The Influence of Teacher-Student Relationships and Feedback on Students' Engagement with Learning

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By

Roger Wood

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To

Inge

For your unwavering love, encouragement, support and belief in me and us throughout what has been a true journey of self-determination.

Thank you for being all of my reasons.

CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

PREFACE

Empirical research that has applied Self-Determination Theory (SDT) within classrooms suggests that the combined satisfaction of three basic psychological needs predicts students' motivation to engage with learning activities. These three basic needs are relatedness, which, for the purposes of the current research, takes the form of a positive teacher-student relationship, to perceive themselves as being competent and having competence, and to be autonomous. The quality of the teacher-student relationship has been alluded to as a "supplement" within the SDT model, with autonomy and competence more often being emphasised as the basis for self-determined engagement (Ryan and Deci, 2009, p. 178). However, the evidence within the current research suggests that student-perceived positive teacher-student relationships are the essential catalysts that inform the quality of students' engagement via the enhancement of perceived competence.

Amongst the discussed research, there was a commonality regarding teacher behaviours and methods that have an influence upon students' perceived competence and motivation to be autonomous are optimized when students perceive that they have a positive relationship with the teacher within the classroom. Where there is a perceived positive teacher-student relationship, different forms of motivation were found to be enhanced. These include intrinsic motivation, extrinsic motivation to work towards goals that are regarded as having a personal value, competence motivation and autonomous motivation (Hughes et al., 2008; Ryan and Deci, 2009). The desire for autonomy also appears to have a motivating impact upon perceived competence and the resultant competence motivation and intrinsic motivation to engage with learning. However, whilst the assertion that the satisfied desire for a positive teacher-student relationship and to feel competent is predictive of the motivation to be autonomous is supported across the current research, each SDT construct may have different interplay implications and precursors in terms of their impact upon students' motivation to learn. For example, with regards to autonomy, students' motivation to exercise their own autonomy originated with the students' affect-driven feelings of perceived competence, self-agency and self-determination.

The motivational perceptions that appear to inform the influence of the teacher-student relationship quality upon competence, and vice-versa, have been unravelled and discussed in detail within this book. The discussion has been approached with the objective of gaining an enhanced conceptual understanding as to how the motivational interplay between the three SDT constructs may merge to create various motivational pathways leading to students' engagement with learning activities (see Chapter 7). This includes some of the variables which prior research has argued to be pivotal to the potential motivational pathways between the teacher-student relationship and students' learning engagement. These variables have been selected as they have consistently emerged, across all four of the data collection methods that I utilized within the current research, as having a strong impact upon students' motivation to engage themselves in learning within classrooms and their schooling in general.

Further to the findings of such prior research and the current research, it is posited that in learning environments where the teacher affords learning activities that enable students to make positive progress on a regular basis, there should be a positive reciprocal impact upon perceived competence and self-efficacy (Marsh and Martin, 2011; Valentine et al., 2004). Further to such assertions, the current research has not only found that the associations between SDT-informed motivational variables are reciprocal in influence, it also shows which of the constituent variables has a greater influence upon the others. Furthermore, the current research supports the claim that the motivation to be autonomous is an outcome dependent upon the combined motivational impact of students' perceptions of the quality of the teacher-student relationship and their own perceived competence.

Across the research, the key puzzle that was solved revolved around the hierarchical sequence of the SDT basic psychological needs. Similar findings revealed that factors that were predictive of and are predicted by a positive teacher-student relationship include a teacher who is;

1. receptive to students' perceived competence and self-confidence;
2. mindful of students' competence levels, allowing learning to progress at an appropriate pace;
3. adept at explaining scientific concepts and theories in such a way that all students may understand them;
4. providing opportunities for the students to discuss their ideas and explore their understanding of subject-specific concepts;
5. providing opportunities for the students to demonstrate their mastery, understanding and application of subject-specific concepts;

6. listening to students, acknowledging their ideas and questions; positive and encouraging in his feedback about a student's progress and competence, including the correction of misunderstandings;
7. perceived to be working hard to help students develop their competence and understanding of subject-specific concepts and processes;
8. treating all students fairly and equally, avoiding nepotism, and;
9. is adept at maintaining good relationships with students outside of lessons.

