what, if anything, were the psychological characteristics of a good supervisor in relation to student and supervisors' perceptions of student success. The qualitative aspect of the

chapter gave attention to the factors students considered in their choice of supervisor and also student and staff perceptions of good supervision.

In relation to research question 5, which was qualitative and investigated the things students consider when deciding on a supervisor, it seems that students took 3 main areas into consideration: Some of the students interviewed selected their supervisor purely on the basis of their research interests; For other students they made the decision on the basis of the personal qualities they believed their supervisor possessed; The final criteria for selection seemed to be based around an interaction between the student's research interest and also the supervisor's personal qualities. These students had an awareness that working in an area of research they were interested in was important, but they were also aware of the need to be able to communicate and work with their supervisor on a personal level. These findings are supportive, in part, of earlier work that has been conducted, on the characteristics of good supervision, which aims to share good practice in research supervision (for example: Delamont et al, 1998; Wisker & Sutcliffe, 1999; Wisker et al, 2003; Kiley & Wisker, 2009). Most of the literature in the area of "good" supervision focuses much attention on the personal and emotional nature of the supervisor relationship, with some research suggesting 'supervision as first and foremost an interpersonal relationship' (Grant 2005, pg 350) and the ideal-type supervisor as 'a caring, expert professional' (Grant 2005, pg 340). Indeed, most probably it is a combination of factors that lead to good supervision. Research on styles of supervision also shares the notion about the importance of the personal aspects of the supervisory relationship and emphasises the crucial need for the supervisor to create a supportive and nurturing environment and to share in a personal relationship with the student (Wilson, 1980). Research into doctoral level supervision has suggested that the quality of a supervisor-student relationship directly impacts on the success the student experiences (e.g. Wisker et al, 2003; Pearson & Kayrooz, 2004; Devos, 2007). Indeed, a positive relationship can lead to many advantages for the student, including, successful socialisation into the department and the discipline (Gerholm, 1990; Weiss 1981). Further, it also leads to timely completion of the degree (Lovitts, 2001). On the other hand, an unsatisfactory relationship has been strongly linked to doctoral students' decision to leave doctoral study (Golde, 2000). All of these

findings, and the findings of this study, suggest that for some students the interpersonal aspects of the supervisor experience are of high importance in both students' choice of their supervisor and also their perceptions of their development and success through the process. However, the findings of this thesis also suggest that there are individual differences between student and supervisors and so show why matching may be of importance.

However, for other students, defining "good supervision" was always related to the academic guidance and support they believed their supervisor could provide. Again, this resonates with the supervision literature at doctoral level which outlines that the supervisor plays a key role in the success of the project (for example: Pearson & Kayrooz, 2004 and Devos, 2007). In terms of the academic qualities good supervisors have been found to display high levels of interaction, in terms of both frequency of meetings with students and the quality of these interactions (Gerholm, 1990 and Hartnett, 1976). In this PhD research this was an issue many of the students focused on during the interviews and availability and time to supervise were key issues that arose.

For a third group of students, when asked to reflect on good supervision, they viewed research expertise and competence and personal qualities as being related concepts that they hoped their supervisor would exhibit. This conception of supervision is also evident with other literature. Hockey (1994) has argued that every supervisory relationship has two dimensions: that of the intellectual as well as the pastoral or counselling aspect, he conceptualises these not in opposition but both as being core aspects for all supervision relationship.

The finding that both personal and academic factors can be influential, for some students, in their definitions of good supervision also has support from other research in the area of doctoral supervision. Research conducted at doctoral level indicated that effective supervision is a mix of two types of support: academic support, including being available to help with academic activities and providing timely feedback on student progress, and personal support, like being emotionally supportive and boosting confidence when students encounter difficulties (see Engebretson et al, 2008; Epstein et al, 2005; Green, 2005; Taylor & Beasley, 2005; Wisker, 2005). This current research confirms that this

is also the case for undergraduate and masters research supervision and so extends and builds on previous research.

The students also discussed feedback as being key to their development as learners, suggesting good supervisors provided them with prompt feedback which was detailed and allowed them to target improvement. This has been found elsewhere in the area of research supervision, again in relation to doctoral research. This research outlined that a good supervisor provides students with feedback on their progress (Hartnett, 1976) helping them to complete in a timely manner (Lovitts, 2001).

The quantitative aspects of research question 6 investigated what, if anything, were the characteristics of a “good” supervisor in relation to student success. In this case there were three outcome variables - student proxy measure of attainment, staff proxy measure of attainment and student outcome questions. For the student proxy measure of success no characteristics of the supervisor were able to predict outcome. For the staff proxy measure of attainment emotional stability and conscientiousness of the supervisors were significant predictors of how they rated their students. Emotional stability was positively correlated with their rating of student outcomes, so as supervisors increased in emotional stability they rated students as doing better. However, supervisor conscientiousness was negatively correlated with student outcome, so as supervisors became more conscientious they rated students as doing more poorly. Finally, for the student outcome questions, relating to students’ perceived skill development, supervisor conscientiousness, supervisor autonomy support, supervisor theory of intelligence and supervisor expectations were able to predict outcome. Supervisor conscientiousness, autonomy support and expectations were negatively associated with student perceived outcome and supervisor theory of intelligence was positively associated with student perceived outcome: So, as supervisor conscientiousness scores increased students’ perceptions of their outcomes decreased; As supervisors perceived autonomy support increased students’ perceptions of their outcomes decreased and when supervisor expectations moved towards the student doing more students’ perceptions of their outcomes decreased; However, as supervisors moved from an entity view of intelligence towards an incremental view of intelligence students’ perceptions of their development increased.

Some of the findings in the area of “good” supervision require further investigation. Firstly, in relation to supervisor conscientious, it was found that as supervisors became more conscientiousness students’ perceptions of their outcomes decreased. No literature has been identified that can explain this pattern in the data, however, it may have been the case that more conscientious supervisors had higher expectations of what their students should be achieving and perhaps this is something that was either implicitly or explicitly communicated to students during communication with their supervisor. It could also have been the case that if the student was not conscientious themselves then, even if they knew their supervisor was conscientious, they felt they did not or were not able to meet their supervisor’s expectations. Another possible explanation for this pattern that emerged in that data could be related to the feedback students were receiving on their work. It is possible conscientious supervisors spent more time and effort reading the students work and giving feedback on it than the less conscientious supervisors and as a result their students had a greater awareness of the errors they were making and had more changes to make on their work before submission, which may have led to a decrease in perceived outcome.

In addition, as supervisor emotional stability increased so too did their rates of student success. Again, no literature has been identified that directly explains this. However, it seems plausible that as supervisors become more emotionally stable, which means they become less neurotic, they worried less about the smaller aspects of student projects that were incorrect and perhaps focused on the whole project, rather than specific parts of it. It would be possible to investigate if this was the case by using questionnaires to identify supervisors with varying personality types and then to interview a range of supervisors and ask them questions relating to how they go about marking student work and what factors they consider.

Another finding was that as supervisors perceived autonomy support increased students’ perceptions of their outcomes decreased. While this seems to be an unusual finding, it could be the case that supervisors who were encouraging their students to develop in autonomy left their students for longer periods of time before helping or intervening. Although this would have developed skills in students, for the students this is likely to have been an uncomfortable

experience and maybe in the short term they were less able to see the benefit of the skills they would have developed.

In relation to the qualitative findings of research question 6, which investigated staff and student perceptions of good supervision, in general there was a conception amongst students that supervisors played a key role in helping them find the scope for their project. This was something undergraduate students felt they really needed guidance with. Many of the undergraduate students interviewed felt they were too ambitious at the start of their project and their supervisors were important for reassuring them. Students defined good supervision in terms of the personal qualities of the supervisor and also as being related to the supervisor's research knowledge and expertise. Different students, during the interviews, placed differing importance and emphasis on personal qualities and research knowledge and expertise. Firstly, some of the students discussed supervision purely in terms of an academic learning experience. For other students the emotional aspects were more important and they reflected on the emotional interpersonal experience of supervision. The third group of students reflected on supervision as a complex interaction between academic and personal. These students and supervisors found it more difficult to disentangle the personal aspects and the academic aspects of supervision and discussed them as an interaction. These findings are related to the findings of the factors students consider when selecting their supervisor, therefore, from this it could be suggested that students having a choice of supervisor would improve the student experience.

In terms of the psychological factors that predict a good supervisor, the social psychology of supervisory relationships, with particular reference to PhD supervision, has been given some attention by Katz & Hartnett (1976), Lozoff (1976), Taylor (1976) and Schon (1987). This literature centres around the tension between the desires for autonomy and guidance in academic-student relationships. In these previous studies, in line with the findings of the current study, for the student to become an effective researcher, there must be a movement from dependence and guidance to autonomy and collegueship (Hockey, 1991; Overall et al., 2010). Good supervisors, therefore, must be able to support students, but at the appropriate level, which may be different for different students. This perhaps relates back to students ZPD (see figure 1 in

previous section) and a supervisor's ability to gauge this effectively and scaffold the student's learning appropriately in order to push them forward to the next stage of their learning. In addition to this, perhaps feedback was a form of scaffolding from the supervisors. Students commented on the importance of feedback for improvement to their own performance and discussed feedback as allowing them to "build" on what they had already done.

Investigating if there were characteristics of a good supervisor was important for the research. The mixing of qualitative and quantitative methods was beneficial as the qualitative research aided the interpretation of the quantitative data and also provided rich detailed data about the students' and supervisors' experiences. Having considered if there are "core" characteristics of a "good" supervisor during undergraduate and masters level the research then progressed to consider the interaction between student and supervisor characteristics.

### **13.4 Theme 4: Investigating Match or Mismatch of psychological characteristics between student and supervisor - Summary and interpretation of the results**

Literature on doctoral supervision has already outlined that the supervisor plays a key role in the success of the project (for example: Pearson & Kayrooz, 2004; Devos, 2007). This was found in this research with undergraduate and masters students, as characteristics of a supervisor were related to students' perceptions of their development. Currently, within the learning and teaching literature it seems that theories of learning and theories of teaching are often considered separately, however there are some exceptions to this (for example see Vermunt & Verloop, 1999). Indeed, it seems like the student, supervisor and the environment may all have a role to play in student success and development. An interesting perspective on the student learning experience, which draws on both the student and elements external to the student, is Illeris' (2002) model of the dimensions of learning. In this model he proposed that there are three interrelated elements of learning: a cognitive component, an emotional component and a social component (as outlined in figure 7 below). In this model Illeris argues that the learner does not learn alone and that there are interaction processes between the learner and the surroundings. According to this model



the cognitive component comprises knowledge and skills; the emotional component relates to feelings and motivations. Both of these components within the model are internal to the student. However, in contrast to this the societal dimension of his work involves students' interaction with their environment including the people in it. It is clear to see the links between a model such as this and a supervision relationship, where students are influenced and supported in their progress by another person.