Therefore, the motivation to be autonomous emerged as a potential outcome, influenced and informed by the students' perceived competence and the perceived quality of the teacher-student relationship. These findings were the basis for three claims to knowledge regarding the impact that the satisfaction of the three basic psychological needs, central to SDT, upon students' engagement with learning activities. These claims are:

1. an individual's motivation to be autonomous (SDT; autonomy) is an outcome dependent upon students' satisfied needs for both a positive teacher-student relationship (SDT: relatedness) and perceived competence (SDT: competence);
2. that perceived competence is informed by and reciprocally informs the quality of the teacher-student relationship, and;
3. that there is a potential cumulative connection between students' perceived competence and the quality of the teacher-student relationship, in terms of the combined impact upon the quality and persistence of autonomous motivation.

In conclusion, it is argued that the three SDT constructs are hierarchical, in that there is an order of influence from the teacher-student relationship quality (SDT: relatedness) and perceived competence (SDT: competence) upon the quality and persistence of students' motivated desire to be autonomous during learning activities (SDT: autonomy). This led to a model of motivational pathways that may enhance teachers' understanding of students' motivation to engage with learning activities (Figure 7.2). The emergent research findings allowed this model to evolve longitudinally, revealing interplay between a variety of SDT and related variables. This model has been presented in such a way that it may be further applied and modified by academics and practitioners as part of their classroom-based research agendas.

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My thanks to all my colleagues within the School of Teacher Development at Bishop Grossesteste University, especially fellow members of the Primary PGCE Team during my involvement from 2015 to 2017. In particular, I extend my grateful thanks to Dr. John Paramore, Sue Lambert, Rachael Paige, Dr. Steve Puttick, Andy Dickenson, Dr. Kate Adams, and Dr. Jack Cunningham for their encouragement, support, good humour and wise counsel during my first two years of University teaching and research.

The ability to be able to access all of the books and resources that I needed was only achievable due to the extremely helpful librarians within the main libraries at the University of Cambridge, the University of Birmingham, Bishop Grosseteste University, the University of Stirling and the University of Dundee. I am grateful to them all for their patience and kindness during my innumerable visits.

To the children who participated in the research: Learn from yesterday, live for today, hope for tomorrow. I ask that you never stop questioning everything that happens in our individual worlds, and never be afraid to ask what others may regard as the naïve question. To ask questions and to question things does not reveal a lack of knowledge; it reveals someone who is curious, keen to find out about themselves and their individual multiverses, and to get things right inside their own minds. It also saves a lot of time trying to 'figure things out'!

As Richard Feynman said, "I would rather have questions that can't be answered than answers that can't be questioned." The children who participated in my research were, indeed, refreshingly honest and forthright, and took a great deal of interest in my research as they foresaw

the benefits for, not least, their longer-term enjoyment of and engagement with science. My time with them, throughout my studies, helped me to retain a sense of proportion and some semblance of sanity.

To the children who attended Highfields School, in Nottinghamshire, between 2004 and 2011: thank you for allowing me to escape your clutches after seven years as Headmaster. The change of direction in my career has enabled me to form an even greater appreciation of what it means to be truly in touch with children's logic, optimism, humour and their unstinting drive to succeed. All without me having to read a single Dr. Seuss (moral philosophy) book!!

Much love and thanks to my family, who shall remain nameless as it is ever growing in size and I do not want to miss anyone out! However, my two sons, their wives and my five grandchildren have been and will always be a constant source of joy, pride and love to me.

Through their example and encouragement, my children, grandchildren and students have taught me and continue to teach me that learning about the world and the worlds inside our minds never stops, and that discoveries come from playing and exploring through an unleashed imagination, combined with enthusiasm and curiosity. If ever you are fortunate enough to find a child who will take you on such a voyage, enjoy the journey: you will see the world in a new light. This is just one of the many reasons why I love working with and have been inspired by all of the children I have met.

Most of all, to my wife and best friend, Inge, I give my ever-grateful thanks and love, as the undertaking and completion of this research has been a test of self-determination, self-regulation, motivation and engagement for us both over the past five years! I have dedicated this thesis to you as a modest thank you for your unwavering love, encouragement, support and belief in me and us throughout. Thank you for being all of my reasons.

Roger Wood
Perthshire, Lincoln and Cambridge

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AUTHOR BIOGRAPHY

At the time of writing, Dr. Roger Wood was a Senior Lecturer in Primary Teacher Development at Bishop Grosseteste University, having previously been a primary school teacher and headteacher for 23 years. Since August 2017, he has been a Lecturer in Education at the University of Aberdeen. Dr. Wood is a scientist and Chartered Biologist by background. His work in science education, conservation and primatology has led to his election to a number of Fellowships including the Royal Society of Biology, the Royal Scottish Society of Arts, the Linnean Society, and the Royal Society of Arts. He is a Fully Registered Teacher with the General Teaching Council for Scotland and a Fellow of the Higher Education Academy. In addition, he is a Member of the Institute of Physics, the British Philosophical Association, the Institute of Philosophy, the Philosophy of Education Society of Great Britain, the Moral Sciences Club (Faculty of Philosophy, University of Cambridge), the British Educational Research Association, and the Scottish Educational Research Association. Since September 2016, Dr. Wood has been a Board Member with the chimpanzee conservation charity, the Jane Goodall Institute UK. Dr. Wood's research focuses upon interpreting and understanding outcomes of human philosophizing, including confidence-informed social motivation and the impact upon the context-based endeavours of children, adolescents and teachers. This includes identifying teacher behaviours and methods that enhance students' motivation for and engagement with school-based formal and informal learning.

CHAPTER ONE

GENERAL INTRODUCTION

1.1 The Research Questions

The research within this book has addressed two research questions. These questions initially emerged from the literature review. The school-based research (Chapters 4 and 5) evolved from the common findings of a meta-ethnographic review (Chapter 3) and was triangulated by an online questionnaire (Chapter 6). The current research applied the Self-Determination Theory (SDT: Ryan and Deci, 2000) as a single theory-informed means of addressing the following research questions:

1. What does SDT-embedded evidence reveal to be the strongest sociocultural motivational influences upon the students' engagement with learning?
2. What do students regard as the key influences that have an impact upon their motivated engagement with learning activities?

1.2 The background to the Research Questions

This research has sought to identify and explain some of the key contextual variables that enhance students' self-determined engagement with learning activities. These variables have specifically focused upon teacher behaviours and methods that have a positive impact upon students' motivation to engage with learning. This includes the impact of such behaviours and methods upon students' perceptions of the quality of the teacher-student relationship.

A review of prior research investigating students' engagement within classroom-based learning activities revealed common variables that suggest a potential reciprocal relationship between the students' perceived quality of the teacher-student relationship, the students' domain-specific perceptions that they have the competence to achieve desired outcomes during learning activities, and the extent to which they felt motivated to be autonomous during the said learning activities (for example, Skinner and

Belmont, 1993). All three variables are the central constructs of the Self-Determination Theory: the authors of SDT propose that the satisfaction of three basic psychological needs (BPNs) will lead to students' enhanced motivation to engage with learning activities (SDT: Ryan and Deci, 2000, 2009). (For the purposes of the current research, the definition of the SDT construct of 'relatedness' is the students' perceptions of the quality of the teacher-student relationship). As a theoretical lens. SDT has been shown, through extensive research, to be an effective theory for identifying and explaining why some key classroom-based behaviours and variables appear to influence the students' engagement more than others (Reeve, 2002, 2012). It is a sociocultural motivational theory that has been effectively applied within schools as a basis for developing evidence-based practice (Ryan and Deci, 2009).