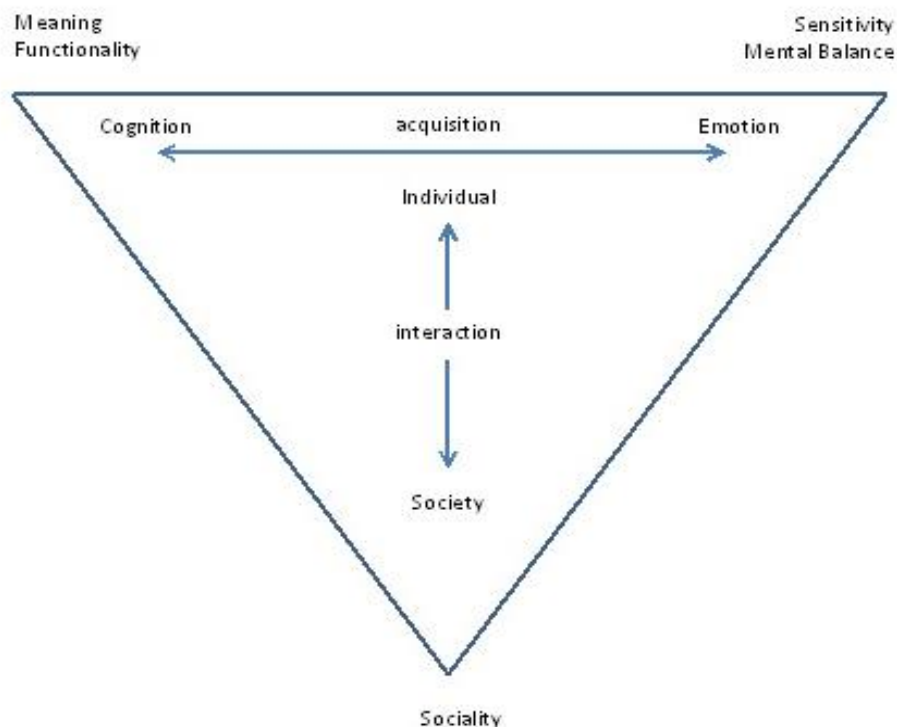


Figure 7-Illers' (2002) Three Dimensions of Learning

This distinction between cognitive and emotional aspects of learning is also something that has been identified as being important by several other researchers (e.g. Short & Weisberg-Benchell, 1989; Wagner and McCombs, 1995).

In order to address both the role of the student and the supervisor and the interaction between them in this thesis, theories of learning and theories of teaching have been considered together. Theories of learning were considered in relation to chapters 9 and 10 which addressed differences between students at different levels of study and then student development over the course of their project. Teaching was then considered using the findings from chapter 11,

which addressed “good” supervision and the qualities of a “good supervisor”. Importantly, identified factors of “good supervisors” and “good students” may be different to what makes “good” supervision and a “good” learning experience. Psychological research with undergraduates has concluded that students have preferences for personalities of lecturers that are similar to their own (Chamorro-Premuzic et al., 2008). Other studies have shown students take into consideration the personality attributes of their lecturers when choosing specific courses (Haghdoust & Shakibir, 2006). This provided an interesting foundation on which the research moved from looking at students and supervisors separately and towards considering the relationship between them and therefore the theme of match or mismatch between students and supervisors may be of importance. Whilst studies have shown this “preference” for a lecturer, no published research has been identified which assessed the outcome of this preference. Finally, this thesis considered teaching and theories of learning together in an attempt to investigate the interaction between students and supervisors and the implications of these interactions for student learning.

While some factors seem to be core to good supervision, there also seems to be individual differences between students in what they need and want from a supervisor. For example, some students’ seem to have preferences for personalities of lecturers that are similar to their own (eg. Chamorro-Premuzic et al 2008). Theories of teaching and theories of learning often originate and operate independently from each other. This section of the thesis attempts to integrate both these types of theories, with particular emphasis on the context of supervision.

Findings chapter 12 aimed to evaluate the impact of match/mismatch between student and supervisor, on various psychological aspects, on student success. The quantitative aspect of the work investigated whether magnitude and direction of match or mismatch between student and supervisor had any implications for student success and students’ perceived success and development. The qualitative aspect of the chapter gave consideration to student and staff perceptions of the impact of match or mismatch and the implications this had for the student experience.

From the match and mismatch data there were some difference score variables that were able to predict student perceptions of success. For the student proxy measure of attainment, best perceived outcomes for the students were associated with students having a more incremental (or growth) view of intelligence than their supervisor, being more extroverted than their supervisor, having higher expectations of what their supervisor would do at the start of the process than their supervisor, and having higher openness scores than their supervisor. For the student outcome questions, best perceived experiences and skill development were associated with students having a more incremental view of intelligence than their supervisor, having higher autonomy support scores than their supervisor, having higher expectations of what their supervisor would do at the start of the process than their supervisor and having higher emotional intelligence scores than their supervisor. Interestingly, for the supervisor proxy measure of attainment the model was not significant- that is none of the match/mismatch variables were able to predict the ratings supervisors would give to their students. From the quantitative data the findings highlighted the importance of both direction and magnitude of difference to students' perceptions of success. Difference in one direction (the student being higher than their supervisor on a variable) led to best perceived outcomes, however, difference in the other direction (the supervisor being higher than their student on a variable) led to worst perceived outcomes. So for the student measures, a form of mismatch was better for outcomes than a match.

As this is a very novel finding, literature to explain this pattern of findings is scarce. However, one of the strengths of this thesis was that it was mixed methods and therefore the qualitative interviews provided some rich information that allowed some interpretation of these quantitative findings. It was clear from the interviews that students and supervisors considered match in relation to: their personality and their personal characteristics; their research interests; and their expectations of the process. Within each of these broad categories, with the exception of expectation, students and supervisors perceived themselves as being similar, complementary or clashing. In the expectations category, students and supervisors only discussed clashing or similar expectations and complementary expectations did not arise from the data. From the analysis of the interview data it seemed that the perception of being

complementary was considered advantageous in terms of outcome and skill development. However, students who perceived they had clashing characteristics/research/expectations always perceived poor outcomes and poor skill development. The qualitative data therefore provided rich and detailed information which may, to some extent, explain the patterns that emerged in the quantitative aspects of the work, discussion of this will follow later.

The finding that direction of differences between students and supervisors is important for the perceptions students have of their experience and their success is unique. While evidence to explain this pattern of findings is limited, it seems that some literature in the area of student learning may go some way to understanding this. Vermunt and Verloop (1999) investigated congruence and friction in relation to teaching strategies and learning strategies. Their argument was that teaching and learning strategies were not always compatible. They proposed that congruence occurs when student and teacher strategies are compatible and friction occurs when this is not the case. Friction can be further divided into two main types: constructive and destructive friction. Constructive friction challenges students to increase their learning and critical thinking skills. In contrast, destructive friction may cause a decrease in thinking and learning skills for the student. This may therefore go some way in explaining the directional nature of the findings of this study. As can be seen from the quantitative results difference (or friction) in one direction led to higher perceived outcomes for the students, however, difference (or friction) in the other direction led to poorer perceived outcomes. The qualitative data also suggested students could be similar to their supervisor (congruent), complementary (constructive friction) or clashing (destructive friction) with their supervisor. Perhaps students who perceived they had done well had experienced something similar to constructive friction and they were challenged during the process, however they felt they had the best learning outcomes. In contrast, students who experienced something similar to destructive friction felt the experience lead to a decrease in their learning and thinking skills.

While this theory explains the findings to some extent, it is clear this explanation does not explain the data entirely. The fact that the quantitative data was directional, and always in the same direction for the students (student higher than supervisor on the variable) suggests that student perception of their

supervisors skills was very important to their rating of their own success- they believed they were more successful when they rated themselves higher than their supervisor rated themselves on significant predictor variables. However, for supervisors their “match” with the student had no impact on their ratings of student success. This incongruence between the student match/mismatch findings and the supervisor ones, which were not significant, is suggestive that students were unable to assess outcome in the same way the supervisors were. It could be the case that this is because students were assessing *perceptions of performance and experience* while the staff data is more probably a representation of *actual performance*.

Further, when analysing the findings from the student data, it was clear there was, at times, a slight inconsistency between the qualitative and the quantitative data which suggest perhaps they analysed different aspects of the student experience. In the quantitative data the students were asked to rate their perceived performance and their perceived skill development. However, in the qualitative data they discussed their experience. From analysis of both the qualitative and the quantitative data it seems that students perceived they always did better when they were higher than their supervisor on each of the significant predictor variables. The fact that only selected variables were significant highlights the things students perceived as being important to their success. However, the qualitative data suggests that perceiving higher success was not always an enjoyable experience, for the student. This may be because an experience which provides the best learning is most probably an experience which challenges the students. So, for example when the supervisor provided the student with lots of autonomy and encouraged them to answer their own questions the student would have probably felt they developed a great deal, and therefore scored highly on the quantitative outcome measure, however, for them this experience may have been challenging and they may have, at times, wanted more support from their supervisor and so in the qualitative interviews, when asked about their project experience, they may have reflected on this more than on the final outcome. Future work will concentrate on the integration of the qualitative and quantitative findings more fully. In order to do this students could be asked to complete questionnaires, similar to the ones completed as part of their research, as part of an interview/before they come to

the interview. This would allow the researcher to ask questions and relate them more closely to the responses on their questionnaire and to probe the students to explain the reasons for rating they gave to selected items on the questionnaire.