   The tenets of the three SDT constructs informed the choice of research methods within the current research, and, therein, the choice of statements and questions asked – hence forming the student questionnaires, focus group interviews, and online survey of former students. Such channelling of statements and questions was necessary for the focused understanding and defining of engagement behaviours and motivational factors that influence students' effortful and sustained engagement with learning. The use of SDT has enabled the identification and discussion of methods and behaviours that teacher-researchers have used and may use to enhance and sustain their students' engagement during learning activities. In addition, the current study has addressed an identified gap in the prior research: SDT had not previously been tested within the science education provision of a British school.

   In conclusion, within the current research, SDT has enabled a critical constructivist approach to the analysis of evidence and the conclusions drawn from such evidence, as the theory has enabled critical meaning, understanding and significance (Kincheloe, 2012, p. 154). Clearly, such evidence and the conclusions drawn will need to be tested and researched further to evaluate how their use in classrooms may impact upon the enhancement of teachers' evidence-based professional practice and further teacher inquiry (Hall, 2009; Thomas and Pring, 2004). Therefore, the next stage in my research journey will be to further apply and embed my conclusions through, for example, school-based action research as a basis for generating living theory that informs and improves teaching and learning (McNiff and Whitehead, 2010, 2011; Pring, 2000; Whitehead, 2008, 2009).

1.3   The Motivation for this Research

This research emerged from my desire to solve a long-standing puzzle central to my professional practice as a science teacher: to gain a greater, informed understanding of how I could improve the learning experiences of my students aged between 8 and 13 years by influencing their motivated engagement with learning. I was keen to understand how and why students are intrinsically and extrinsically engaged in their own learning, and the part that teachers can play in enhancing and encouraging the translation of students' self-determined motivation into engagement. This desire for understanding included the wish to increase my professional awareness of some of the motivating experiences that informed the students' self-reported reasons for why they felt motivated to fully engage in learning activities during lessons. The central aim of the outcomes of this research is to present the areas investigated and the findings obtained in such a way that they can be applied by teachers within their own classrooms as a means of improving and developing both their evidence-informed professional practice and further in-school research (Abrahams, 2011; Cordingley, 2004; IES, 2013; Muschamp, 2013; Southerland et al., 2014: Thomas, 2002, 2004, 2007). This aim is revisited and discussed in Chapter 7.

Prior to the start of my doctorate in September 2011, I had completed 21 years in teaching: this included thirteen years within a variety of headships and a deputy headship. For most of my career, I taught Science with students aged between 8 and 13. My students appeared to be motivated to learn science, as they were fully engaged in the learning activities that I had planned and provided for them. I became increasingly interested in how perceptions of motivation and engagement influenced the students that I was teaching, and, therefore, how I could, through evidence-informed practice, have an increased positive impact upon these perceptions and indirectly, on academic achievement. In terms of outcomes, I wanted to increase the awareness of key classroom variables that have a positive influence upon students' motivational intentions and engaged behaviours within learning activities in general.

The viability of such an approach to undertaking research that is intended to ensure the generalisability of the findings was influenced by the views of Pring (2000), who notes that no one classroom situation is unique in every respect, and that the research findings that emanate from one setting can be used to inform and suggest similar appropriate practice in other classrooms (p. 133). That is, "… there are sufficient similarities between contexts, and there is often sufficient agreement on understandings

and values, for well-tested hypotheses in one situation to illuminate similar practice undertaken by others" (Pring, 2000, pp. 136 – 137). This aim is revisited and discussed in section 7.4.