Research question 8 will not be discussed in detail. The reason for this is that research question 8 was exploratory and aimed to investigate differences between undergraduate and masters students in the implications of match/mismatch between them and their supervisor. As a result of the further division of the data, it is possible that there were too few in the sample for the results to be generalisable and therefore research question 7 provides more detail evidence regarding the implications of match and mismatch between student and supervisor. However, preliminary analysis indicates there may be differences between undergraduate and masters students and this is something that will be considered in future research.

This findings chapter of the thesis provided strong support for the notion that theories of learning and theories of teaching are not mutually exclusive. The first part of the thesis identified individual characteristics of students that are important, the second part identified characteristics of supervisors are important and the final section highlighted that when considered together match and mismatch between student and supervisor is important for student perceptions of success. This provides evidence that theories of learning and theories of teaching should be considered together as there is a clear interaction between student learning and teaching strategies. It is clear from this research that match or mismatch between student and supervisor has implications for students' perceptions of their own skill development and success.

## **13.5 Implications and Recommendations**

This section brings the salient findings and central themes together and looks at the pedagogical implications of this and makes recommendations for future practice. It is hoped that the present study will prove to be valuable to different groups of people and therefore these recommendations are in relation to what institutions should consider, what students should consider, and what supervisors should consider, regarding the final year and masters thesis. As the

research was divided into 4 main themes, practical and theoretical implications and recommendations, in relation to each theme, will be considered in turn.

In relation to theme 1, it is clear there are subtle differences between the undergraduate and masters students involved in this research in terms of their conceptions of, or potentially their ability to discuss, their learning over the course of their project. This may be due to the masters students being able to better apply what they have learned in theory to a more practical context. Perhaps one possible practical outcome of this research could be that undergraduate students need to be given more of an awareness of the skills they develop over the course of their project, and also the language to discuss this development, as this would allow them to consider their graduate attributes and also their employability. This could be achieved through student training and discussions with students about their learning experience. In addition, giving students more reflective experiences, in which they are asked to reflect on their strengths and weaknesses and the skills they are developing, may be useful. It may also be possible to provide students with explicit information, in the form of intended learning outcomes, which indicate to them the skills they may be developing, or should work to develop over the course of their project.

In addition to this, masters students were more aware of their weakness and as a result this had a positive influence on their help-seeking strategies. The reasons for undergraduates not discussing their weakness could perhaps be related to their unawareness, or it could be related to them not feeling able to discuss them. Therefore, one possible practical application could be that perhaps working with undergraduate students to help them identify their strengths and weaknesses would be important. It would also be of importance to encourage students to discuss their weaknesses and target improvement as this may have implications for changing their help-seeking behaviour. Fostering these skills in undergraduate students is important as it is linked to students being able to develop graduate attributes. The identification of the subtle difference between undergraduate and masters students may allow for the implementation of support strategies which will enhance student learning and development.

Theme 2 outlines that students develop significantly over the course of their project. This information could be practically useful in providing evidence to

suggest that institutions should continue to support student practical projects, even though they are an expensive form of teaching, as they are an important aspect of student learning and development. In addition to this, the qualitative aspects of this chapter were suggestive of some of the undergraduate students being over-confident at the start of the experience, which led to a reduction in self-efficacy and confidence during the process. Perhaps this draws attention to the fact that students' expectations of the experience are often different to what the experience is and therefore conversations with students about this, at the beginning of the process, may be helpful in managing these expectations. These conversations could come from the supervisor, however in addition to this, perhaps peer support from more experienced students who have already completed a project would be valuable for the students. It is important that students are aware of the benefits of the final year/master project. In order for them to fully utilise the experience, it is recommended that students take an active approach in recording the skills that they are developing during their project. This has been found to be an important method of linking student projects to graduate attributes (Gresty, 2009). Perhaps students and supervisors should be encouraged to work together to produce a list of the skills that the student could/ should be developing over the course of their project. Further, students and supervisors should be encouraged to review and discuss these skills throughout the process as this may allow students an invaluable opportunity to become more aware of their skill development and give them the opportunity to discuss this.

Theme 3 is important for outlining to supervisors the "core" qualities, such as availability, openness and ability to listen to the student, that are important in their supervision relationship. This could be used in the creation of practical guides for academic staff regarding supervision. Such guides would outline to staff the importance of providing autonomy support to students, as this seemed to be key in the development of student skills. Further, it would advise that for students both the interpersonal and academic aspects of supervision, on the basis of the qualitative data, seem to be of equal importance and therefore this is something supervisors should consider when working with students. As well as being useful for staff perhaps practical guidance on good supervision would also be useful for students. It would allow them to consider what they could



reasonably expect from their supervisor, but also highlight to them the importance of autonomy support to their own development.

On the basis of this, it is recommended that supervisors should be informed about the individual differences in the development of student autonomy and self-efficacy. The data from this research suggests that, for some students, there is not a linear development of autonomy or self-efficacy. Students who do not have a linear view of autonomy have a more flexible view of their development as learners, believing they needed more help and support at different stages of the process.

The finding that both personal and academic factors can be influential in supervision has clear implications for the training of supervisors. Research conducted at doctoral level indicated that effective supervision is a mix of two types of support: academic support, including being available to help with academic activities and providing timely feedback on student progress, and personal support, like being emotionally supportive and boosting confidence when students encounter difficulties. This current research confirms that this is also the case for undergraduate and masters research supervision and therefore, supervisors should be mindful of their perceived dual role when supervising students. In relation to autonomy support, one recommendation is that supervisors should be trained in giving good autonomy support to students as this requires supervisors giving the correct amount of freedom to students, while also recognising that this is the first time many students have engaged in such an activity and therefore students also require support.

Theme 4 is perhaps of more theoretical interest than of practical importance. However, perhaps raising awareness of the implications and outcomes associated with match/mismatch is important to both students and supervisors. Within the research it is clear that mismatch between students and supervisors in one direction leads to best perceived outcomes, however, mismatch between students and supervisors in the other direction leads to worst perceived outcomes. However, from the supervisor ratings of student success, there was some evidence to suggest match and mismatch did not actually affect student outcome, but rather just their perception of it. With this information, there is evidence to suggest that within the supervision meetings/through

communication with their supervisors students are aware of differences between themselves and their supervisors and this is affecting their perceptions of their success. While it would be practically difficult to ensure this did not happen perhaps awareness that this might be happening would change the behaviours of supervisors in their interactions with students and students in their perceptions of their outcomes. While it might not always be practically possible to “pair” students and supervisors on the basis of psychological factors, what is possible is to raise student and staff awareness of such issues, in order to inform staff and student choice of pairing where possible. Further, this information could be used to advise students that even if the experience with their supervisor is poor, they are still learning.

## 13.6 Limitations

Before discussing the limitations of the research it is important to consider the point that many potential limitations of the research were reduced through the selection of appropriate research methods and design at the conception of the project. The combined use of qualitative and quantitative methods within one study for the investigation of the same research questions was advantageous, however not without challenges. From the onset of the study it was clear that mixed methods was the appropriate approach, due to the reasons outlined in the methodology chapter which were concerned with fitness for purpose. It seems that mixed methods was advantageous as this allowed a fuller picture of the development of students during the course of a project and the role supervision has to play in this, giving consideration to the implications of match or mismatch between students and supervisors. This was due to the triangulation of the data ensuring that the methods complemented each other. As outlined in the methodology chapter, the quantitative aspects of the study allowed the detection of significant aspects of the student learning experience over the course of a project and the relative importance of match or mismatch on this. The qualitative aspects of the study provided rich and detailed information about students’ and supervisors’ conceptions of doing a project and the importance they placed on supervision for student development. For example, the quantitative study detected changes in self-efficacy over the course of a project, however, found no significant differences between self-efficacy of undergraduates and master students. The qualitative data was useful for

uncovering that the reasons for this were nuanced. It seemed from the interviews that many of the undergraduates felt they had under-estimated the difficulties of doing a project at the start of the process and therefore were over-confident about their abilities to complete tasks at the start of the process. In contrast, the masters students had completed a project once before and were mindful of the difficulties associated with this and therefore, it is possible their ratings of their confidence in their perceived abilities to complete a task were more in-line with their actual abilities.

However, there were some limitations of the research that are important to be mindful of when considering the results. One limitation of the research, at the point of data collection, was the sampling of the students and supervisors in the quantitative aspects of the work. It has to be acknowledged that in a longitudinal design such as this, where students were required to complete a questionnaire at two time points, it is unlikely that the missing data was random. It seems plausible that potentially only a certain type of student is likely to take the time to complete a questionnaire twice. In addition to this, it is also the case that probably only certain kinds of supervisors were likely to spend the time completing the supervisor aspect of the questionnaire. Most probably the supervisors who completed the questionnaires were interested in learning and teaching and believed that the research was important. While this is something that could not have been avoided, it may have affected the findings in several ways. In terms of the students, it is plausible that only highly motivated students completed the questionnaires at two time points and it could have been the case that these were the students who were most likely to benefit from the experience of conducting an independent research project. As a result, measures of student development may have been inflated slightly compared to if the whole population had completed the questionnaires. In terms of the supervisors, the questionnaires that were returned most probably came from a certain “type” of supervisor, for example those high on agreeability, so it is possible all the supervisors shared some similar characteristics and therefore the impact of match/mismatch has only been investigated with a subset of possible types of match.

The sampling of students and supervisor for interviews is something that also has to be considered. From the student interviews it seemed that only students who

believed they had had an extreme experience volunteered to be interviewed. Students who were interviewed seemed to either have had a very good experience or a very poor experience. None of the students interviewed seemed to fall in the middle of this. This was both an advantage, and also a disadvantage. The advantage of this was that it allowed extremes to be mapped, and therefore this may be particularly important when making suggestions for practice. However, the disadvantage of this is related to the fact that only the views of certain students were heard and perhaps these students were not representative of what could be considered a “typical” project experience.

In terms of the limitations of the quantitative dataset, it is important to be aware of the large amount of missing data. This missing data was due, in part, to attrition over the course of the longitudinal project. In order to maximize the available data, slightly different data sets were used for different parts of the analysis. Each research theme focused on the analysis of a certain part of the dataset. For example, in the first research question all students were included in the time 1 and time 2 analysis. This was important as it allowed views of students who had just completed the questionnaire at one time point to be considered in the analysis and also allowed for a larger sample. However, for the second research question, only the students that had completed both questionnaires could be included in the analysis. While the use of all the data was strength of the research, it is important to be aware of the fact that this may have produced some inconsistencies across the dataset and therefore this should be given consideration when interpreting the findings of the thesis.

Analysing the supervisor and student data in a paired way was informative in the production of the coding categories and as such was a strength associated with the research. However, it is important to note that obviously some of the richness of the paired data was lost in the presentation of the findings when they were not reported in paired format.

## **13.7 Future directions**

Despite its strengths in building on previous research from a new perspective and adding to the literature in this area, this study has some limitations, which could

be useful in suggesting future directions for the research. Throughout both the questionnaire and interview aspects of the study the research was reliant on self-report. Although invaluable, self-report data collection may be problematic. Individuals are often mistaken in their view of themselves and their behaviour and often this may lead to them reporting themselves inaccurately (Alicke & Govorun, 2005). It has been found in other work that the social desirability bias (Fisher, 1993) may also reduce the reliability and validity of data collected in this way. It is possible that the students felt under pressure to answer the questions in a way that was socially desirable and answered questions using the response they thought would be expected (Rydell & Boucher, 2010; Sinclair et al, 2006). For example, in the self-efficacy and autonomy aspects of the questionnaire, it is possible the students rated how they believed they should feel/should be performing, rather than how they actually felt and performed. As a result of this, in future it would be interesting, and beneficial, to collect observational data of the supervision experience. This could be collected through observation of supervision meetings. In order to carry this out in as naturalistic way as possible, it may be conceivable, in cases where students have two supervisors, to get one supervisor to observe the meeting. This may be beneficial because in this case the presence of the other person would not be intrusive and therefore have limited impact on the supervision dynamic. Another possible method of collecting this data would be by asking the student and supervisor to consent to someone observing the meeting. This would have the advantage of the observer not being involved in the supervision of the student, however, it may be intrusive and therefore may change the dynamics of the meeting.

In addition, it might be interesting to consider gender differences in perceived outcome. Evidence suggests that females generally tend to have lower self-perceptions of their academic ability in mathematics and science, even when their actual performance is not lower than that of males (Eccles, 1983). While it could be the case that females have lower self-perceptions of their academic ability, it could also be the case that female students do not have lower self-perceptions but rather they are just more modest when reporting. Indeed, research has found that females may have a tendency towards modesty when rating their confidence levels, while males may exaggerate their levels (e.g.

Pajares & Graham, 1999). On the basis of this, it seems that gender of the student may have important implications for students reporting of their success and self-efficacy. Therefore, researching this would potentially extend and improve the research that has been conducted as part of this thesis. In addition to the impact of student gender on their perceptions of success, the interaction between student and supervisor gender would also be an interesting direction for further research. This research could investigate if students and supervisors being the same or different gender to each other had any implications for the process of the research project and also the outcome in terms of student success and development.

In this research, although discipline was something that was taken note of, there was not a sufficient amount of data to consider discipline-specific differences to any great degree. However, views of supervision, from both the student and the supervisor, and the way the projects were conducted might be related to the discipline being studied/investigated. Research has suggested disciplinary background may shape practices in university teaching and learning (Anderson & Day, 2005) and also that writing practices of specific disciplines impact on students (e.g. Lea & Stierer, 2000; Stierer, 2000; Dysthe, 2002). Therefore, in future work it would be of importance to consider student development over the course of a project in relation to discipline and also to consider if there are differences in supervision between disciplines. Indeed, this relates to the previous point regarding discipline differences as there were higher numbers of females in some of the disciplines (e.g. psychology) and higher numbers of males in other disciplines (e.g. engineering).

Further, due to the changing face of UK Higher Education, it is important to consider in future work are international students and their learning and development over the course of the project as well as their views of supervision and the implications of this. Currently, UK Higher Education is receiving a growing number of international students particularly at masters level, but also at undergraduate level. These students bring not only financial rewards, but are also an asset to universities, home students and staff in learning to work as global citizens in an increasingly globalised world (UKCISA TALIS Initiative, position paper, December 2008). However, currently these students may not all be receiving the support they need. Research has found that when compared to

domestic students, international students have “less social support, used more dysfunctional coping strategies and had greater incongruence between their expectations and experiences of university life” (Khawaja & Dempsey, 2008, p. 30). Further challenges that international students have to overcome when studying abroad include misunderstandings resulting from their relationship with academic staff (Ramsay et al, 1999). Therefore, a focus on the student project experience with particular attention to international students would be beneficial. A comparison between international and home students, in terms of their project experience and their relationship with their supervisor, may allow for the betterment of support for learning particularly for international students.

As already discussed in the implication section of this chapter, it would be beneficial to conduct further research to uncover if any strategies can be put in place to allow undergraduate students to articulate their skill development and learning experience in a similar way to masters students or if this is just part of the learning process that students will develop organically with increasing maturity. If strategies can be put in place it would be of interest to evaluate the effectiveness of each of the strategies.

In this research the self-efficacy of the supervisor was something that was not taken into consideration, however, it seems that this is something that could have been important to the development of students. Teachers with high self-efficacy can have a positive impact on their students. In a study which interviewed teachers within a school environment, it was stated that “we will never have the perfect curriculum or teaching strategy, but teachers who set high goals, who persist, who try another strategy when one approach is found wanting... those with high self-efficacy... are more likely to have students who learn” (Shaughnessy, 2004, p. 156). This statement is supported by research that suggests that teachers’ sense of self-efficacy is one of the characteristics that has been linked to student achievement (Ross, 1992). Interestingly it has been found that teacher’s self-efficacy impacts not only on student motivation (Midgley et al, 1989), but also on the student’s sense of self-efficacy (Anderson et al, 1988). Therefore, perhaps in future work supervisor research self-efficacy should be considered as well as student self-efficacy.

Given the unique contribution of the match/mismatch chapter of the thesis, it would be of interest to conduct more research in this area. It is particularly interesting that this research highlighted that a certain kind of mismatch (when the student was higher than the supervisor on the psychological predictor variables) was better than match for students' *perceptions* of their success; however, it seemed from the overall supervisor measure that it may not be important for their actual success. This difference in perceptions of students in relation to their views of success and perceptions of supervisors is an area which would be important to research further. In order to achieve this, it would be of particular interest to consider in more detail the integration of the qualitative and quantitative findings. From these findings, future work by the researchers will focus on the development of an inventory which encourages students and staff to discuss the process of conducting a project and the supervision relationship. For example, once developed, this inventory could encourage them to discuss their expectations of the process and their expectations of each other. In addition, it would encourage them to discuss their preferences in relation to the way they like to work, and their expectations of the process, and the support the student feels they might need and the support the supervisor feels they can provide. The opportunity for staff and students to have this discussion, prior to the agreement to work with one other, could limit problems that later emerge in supervision partnerships.

## 13.8 Conclusions

To summarise, from the findings of this work it can be concluded that student projects are a key component for student learning and development, in terms of both discipline specific knowledge (e.g. statistics, programming) and transferable skills (e.g. autonomy, time-management, communication). They also seem to be important for many psychological factors, such as autonomy and self-efficacy and as such are key to the development of graduate attributes. Often, from the qualitative data, it seemed that for undergraduate students they were unable to articulate the importance of the experience, however, from the quantitative data it was clear these students had developed considerably over the course of the year. In addition, the research was able to identify some of the characteristics of what makes a "good" student.



As well as the students playing an important part, it seems that the supervisor too has a vital role to play in student perceived success and development. The research found that there were some “core” attributes of “good” supervisors such as availability, openness to students’ ideas and input, and being approachable. However, beyond this the individual differences of the students and supervisors played an important role.

The idea of match/mismatch between student and supervisor was novel, and was significant in terms of students’ *perceptions of their success* and development. However, and importantly, it seemed that match /mismatch, on the basis of supervisor scores, was not important for their *actual success*. This highlights that theories of teaching and theories of learning are inextricably linked and should be considered together. It was from consideration of teaching and learning together that it became clear that students’ perceptions of their learning were in fact out of line with their actual learning and development. This is a finding that would not have been detected if student or supervisor ratings of student success and development had been considered in isolation. This has clear important implications for both theories of teaching and theories of learning.

In conclusion, this study provides a rich and detailed picture of student learning and development over the course of a project and the implications of supervision on this development. It is on the basis of this that recommendations and suggestions for future research have been made.

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## Appendix A- Interview schedules for students and supervisors



### Interview Schedule for Students

#### General supervision process

1. Can you tell me, first of all, about how you chose the topic and supervisor for your dissertation?
  - Can you explain the reasons for these choices?
2. Thinking back to the beginning of your dissertation, what were the main things you covered in early supervision meetings?
  - Is this what you expected to happen?
  - Did anything surprise you about the supervision process?

#### Qualities

3. Thinking about how you were supervised, were there particular aspects of the process which worked well for you?
  - Can you explain why this was helpful?
  - Were there any aspects of the process that did not go so well?
  - Can you explain why this was difficult for you?
4. Can you now think of the supervision experience you are having in comparison to others in your year, if you have discussed this. Are there any differences?
  - Do you think you all value/need the same things from your supervisors? Or does it seem to vary?

#### Expectations

5. As you have been working on your project can you reflect on the levels of assistance your supervisor provided?
  - Compared to others in your year, how much assistance did you receive?
  - Did it feel like you received enough guidance? Can you explain why?
6. What are the main kinds of support you expect from your supervisor?
  - Have you been getting the support you expected?
  - Has the amount of support you expected changed any way since the start of your project?
  - Can you explain the reasons of this?
7. Can you reflect now on the feedback you received on your project?
  - How was this given? (verbal, written etc)
  - When was the feedback you received given?

- What part of this did you find useful and what action did you take as a result of this feedback?
- Is there anything you did not receive that would have been helpful?

### **Overall**

8. Can I ask you now to reflect on your feelings as you progressed through the project? How did you feel before you started, while in the middle and now at the end of your project?
  - Any high points? Can you explain why?
  - Lowest point? Can you explain why?
  - What role did your supervisor play in this?
  
9. Can you talk me through the main things you have learned from doing your final year project?
  - Other than learning about the topic of your project, do you think you have developed any new skills or capacities?
  - What parts of the experience have been most valuable for your learning? Can you explain why?
  - Would you say you have learned anything from your project which has helped you be more effective in other aspects of your studies?
  