The motivation for the current research began with the desire to gain a more informed understanding of the key teacher behaviours and methods that have an impact on the students' engagement. The findings of prior research revealed common variables that appeared to be central to students' motivated engagement with learning activities. From the research literature, during the first year of my research, I found that Self-Determination Theory (SDT: Ryan and Deci, 2000) had been frequently used within classroom-based research as a means of enhancing the educators' understanding of how students' engagement was motivated (see Chapter 2). However, there were no specific written or diagrammatic motivational pathways considering the interplay between the perceived quality of the teacher-student relationship (relatedness), competence and autonomy centred upon learning activities, as all three constructs were usually shown as being simultaneous in action and influence. The application of SDT as a focal lens has not been about finding supporting evidence for its applicability as a theory or, indeed, regarding SDT as evidence. Instead, the purpose has been to use SDT as a means of gaining an informed understanding of some of the key teacher behaviours and methods that, from students' perspectives, have a significant impact upon the students' motivation to engage with learning (further information may be found in section 1.5).

1.4 Objectives of the Research

Gaps in the research literature (see section 1.6), together with the professional desire to gain an informed in-depth understanding of some of the factors influencing students' engagement with learning activities, led to the following research objectives:

1. To identify and understand the key motivational variables that teachers can devote their energies to as informed means of supporting and enhancing their students' engagement behaviours and responses within classrooms;
2. To outline key common behaviours and characteristics of teachers that students regard as being most influential upon their engagement with learning activities, and;
3. To investigate the motivational relationships between teachers' relational behaviours, students' self-attributes (especially, perceived

competence), and their perception of autonomy supported learning, together with the relative influential hierarchies of such variables based upon students' self-reported perceptions of their engagement with learning.

1.5   The Significance of the Research

Students' declining motivation to engage with learning has been reported across the whole range of school grades over several decades (for example, Eccles et al, 1984; Fredricks and Eccles, 2002; Fredricks et al, 2004). Positive psychosocial development is embedded in many interrelated sociocultural contexts that each influence students' motivated engagement, mainly due to repeated positive experiences that lead to sustained positive outcomes (Eccles and Gootman, 2002) such as academic achievement (Connell et al, 1994; Connell and Wellborn, 1991. 1994; Skinner et al, 1990), social functioning, well-being (Fredricks, 2011), as well as reduced dropout rates, boredom and disengagement with learning activities (Fredricks, 2011: Fredricks et al, 2004; Fredricks and Eccles, 2006).

The individual teacher has been asserted as the key factor in motivating students to engage with learning activities within their specific educational contexts (Martin and Dowson, 2009; Reeve, 2002, 2012; Reeve and Tseng, 2011; Royal Society, 2007; Ryan and Deci, 2009: Willms, 2003). A teacher whose behaviours reveal a positive attitude and enthusiasm for learning within a specific curricula subject is more likely to have students who develop positive affect and enthusiasm for learning and achievement within the subject (Fredricks et al., 2004; Jarvis and Pell, 2005; Jennings, 2003; Jimerson et al., 2003; Tymms et al., 2008).

Teachers' ability to engage students' interest and participation in their schooling in general (Christenson et al., 2012; Klem and Connell, 2004; Skinner and Belmont, 1993) and specifically within science (Ainley and Ainley, 2011ab; Darby, 2005; Royal Society, 2010) is regarded as essential for sustained academic achievement (Christenson et al., 2012; Fredricks et al., 2004; Marsh and Martin, 2011; Reeve, 2002, 2012). Some of these researchers have posited a reciprocal relationship between positive engagement and academic achievement within specific curriculum areas, such as science (for example, Darby, 2005; Marsh and Martin, 2011). For example, the Programme for International Student Assessment (PISA: OECD, 2000, 2013) and Trends in International Mathematics and Science Study (TIMSS: Martin et al., 2012), have proposed a causal link between students' positive academic engagement

and the subsequent improvements that students make in their academic achievement in that subject (Willms, 2003). One of the aims of developing an engaging science education within school settings is to develop and maintain a scientifically literate and capable workforce (Painter, 2011). However, this aim may not have been universally met, as a review of PISA 2009 (OECD, 2010) revealed that,

> "Consistent with PISA results, the average scores of U.S. students on … (TIMSS) from 1995 to 2007 remained flat … The 2009 National Assessment of Educational Progress (NAEP) in science revealed that only 34% of fourth graders, 30% of eighth graders, and 21% of 12th graders performed at or above the proficiency level in science ... Even more distressing, only 1% of fourth graders, 2% of eighth graders, and 1% of 12th graders performed at an advanced level."

> (Painter, 2011, pp. 1 – 2)

This reported disengagement with science as a school-based subject was reported as prevalent amongst children aged 9+ years across 26 countries in TIMSS 2007 (IEA, 2008). It was reported that between 40 % and 60 % of high school students were chronically disengaged within their academic studies including science (Tymms et al., 2008). This had been also reported in the results of the TIMSS surveys of 1995, 1999 (Mullis et al, 2000) and 2003, which have suggested a continuing trend in that students have reported that they have enjoyed or are studying science less over time (Abrahams, 2007; Dunbar, 1995; Lee and Anderson, 1993; Martin et al., 1997, 2004; Osborne et al., 2003; Tymms et al., 2008; Vedder-Weiss and Fortus, 2011, 2012). Indeed, the House of Commons Science Technology Committee (2002), OECD (2007) and Royal Society (2006, 2008, 2010) have independently reported a decline in the percentages of students who were choosing to study science beyond compulsory schooling. This same report recommended that those involved in the policy and practice of science education needed to consider ways of engaging more students with science, and thus reverse the recorded decline in interest in the subject. The outcomes of OECD (2007) revealed that there had been little positive change, over time, in students' overall motivation for science, particularly in Great Britain.

Amongst the key findings of TIMSS 2011 (Martin et al., 2012) there was a significant positive correlation between higher levels of academic achievement within science assessments and students' liking of science as a subject, academic self-concept, perceived value of, and engagement with science (Martin et al., 2012). The report highlighted the continuing on-

going decline in students' enjoyment, confidence, engagement and perceived value of science between the ages of 10 and 15 years (pp. 17-21). While the results asserted that positive attitudes and engagement with science had a positive relationship with improvement within science achievement, the survey found that attitudes were more positive at Fourth Grade (students aged 9-10) than Eighth Grade (students aged 13-14). By the Eighth Grade, only a quarter of the student respondents stated that they were engaged by science lessons with almost another quarter stating that they were not engaged by science lessons (Martin et al., 2012, p. 329).

This asserted disengagement with science and the purported influence of the teacher upon students' enjoyment, engagement and mastery of science within classrooms across a wide range of countries was a key motivator for this research study: the desire to investigate and understand the classroom contextual variables that could be implemented by teacher within schools as a means of influencing their students' affective, cognitive and academic engagement with both science (investigated through the questionnaires and focus group interviews herein) and school-based learning in general (investigated through the MER and online survey herein).

The desire for such understanding is similarly central to many research studies that have investigated school-based engagement (Martin et al., 2012). Fredricks et al. (2004) noted that the degree to which the three SDT needs mediate between teacher behaviour contextual factors and engagement had not been investigated by most studies seeking to understand engagement, and that least studied are the motivational relationships between perceived competence and students' persistent engagement with learning (p. 82). They suggest that further research is needed to investigate the interplay between different components informing engagement as a multidimensional concept, as many studies have not encompassed a consideration of how cognitive factors such as perceived competence and self-efficacy interplay with affect and behavioural outcomes to inform students' motivated engagement with learning activities (Fredricks et al., 2004, p. 83). Where models have been posited, the antecedents are often shown as simultaneous or as a simplistic linear relationship. However, nonlinear relationships have been proposed where particular needs and variables that influence engagement appear to have a greater impact comparative to others. This includes the question of whether some needs are required as the threshold for other needs to be motivated, or whether a larger amount of one component is sufficient to compensate for less of another (p. 83). As part of such research, the reciprocal relations between social contextual factors, academic