10. How well do you think your project has gone overall?
  - Can you explain why you think it has gone well/not so well?
  - What do you think have been the main reasons why the project has gone well/not so well?
  
11. Overall what would you say you enjoy most about working with your supervisor?
  - Are there any aspects of working with them that you found challenging?
  
12. Finally, can I ask you to reflect on what you think supervision is and what that means for you?



## Interview Schedule for Supervisors

### General supervision process

1. Thinking of an Undergraduate student that you have supervised recently, can you tell me what you did in the first supervision meeting?
  - a. Can you explain why?
  - b. Is this what you usually do or does it vary?
  - c. What about when you supervise PGT students? In what way is the process different/similar with them?
2. Thinking of the same undergraduate student, can you talk me through the main steps in the supervision process?
  - a. Can you explain why you do things this way?
  - b. Is this what you usually do, or does it vary?
  - c. Would things vary much for PGT students?
3. Do you ever any difficult moments in the supervision process?
  - a. How do you resolve these?
  - b. Are these a common difficulty?
  - c. What other common difficulties do you encounter with your students?
  - d. Are there any differences in the problems you encounter between undergraduate and PGT students?

### Qualities

4. Can you think of the undergraduate student you found it most rewarding to supervise? What was it about that student's approach to the dissertation which made this a rewarding experience?
  - a. Are there any particular skills, attitudes or approaches that students can bring to the dissertation process which make the experience more successful?
  - b. Are there any skills, attitudes or approaches that you particularly like in students that might be different from other supervisors?
  - c. Now can you reflect on the PGT student you found it most rewarding to supervise? Were the skills and qualities they had different to the skills and qualities of your undergraduate example?
  - d. Was this supervision experience rewarding for different reasons to undergraduate supervision?
5. Thinking of the same undergraduate student, can you describe your role in their progress through their project?
  - a. Can you explain why you took this role?
  - b. Is this usually the role you take or does it vary?
  - c. Thinking of the same PGT student, can you describe your role in their progress through their project? - Different to U.G?

### **Expectations**

6. Can you think of the undergraduate student you found it most challenging to supervise? What was it about that student's approach to the dissertation which made this a challenging experience?
  - Are there any particular things that student could have done differently that would have made the experience better for them and yourself?
  - Can you think of the PGT student you found it most challenging to supervise? What was it about that student's approach to the dissertation which made this a challenging experience?
  
7. Thinking of the same undergraduate student, can you describe your role in their progress through their project?
  - Can you explain why you took this role?
  - Was this different from the role you usually take?
  - What about your role for the PGT student?
  
8. Thinking of an undergraduate student that you have supervised recently, can you explain to me the main expectations you had of them?
  - Can you explain why you had these expectations?
  - Are these the same expectations you have of every student, or does it vary? If so why?
  - What about for students at PGT level, what are the main expectations you have of them?
  - What are the main similarities and differences between your expectations at undergraduate and PGT level?
  
9. Can I ask you now, again thinking of one particular undergraduate student, to reflect on the feedback that you provide to this student?
  - a. How did you give this student feedback? Was it written or verbal etc?
  - b. Is this the same for all students or would you say it varies?
  - c. Are there particular times in the project you give feedback?
  - d. Do you give students feedback on their performance outside of their written work?
  - e. What about with PGT students, how would you provide feedback to them?

### **Overall**

10. Thinking of a successful undergraduate student project that you supervised recently can you talk me through the main benefits of a final year project for this student?
  - a. What were the main things this student seemed to learn?
  - b. In addition to learning about the topic did the student develop any particular skills or capacities?



- c. Why do you think this student learned so much?
- d. How involved was this student in the decisions about the topic they studied, their question and the design?
- e. How did you as a supervisor decide how much support this student needed?

11. Thinking of a successful PGT student project that you supervised recently can you talk me through the main benefits of a PGT project for this student?

- a. Are there any benefits that students experience in doing a PGT project that they don't experience when doing an undergraduate project?
- b. In addition to learning about the topic did the student develop any particular skills or capacities?
- c. Why do you think this student learned so much?
- d. How involved was this student in the decisions about the topic they studied, their question and the design?
- e. How did you as a supervisor decide how much support this student needed?

12. Overall what would you say you find most rewarding about working with your students?

- a. Are there different rewards associated with undergraduate and PGT supervision?

13. Finally, can I ask you to reflect on what you think supervision is and what that means for you?

## Appendix B (Pilot 1 Quantitative- student and supervisor information form and consent)



### Plain Language Statement

**Project Title:** Investigating the “fit” and interplay between dissertation students and their supervisors.

You are being invited to take part in a research study. It is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully.

The purpose of this study is to examine the working relationship of students working on research projects/dissertations and their supervisors. In particular, it aims to investigate the factors that lead to students having a good experience during the process. It will also investigate if various factors either “matching” or “mismatching” between student and supervisor have an impact on outcome. The personalities of students and supervisors will be explored, as well as the expectations of both students and supervisors about the nature of the working relationship, and the responsibilities of each within that relationship. In addition, participants’ perceptions of the malleability of intelligence will be examined. The extent of “match” or “mismatch” between these will then be analysed.

Thus, during this study both students and supervisors will be asked to complete a questionnaire. This questionnaire will include a short personality measure and some questions relating to your own concept of intelligence and some questions regarding your expectations of the dissertation/project.

Both students and supervisors will be required to provide their names (and in the case of students, their matriculation numbers), as well as the names of the supervisor of the project, or students supervised. However, to protect the complete confidentiality of both students and supervisors, the information containing the personal details of the students and supervisors will only be accessible to the main researcher, Niamh Friel. No member of the department/school will ever be able to identify either the student or staff member with the data.

If you wish information about the study and/or a summary of the anonymised group results to please feel free to contact me, Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk)) or either of the supervisors, Dr Velda McCune ([Velda.McCune@glasgow.ac.uk](mailto:Velda.McCune@glasgow.ac.uk)) or Dr Lorna Morrow ([Lorna.Morrow@glasgow.ac.uk](mailto:Lorna.Morrow@glasgow.ac.uk)).

If you have any concerns with regards to the conduct of the study you can contact the College of Social Sciences Ethics Officer, Dr Georgina Wardle at ([Georgina.Wardle@glasgow.ac.uk](mailto:Georgina.Wardle@glasgow.ac.uk)).

**Consent for participation in this study: Student Form**

**Title of Project:** Investigating the “fit” and interplay between dissertation students and their supervisors.

**Name of Researcher:** Niamh Friel

If you agree to participate in this study then please read the following statements and sign your name below to indicate your consent.

- I have read the information form for participants and so understand the procedures and have been informed about what to expect;
- I agree to participate in this study on the “fit” between dissertation/project students and their supervisors;
- I understand that my participation in this study is voluntary, and that I can withdraw from the study at any time and for any reason;
- I understand that I may omit any questions that I would prefer not to answer;
- I understand that my participation in this project is for the purposes of research, and is in no way an evaluation of me as an individual;
- I understand that, although I am providing information regarding my identity, this will be kept confidential and no member of my department will see it. This is for the purposes of pairing the student and supervisor data, after which time the information relating to my identity will be removed, thus the data will not be identifiable to me in any way;
- I understand that all of the information I give will be made and kept anonymous, will be treated with full confidentiality and that, if published in any written output or public dissemination of the results, it will not be in any way identifiable as mine;
- I understand that I can contact the researcher for this project;  
Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk))  
by e-mail to receive more information and/or a summary of the anonymised group results.

Name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

**Participant Information**

Sex M/F

Age \_\_\_\_\_

Student Number \_\_\_\_\_

Name of final year project supervisor \_\_\_\_\_

**Consent for participation in this study: Staff Form**

**Title of Project:** Investigating the “fit” and interplay between dissertation students and their supervisors.

**Name of Researcher:** Niamh Friel

If you agree to participate in this study then please read the following statements and sign your name below to indicate your consent.

- I have read the information form for participants and so understand the procedures and have been informed about what to expect;
- I agree to participate in this study on the “fit” between dissertation/project students and their supervisors;
- I understand that my participation in this study is voluntary, and that I can withdraw from the study at any time and for any reason;
- I understand that I may omit any questions that I would prefer not to answer;
- I understand that my participation in this project is for the purposes of research, and is in no way an evaluation of me as an individual;
- I understand that, although I am providing information regarding my identity, this will be kept confidential and no member of my department will see it. This is for the purposes of pairing the student and supervisor data, after which time the information relating to my identity will be removed, thus the data will not be identifiable to me in any way;
- I understand that all of the information I give will be made and kept anonymous, will be treated with full confidentiality and that, if published in any written output or public dissemination of the results, it will not be in any way identifiable as mine;
- I understand that I can contact the researcher for this project;  
Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk))  
by e-mail to receive more information and/or a summary of the anonymised group results.

Name (PRINT) _____	Signature _____	Date _____
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## Appendix C Quantitative Pilot 2 (information and consent)



University of Glasgow | College of Social Sciences

### Plain Language Statement

**Project Title:** Investigating the “fit” and interplay between dissertation students and their supervisors.

**Researcher:** Niamh Friel

You are being invited to take part in a research study. It is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully. After reading the information please show your consent to taking part by signing and dating the consent form.

The purpose of this study is to investigate skill development of students engaged in research projects/dissertations. In particular, it aims to investigate the development of student self-efficacy and autonomy during the process. Thus, during this study you will be asked to complete a questionnaire. This questionnaire will include a short self-efficacy measure and a short autonomy measure. In addition to this there is a questionnaire that aims to measure your emotions and emotional responses.

During this study students will be asked to complete a questionnaire. However, to protect the complete confidentiality of students, you are not asked to disclose any personal information. The consent form is signed separately from the questionnaire and therefore no one will be able to identify the student or with the data.

You have been invited to take part because you are a Masters student and are, therefore, currently involved completing a dissertation/project at university level. During this study your participation is voluntary and you have a right to withdraw at any time and for any reason. You also have the right to omit any of the questions you wish to. All information will be kept anonymous and will never be identifiable as your own in any written output or public dissemination of the results.

If you are happy to be involved in the project, you will now be asked to sign a consent form to confirm this. If you wish information about the study and/or a summary of the anonymised group results please feel free to contact me, Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk)) or either of my supervisors, Dr. Velda McCune ([Velda.McCune@glasgow.ac.uk](mailto:Velda.McCune@glasgow.ac.uk)) or Dr. Lorna Morrow ([Lorna.Morrow@glasgow.ac.uk](mailto:Lorna.Morrow@glasgow.ac.uk)).

If you have any concerns with regards to the conduct of the study you can contact the College of Social Sciences Ethics Officer, Dr Valentina Bold at ([Valentina.Bold@glasgow.ac.uk](mailto:Valentina.Bold@glasgow.ac.uk)).

### Consent for participation in this study

**Title of Project:** Investigating the “fit” and interplay between dissertation students and their supervisors.

**Name of Researcher:** Niamh Friel

If you agree to participate in this study then please read the following statements and sign your name below to indicate your consent.

- I have read the Plain Language Statement for participants and so understand the procedures and have been informed about what to expect;
- I agree to participate in this study on the “fit” between dissertation/project students and their supervisors;
- I understand that my participation in this study is voluntary, and that I can withdraw from the study at any time and for any reason;
- I understand that I may omit any questions that I would prefer not to answer;
- I understand that my participation in this project is for the purposes of research, and is in no way an evaluation of me as an individual;
- I understand that all of the information I give will be made and kept anonymous, will be treated with full confidentiality and that, if published in any written output or public dissemination of the results, it will not be in any way identifiable as mine;
- I understand that I can contact the researcher for this project;  
Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk))  
by e-mail to receive more information and/or a summary of the anonymised group results.

Researcher  
Signature

Date

Participant  
Name

Signature

Date

## Appendix D - Qualitative pilot 1 student and supervisor information and consent forms



University  
of Glasgow | College of  
Social Sciences

### Plain Language Statement

**Project Title:** Investigating the “fit” and interplay between dissertation students and their supervisors.

**Researcher:** Niamh Friel

You are being invited to take part in a research study. It is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully. After reading the information please show your consent to taking part by signing and dating the consent form.

The purpose of this study is to examine the working relationship of students engaged in research projects/dissertations and their supervisors. In particular, it aims to investigate the factors that lead to students having a good experience during the process. This study is a qualitative study and both students and staff involved in supervision will be interviewed individually and given the opportunity to express their views on the topic. It is hoped that students and supervisors can share their experiences of the process.

You have been invited to take part because you are either the supervisor of undergraduate students or you are a final year undergraduate student and are therefore currently involved in the supervision process at university level. You will be asked a series of questions about supervision. Your answers will be recorded using an audio recording device, and will be transcribed at a later date. The whole interview will take a maximum of 1 hour. Participation is voluntary and you may withdraw from the study at any point and for any reason. You may also have the right to omit any questions you do not wish to answer. If you have any queries with regard to this study, you may ask the researcher at any point.

All information obtained will remain confidential. Signed consent forms will be stored separately from the audio recordings and transcriptions, thus providing complete anonymity. Student and supervisor data will be paired, if both have been interviewed, and then anonymised. The only information about you which will be kept is the audio recording and the anonymised transcription. These audio recording will be accessible to only the main researcher but some anonymised transcripts will be shared with her supervisors. The digital audio recordings will be stored on a password protected computer. On completion of the project, the audio recordings will be destroyed. Any quotes reported in any written output from the project will have any potentially identifying information removed and will not be reported in paired format.

If you are happy to be involved in the project, you will now be asked to sign a consent form to confirm this. If you wish information about the study and/or a summary of the anonymised group results please feel free to contact me, Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk)) or either of my supervisors, Dr. Velda McCune ([Velda.McCune@glasgow.ac.uk](mailto:Velda.McCune@glasgow.ac.uk)) or Dr. Lorna Morrow ([Lorna.Morrow@glasgow.ac.uk](mailto:Lorna.Morrow@glasgow.ac.uk)).

If you have any concerns with regards to the conduct of the study you can contact the College of Social Sciences Ethics Officer, Dr Georgina Wardle at ([Georgina.Wardle@glasgow.ac.uk](mailto:Georgina.Wardle@glasgow.ac.uk)).

**Consent for participation in this study: Student Form**

**Title of Project:** Investigating the “fit” and interplay between dissertation students and their supervisors.

**Name of Researcher:** Niamh Friel

If you agree to participate in this study then please read the following statements and sign your name below to indicate your consent.

- I have read the Plain Language Statement for participants and so understand the procedures and have been informed about what to expect;
- I agree to participate in this study on the “fit” between dissertation/project students and their supervisors;
- I understand that my participation in this study is voluntary, and that I can withdraw from the study at any time and for any reason;
- I understand that I may omit any questions that I would prefer not to answer;
- I understand that my participation in this project is for the purposes of research, and is in no way an evaluation of me as an individual;
- I consent to being audio recorded as part of the project;
- I understand that any information recorded in the investigation will be made and kept anonymous and will remain confidential and no information that identifies me will be made publicly available;
- I understand that I can contact the researcher for this project;  
Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk))  
by e-mail to receive more information and/or a summary of the anonymised group results.

Researcher  
Signature

Date

Name

Signature

Date



### **Consent for participation in this study: Supervisor Form**

**Title of Project:** Investigating the “fit” and interplay between dissertation students and their supervisors.

**Name of Researcher:** Niamh Friel

If you agree to participate in this study then please read the following statements and sign your name below to indicate your consent.

- I have read the Plain Language Statement for participants and so understand the procedures and have been informed about what to expect;
- I agree to participate in this study on the “fit” between dissertation/project students and their supervisors;
- I understand that my participation in this study is voluntary, and that I can withdraw from the study at any time and for any reason;
- I understand that I may omit any questions that I would prefer not to answer;
- I understand that my participation in this project is for the purposes of research, and is in no way an evaluation of me as an individual;
- I consent to being audio recorded as part of the project;
- I understand that any information recorded in the investigation will be made and kept anonymous and will remain confidential and no information that identifies me will be made publicly available;
- I understand that I can contact the researcher for this project;  
Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk))  
by e-mail to receive more information and/or a summary of the anonymised group results.

Researcher  
Signature

Date

Name  
(PRINT)

Signature

Date

## Appendix E - Qualitative pilot- student and supervisor interview schedules



### Interview Schedule for Students

#### General supervision process

13. Can you tell me, first of all, about how you chose the topic and supervisor for your dissertation?
  - Can you explain the reasons for these choices?
14. Thinking back to the beginning of your dissertation, what were the main things you covered in early supervision meetings?
  - Is this what you expected to happen?
  - Did anything surprise you about the supervision process?

#### Qualities

15. Thinking about how you were supervised, were there particular aspects of the process which worked well for you?
  - Can you explain why this was helpful?
  - Were there any aspects of the process that did not go so well?
  - Can you explain why this was difficult for you?
16. Can you now think of the supervision experience you are having in comparison to others in your year, if you have discussed this. Are there any differences?
  - Do you think you all value/need the same things from your supervisors? Or does it seem to vary?

#### Expectations

17. As you have been working on your project can you reflect on the levels of assistance your supervisor provided?
  - Compared to others in your year, how much assistance did you receive?
  - Did it feel like you received enough guidance? Can you explain why?
18. What are the main kinds of support you expect from your supervisor?
  - Have you been getting the support you expected?
  - Has the amount of support you expected changed any way since the start of your project?
  - Can you explain the reasons of this?

#### Overall

19. Can you talk me through the main things you have learned from doing your final year project?
  - Other than learning about the topic of your project, do you think you have developed any new skills or capacities?

- What parts of the experience have been most valuable for your learning? Can you explain why?
- Would you say you have learned anything from your project which has helped you be more effective in other aspects of your studies?

20. How well do you think your project has gone overall?

- Can you explain why you think it has gone well/not so well?
- What do you think have been the main reasons why the project has gone well/not so well?

21. Finally, overall what would you say you enjoy most about working with your supervisor?

- Are there any aspects of working with them that you found challenging?

### Interview Schedule for Supervisors

#### General supervision process

13. Thinking of a student that you have supervised recently, can you tell me what you did in the first supervision meeting?
  - a. Can you explain why?
  - b. Is this what you usually do or does it vary?
  
14. Thinking of the same student, can you talk me through the main steps in the supervision process?
  - a. Can you explain why you do things this way?
  - b. Is this what you usually do, or does it vary?
  
15. Were there any difficult moments in the supervision process?
  - a. How did you resolve these?
  - b. Is this a common difficulty?
  - c. What other common difficulties do you encounter with your students?

#### Qualities

16. Can you think of the undergraduate student you found it most rewarding to supervise? What was it about that student's approach to the dissertation which made this a rewarding experience?
  - a. Are there any particular skills, attitudes or approaches that students can bring to the dissertation process which make the experience more successful?
  - b. Are there any skills, attitudes or approaches that you particularly like in students that might be different from other supervisors?
  
17. Thinking of the same student, can you describe your role in their progress through their project?
  - a. Can you explain why you took this role?
  - b. Is this usually the role you take or does it vary?

#### Expectations

18. Can you think of the undergraduate student you found it most challenging to supervise? What was it about that student's approach to the dissertation which made this a challenging experience?
  - Are there any particular things that student could have done differently that would have made the experience better for them and yourself?
  
19. Thinking of the same student, can you describe your role in their progress through their project?
  - Can you explain why you took this role?
  - Was this different from the role you usually take?

20. Thinking of a student that you have supervised recently, can you explain to me the main expectations you had of them?

- Can you explain why you had these expectations?
- Are these the same expectations you have of every student, or does it vary? If so why?

### **Overall**

21. Thinking of a successful student project that you supervised recently can you talk me through the main benefits of a final year project for this student?

- What were the main things this student seemed to learn?
- In addition to learning about the topic did the student develop any particular skills or capacities?
- Why do you think this student learned so much?
- How involved was this student in the decisions about the topic they studied, their question and the design?
- How did you as a supervisor decide how much support this student needed?

22. Finally, overall what would you say you find most rewarding about working with your students?

## Appendix F- Information and consent form student questionnaires



### Plain Language Statement

**Project Title:** Investigating the psychological “fit” and interplay between dissertation students and their supervisors.

You are being invited to take part in a research study. It is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully.

The purpose of this study is to examine the working relationship of students working on research projects/dissertations and their supervisors. In particular, it aims to investigate the factors that lead to students having a good experience during the process. It will also investigate if various factors either “matching” or “mismatching” between student and supervisor have an impact on outcome. The personalities of students and supervisors will be explored, as well as the expectations of both students and supervisors about the nature of the working relationship, and the responsibilities of each within that relationship. Participants’ perceptions of the malleability of intelligence will also be examined. In addition, this questionnaire will include a short self-efficacy measure and a short autonomy measure and a scale that aims to measure your emotions and emotional responses. The extent of “match” or “mismatch” between these will then be analysed.

Thus, during this study both students and supervisors will be asked to complete a questionnaire. Both students and supervisors will be required to provide their names (and in the case of students, their matriculation numbers and the name of the supervisor of the project). However, to protect the complete confidentiality of both students and supervisors, the information containing the personal details of the students and supervisors will only be accessible to the main researcher, Niamh Friel. No member of the department/school will ever be able to identify either the student or staff member with the data.

If you wish information about the study and/or a summary of the anonymised group results to please feel free to contact me, Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk)) or either of my supervisors, Dr. Lorna Morrow ([Lorna.Morrow@glasgow.ac.uk](mailto:Lorna.Morrow@glasgow.ac.uk)) or Dr. Velda McCune ([Velda.McCune@ed.ac.uk](mailto:Velda.McCune@ed.ac.uk))



### Consent for participation in this study: Student Form

**Title of Project:** Investigating the “fit” and interplay between dissertation students and their supervisors.

**Name of Researcher:** Niamh Friel

If you agree to participate in this study then please read the following statements and sign your name below to indicate your consent.

- I have read the information form for participants and so understand the procedures and have been informed about what to expect;
- I agree to participate in this study on the “fit” between dissertation/project students and their supervisors;
- I understand that my participation in this study is voluntary, and that I can withdraw from the study, without prejudice, at any time and for any reason, without having to give a reason to the researcher;
- I understand that I may omit any questions that I would prefer not to answer;
- I understand that my participation in this project is for the purposes of research, and is in no way an evaluation of me as an individual;
- I understand that, although I am providing information regarding my identity, this will be kept confidential and no member of my department will see it. This is for the purposes of pairing the student and supervisor data, after which time the information relating to my identity will be removed, thus the data will not be identifiable to me in any way;
- I understand that all of the information I give will be made and kept anonymous, will be treated with full confidentiality and that, if published in any written output or public dissemination of the results, it will not be in any way identifiable as mine;
- I understand that my supervisor will not complete any questionnaire until after the completion of my project;
- I understand that I can contact the researcher for this project;  
Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk)) by e-mail to receive more information and/or a summary of the anonymised group results.

Name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

### Participant Information

Year of Study: \_\_\_\_\_

Name of course \_\_\_\_\_

Gender (please circle): Male/ Female

Name of final year supervisor (if known)

For fees purposes, is your normal place of residence registered as: Home EU other Non EU

Are you native English speaker? Yes No

Are you bilingual with English as one of your languages? Yes No

Age:

## Appendix G- Information and consent forms supervisor questionnaires



### Plain Language Statement

**Project Title:** Investigating the psychological “fit” and interplay between dissertation students and their supervisors.

You are being invited to take part in a research study. It is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully.

The purpose of this study is to examine the working relationship of students working on research projects/dissertations and their supervisors. In particular, it aims to investigate the factors that lead to students having a good experience during the process. It will also investigate if various factors either “matching” or “mismatching” between student and supervisor have an impact on outcome. The personalities of students and supervisors will be explored, as well as the expectations of both students and supervisors about the nature of the working relationship, and the responsibilities of each within that relationship. Participants’ perceptions of the malleability of intelligence will also be examined. In addition, there is a scale that aims to measure your emotions and emotional responses. The extent of “match” or “mismatch” between these will then be analysed. You will then be given the names of your students who have consented to taking part in the study and you are asked to select one/two of those students and complete an outcome measure of their skill development.

Thus, during this study both students and supervisors will be asked to complete a questionnaire. Both students and supervisors will be required to provide their names (and in the case of students the name of the supervisor of the project). However, to protect the complete confidentiality of both students and supervisors, the information containing the personal details of the students and supervisors will only be accessible to the main researcher, Niamh Friel. No member of the department/school will ever be able to identify either the student or staff member with the data.

If you wish information about the study and/or a summary of the anonymised group results to please feel free to contact me, Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk)) or either of my supervisors, Dr. Lorna Morrow ([Lorna.Morrow@glasgow.ac.uk](mailto:Lorna.Morrow@glasgow.ac.uk)) or Dr. Velda McCune ([Velda.McCune@ed.ac.uk](mailto:Velda.McCune@ed.ac.uk)).





### Consent for participation in this study: Supervisor Form

**Title of Project:** Investigating the “fit” and interplay between dissertation students and their supervisors.

**Name of Researcher:** Niamh Friel

If you agree to participate in this study then please read the following statements and sign your name below to indicate your consent.

- I have read the information form for participants and so understand the procedures and have been informed about what to expect;
- I agree to participate in this study on the “fit” between dissertation/project students and their supervisors;
- I understand that my participation in this study is voluntary, and that I can withdraw from the study at any time and for any reason;
- I understand that I may omit any questions that I would prefer not to answer;
- I understand that my participation in this project is for the purposes of research, and is in no way an evaluation of me as an individual;
- I understand that, although I am providing information regarding my identity, this will be kept confidential and no member of my department will see it. This is for the purposes of pairing the student and supervisor data, after which time the information relating to my identity will be removed, thus the data will not be identifiable to me in any way;
- I understand that all of the information I give will be made and kept anonymous, will be treated with full confidentiality and that, if published in any written output or public dissemination of the results, it will not be in any way identifiable as mine;
- I understand that I can contact the researcher for this project;  
Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk))  
by e-mail to receive more information and/or a summary of the anonymised group results.

Name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

### Participant Information

Sex M/F

For how many years have you been teaching (in this and/or other institutions)?

\_\_\_\_\_

## Appendix H- Information and consent forms staff and student interviews



### Plain Language Statement

**Project Title:** Investigating the “fit” and interplay between dissertation students and their supervisors.

**Researcher:** Niamh Friel

You are being invited to take part in a research study. It is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully. After reading the information please show your consent to taking part by signing and dating the consent form.

The purpose of this study is to examine the working relationship of students engaged in research projects/dissertations and their supervisors. In particular, it aims to investigate the factors that lead to students having a good experience during the process. This study is a qualitative study and both students and staff involved in supervision will be interviewed individually and given the opportunity to express their views on the topic. It is hoped that students and supervisors can share their experiences of the process.

You have been invited to take part because you are either the supervisor of undergraduate/masters students or you are a final year undergraduate student/masters student and are therefore currently involved in the supervision process at university level. You will be asked a series of questions about supervision and the experience of conducting a project. Your answers will be recorded using an audio recording device, and will be transcribed at a later date. The whole interview will take a maximum of 1 hour. Participation is voluntary and you may withdraw from the study at any point and for any reason, without having to give a reason to the researcher. You may also have the right to omit any questions you do not wish to answer. If you have any queries with regard to this study, you may ask the researcher at any point.

All information obtained will remain confidential. Signed consent forms will be stored separately from the audio recordings and transcriptions, thus providing complete anonymity. Student and supervisor data will be paired, if both have been interviewed, and then anonymised. Crucially, your supervisor/student will never be aware of you participating or withdrawing. The only information about you which will be kept is the audio recording and the anonymised transcription. These audio recordings will be accessible to only the main researcher but some anonymised transcripts will be shared with her supervisors. The digital audio recordings will be stored on a password protected computer. On completion of the project, the audio recordings will be destroyed. Any quotes reported in any written output from the project will have any potentially identifying information removed and will not be reported in paired format.

If you are happy to be involved in the project, you will now be asked to sign a consent form to confirm this. If you wish information about the study and/or a summary of the anonymised group results please feel free to contact me, Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk)) or either of my supervisors, Dr. Lorna Morrow ([Lorna.Morrow@glasgow.ac.uk](mailto:Lorna.Morrow@glasgow.ac.uk)) or Dr. Velda McCune ([Velda.McCune@ed.ac.uk](mailto:Velda.McCune@ed.ac.uk))



### Consent for participation in this study: Student Form

**Title of Project:** Investigating the “fit” and interplay between dissertation students and their supervisors.

**Name of Researcher:** Niamh Friel

If you agree to participate in this study then please read the following statements and sign your name below to indicate your consent.

- I have read the Plain Language Statement for participants and so understand the procedures and have been informed about what to expect;
- I agree to participate in this study on the “fit” between dissertation/project students and their supervisors;
- I understand that my participation in this study is voluntary, and that I can withdraw from the study, without prejudice, at any time and for any reason, without having to give a reason to the researcher;
- I understand that I may omit any questions that I would prefer not to answer;
- I understand that my participation in this project is for the purposes of research, and is in no way an evaluation of me as an individual;
- I consent to being audio recorded as part of the project;
- I understand that any information recorded in the investigation will be made and kept anonymous and will remain confidential and no information that identifies me will be made publicly available;
- I understand that my supervisor will never be aware of my participation or withdrawal from the interview.
- I understand that I can contact the researcher for this project;  
Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk))  
by e-mail to receive more information and/or a summary of the anonymised group results.

Name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

Name of Final Year Supervisor:



### Consent for participation in this study: Supervisor Form

**Title of Project:** Investigating the “fit” and interplay between dissertation students and their supervisors.

**Name of Researcher:** Niamh Friel

If you agree to participate in this study then please read the following statements and sign your name below to indicate your consent.

- I have read the Plain Language Statement for participants and so understand the procedures and have been informed about what to expect;
- I agree to participate in this study on the “fit” between dissertation/project students and their supervisors;
- I understand that my participation in this study is voluntary, and that I can withdraw from the study at any time and for any reason;
- I understand that I may omit any questions that I would prefer not to answer;
- I understand that my participation in this project is for the purposes of research, and is in no way an evaluation of me as an individual;
- I consent to being audio recorded as part of the project;
- I understand that any information recorded in the investigation will be made and kept anonymous and will remain confidential and no information that identifies me will be made publicly available;
- I understand that I can contact the researcher for this project;  
Niamh Friel ([n.friel.1@research.gla.ac.uk](mailto:n.friel.1@research.gla.ac.uk))  
by e-mail to receive more information and/or a summary of the anonymised group results.

Name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

## Appendix I- Coding template

### Cross checking Coding Template

- Factors students and staff discuss as being important for influencing students choice of supervisor

*In this theme record anything that sets the context for how students went about choosing their supervisor. In addition staff reflect on what they think is important as well as what they think students think is important. There are 3 different possibilities (personal attributes; research interests; did not have a choice). Often students discussed the reasons and implications of these choices, so it would be good to record these.*

- Personal attributes
  - Research interests
  - Did not have a choice
- 

- Match & mismatch quotes

*In this theme record anything the student/supervisor has said that could be related to match or mismatch and the impact of this. For example, students and supervisors both discuss their own characteristics as “fitting” with the students/supervisors. Sometimes this was because they believed they had similar traits/skills/beliefs and sometimes this was because they believed they had different but complementary traits/skills/beliefs. Three sub-themes within this idea of match/mismatch seem to be evident.*

- Personality/Personal Characteristics
    - personality/personal characteristics - similar;
    - personality/personal characteristics - complementary;
    - personality/personal characteristics-clashing
  - Expectations
    - expectations - similar;
    - expectations - complementary;
    - expectations-clashing
  - Research interests/research ideas
    - Research interests/ideas- similar
    - Research interests/ideas- complementary
    - Research interests/ideas-clashing
- 

- What, if anything do students perceive to be characteristics of a “good” supervisor?

*In this theme record anything that students believe are characteristic of good supervision. In the interviews students reflect on the qualities their own supervisor had that they believed to be good, but they often also reflected on the qualities of their ideal supervisor.*

- **Availability**

*In this sub-theme record data that relates to students being able to contact their supervisor when they felt they needed to.*

- **Clear and open communication**

*In this sub-theme record anything that relates to the importance of clear and open communication between student and supervisor.*

- **Personal traits**

*In this sub-theme record data that relates to the personal traits students felt to be important in their supervisors.*

- **Approachability/welcoming**
- **Ability to understand/relate to things from the students perspective**
- **Good listener**
- **Openness to student input**
- **Was able to judge support and give correct amount**

- **Knowledge and research experience**

*In this sub-theme record data that relates to the importance of the supervisor being knowledgeable about the research topic and research practice.*

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- **What is supervision student and supervisor reflections**

*This theme comes from a question in the interview schedule. Both students and supervisors were asked to reflect on what supervision is and what it means to them. Sometimes some of the students and supervisors reflect on this before they are asked to. There are a range of responses, so I thought it might be interesting to look at this. 4 sub themes emerge from this:*

- **Shared process between staff and students**

*In this sub-theme record anything that related to the way the project is negotiated between staff and students.*

- **An emotional, interpersonal experience**

*In this theme record any data that suggests students/staff believe the process of the project is primarily a personal one, which is driven by emotional/relational aspects.*

- **An academic learning experience**

*In this theme record any data that suggests students/staff believe the process of the project is primarily an academic one.*

- **Complex interaction of the academic and personal aspects of supervision**

*In this theme record any data that suggests students/staff believed the process of the project was both academic and*

*personal and these could not be clearly divided.*

- 
- Do students/supervisors believe students have developed in key skills during the course of their project?

*Students and supervisors reflect on the main skills they think are developed from engaging with a project. These skills divide into two different types. So, in this theme record the different types of development that takes place under the following two sub-themes. These sub-themes can be divided into undergraduate and masters students.*

### **Undergraduate Students**

- transferable skills

*In this sub-theme record any skills that students believed they have developed that are transferable (e.g. organisation and time management)*

- Time management
- Communication
- Organisational
- Working with others

- Discipline specific skills

*In this sub-theme record any skills that students believed they have developed that are discipline specific.*

- developing skill in academic writing
- Technical discipline skills- e.g. programming, coding, interviewing
- Statistics/qualitative analysis skills
- Critical engagement with research

### **Masters students**

- transferable skills

*In this sub-theme record any skills that students believed they have developed that are transferable (e.g. organisation and time management)*

- Time management
- Communication
- Organisational
- Working with others

- Discipline specific skills

*In this sub-theme record any skills that students believed they have developed that are discipline specific.*

- developing skill in academic writing
- Technical discipline skills- e.g. programming, coding, interviewing
- Statistics/qualitative analysis skills
- Critical engagement with research



- 
- What do students/supervisors discuss in relation to their theory of intelligence, expectations, self-efficacy autonomy? In addition to the presence of these factors do any of the interviews suggest these psychological factors develop over the course of their project? Do these factors have an impact on how they perceived the process?

*In this theme record anything that relates to students' attitudes towards the psychological factors named above. In addition, if there has been any change in these attitudes record this as this could be evidence of students development as learners.*

- **theory of intelligence**

*In this sub-theme record anything that shows students' mindset in relation to their studies, this may be incremental or entity. In addition record anything that suggests students have had a change of mind-set over the course of their project. For example some of the students discuss how at the start they thought they didn't know they answers to things, but through the course of their project they realised they didn't have to know the answers as long as they knew how to find out. Implicit theories of intelligence are assumptions that an individual makes about the malleability of their intelligence (Dweck, 2008). Individuals differ with regard to how they view their own intelligence. Dweck (1999, 2006) proposed that students can have two beliefs about their intelligence. They either adopt the Entity theory or the Incremental theory. Those that hold the entity view of intelligence believe intellectual ability is a fixed trait. On the other hand, those that have the incremental view believe that their intellectual ability is something they can develop through education and hard work. This clearly could have an impact on performance.*

- **Entity**
- **Incremental**
- **Evidence of change of mindset**

- **self-efficacy**

*In this theme record anything that outlines students' self-efficacy or supervisors' beliefs about students' self-efficacy. In addition in this theme there seems to be a lot of developmental data which suggests that students/staff believe they/students have learned from their experience and are confident that they can do it again. Often students discuss that they could apply what they have learned to a different context. Self-efficacy is described by Bandura (1986) as a belief about one's ability to produce a desired outcome. Self-efficacy has been researched in a variety of different domains, for example, sport, educational attainment and the ability to diet and exercise, human resources, information systems, sales, and entrepreneurship(e.g., Bandura, 1997, Barling & Beattie, 1983; Chen, Greene, & Crick, 1998; Gist, 1987; Igbaria*



& livari, 1995; Wood & Bandura, 1989). Self-efficacy is not related to a person's actual ability per se, but rather is more concerned with a person's perceived competence at any given activity, so self-efficacy could be described as a situational specific self-confidence (Bandura, 1988). Bandura (1986) suggested that the way in which individuals behave is best predicted by the beliefs they hold about their capabilities rather than what they are actually capable of accomplishing. Self-efficacy perceptions help to determine what individuals do with the skills and knowledge that they possess.

- **Perceptions of autonomy**

*In this theme record anything that is related to the levels of autonomy given to students during the course of their project. In addition code anything that suggests development/facilitation of student autonomy. During the interview students and supervisors had differing views about how autonomous the project should be for students. Autonomy is often defined as a quality or state of functioning independently without the control of others (MacDonald, 2002). It is a psychological characteristic of individuals who are able to independently direct their own learning (Knowles 1980; Merriam and Caffarella 1999; Ponton 1999). Autonomous learning is described as the learner's ability to acquire knowledge, skills or values independently by processes that he/she determines (Chene 1983). Holec (1981), defines autonomous learning as the ability to take charge of one's learning.*

- **Practical Aspects: What students/supervisors thought should happen:**

- **Students/supervisors perceptions of autonomy: Prefer supervisor led project**

*Some of the students and supervisors preferred the supervisor to set the topic etc. Students/supervisors reflected on the benefits of this. Record any of these reflections in this theme.*

- **Student/supervisors perceptions of autonomy: Prefer student led project**

*Some of the students and supervisors preferred students to choose their topics. Students/supervisors reflected on the benefits of this. Record any of these reflections in this theme.*

- **Student/supervisors perceptions of autonomy: Project as an negotiation**

- **Practical Aspects: What actually happened during the process:**
  - **Supervisor led project**  
*In practice sometimes the process became supervisor led. Both students and supervisors reflect on this. Record in this theme any parts of the interview that suggest that in practice this is what happens.*
  - **Student led project**  
*In practice sometimes the process became student led. Both students and supervisors reflect on this. Record in this theme any parts of the interview that suggest that in practice this is what happens.*
  - **Project as an negotiation**
- **Perceptions of how students become autonomous learners**
  - **Autonomy: set trajectory from high levels of support which gradually reduce throughout the project.**  
*There was, a view amongst some, that autonomy should develop over the project and students should become more independent. Record any of these reflections under this theme.*
  - **Autonomy: flexible process- doesn't change from high support to low support as the project processes, but there are different levels at different times**  
*There is a common perception that as students move through university they become more autonomous. However, in this data there is evidence that it is not as straightforward as this. Students reflected on the fact they needed differing levels of input at different times. Record any of these reflections in this theme.*

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- **Perceptions of feedback**

*Throughout all of the interviews students and supervisors reflected on the feedback they gave/were given. Supervisors reflected on why they give feedback in this way. Students reflected on the types of feedback they received and how helpful this was. In this theme record instances where students and staff discuss giving/receiving feedback on student projects. Also code anything which outlines the implications of this.*

- **Feedback: Helpful**
  - **Written**
  - **Verbal**

- *Both written and verbal*
- *Feedback: Not helpful*
  - *Written*
  - *Verbal*
  - *Both written and verbal*
- *Feedback: Not given*

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- **Students/Supervisors feelings throughout the process**

*Throughout all the student interviews the emotional aspects of engaging with a project came out very strongly. Students experienced different stages in the process. In this theme I have noted the emotions students discuss. So here, code each emotional response to the project to the appropriate sub-theme along with the reason this response was provoked.*

***Masters students***

- *Anxiety*
- *Frustration*
- *Sense of failure*
- *Excitement*
- *Pride*

***Undergraduate students***

- *Anxiety*
- *Frustration*
- *Sense of failure*
- *Excitement*
- *Pride*

***Supervisors***

- *Anxiety*
- *Frustration*
- *Enjoyment*
- *Reward*