perceptions and engagement could be investigated (Fredricks et al., 2004; Skinner and Belmont, 1993). In addition, there may be differences in the interplay between how needs and contextual variables influence engagement across different developmental stages, as "students may not become deeply invested in learning until they have the intellectual capacity to self-regulate and become intentional learners, which tends to occur at later ages" (Fredricks et al., 2004, p. 84). In addition, it was noted that 'The presumption is that support from the teacher meets an individual's need for relatedness; but, for the most part, the mediation assumption has not been tested' (Fredricks et al, 2004, p. 86).

The current research was approached with the view that it may be, therefore, that engagement is an outcome that is manifested in response to the motivation that students gain from the teacher satisfying the need for competence or autonomy, or both. Further to the meta-ethnographic review (MER), it appeared that there may be a hierarchy amongst SDT constructs in terms of their impact upon each other and, as an outcome, engagement. Indeed, a hierarchy amongst types of engagement has previously been proposed by Reschly and Christenson (2006, 2012) in that they argue that cognitive and emotional engagement precede and inform the quality and persistence of behavioural engagement. The evidence and interpretations within the current research is significant in that has suggested a hierarchical motivational pathway as a potential means of informing teachers' understanding of how they have a direct impact upon their students' motivated engagement. These interpretations are discussed and illustrated within the current research.

Therefore, this research has a significance in that it has led to an informed conceptual understanding, through the proposed hierarchy and motivational interplay between the three SDT constructs, of some of the key teacher behaviour factors that influence students' motivation to engage in learning activities. This understanding may be used to inform practitioners' evidence-based practice. For example, these identified factors and the associated understanding of the interplay between them may be used in the design and implementation of interventions with the objective of teachers successfully enhancing their students' engagement with learning: however, this is beyond the remit of this research study but has continued to be part of my post-doctoral research.

1.6   Identified Gaps within Prior Research

To date, there has been a plethora of research relating to specific teacher influences upon student engagement within schooling and the

classroom in general. There is a wealth of empirical support for positively correlating student engagement as a predictor of academic achievement and motivated involvement within school in general (Connell and Wellborn, 1991; Finn, 1989; Klem and Connell, 2004; Voelkl, 1995, 1996, 1997). The main domain- or subject-specific areas of student engagement research have been health and exercise (Gillison 2007; Sebire, 2009), reading (Guthrie and Anderson, 1999; Guthrie and Wigfield, 2000) and maths (Hughes et al., 2008). By comparison, there has been a paucity of research regarding domain-specific or subject-specific engagement factors in science.

Despite such a paucity, engagement-enhancing factors specific to children's positive perceptions of science have been widely investigated (for example, Abrahams, 2009, 2011; Abrahams and Millar, 2008; Ainley and Ainley, 2011a, 2011b; Blumenfeld and Meece; 1988; Darby, 2005; Lee and Anderson, 1993; Lee and Brophy, 1996; Murphy et al., 2012). These studies have suggested, to varying degrees, that there are several common key elements central to an engaging science education, including teaching methods / behaviours that promote autonomous learning and strong teacher-student interpersonal relationships. While the findings of these studies have defined some of the key factors regarded as being central to engaging students with science, none of them included the consideration of a potential reciprocal effects relationship between science teacher behaviours and student engagement with science as called for by Klem and Connell (2004, p. 270). The presence of a reciprocal effects relationship within the dynamics of engagement with learning has also been raised by, for example, Marsh and Craven (2006), Marsh and Martin (2011) and Skinner and Belmont (1993). Therefore, the methods used within the current research have investigated and discussed the potential reciprocal relationship between relatedness, competence and autonomy in terms of their motivational impact upon students' academic engagement.

Searches of ten literature databases (section 3.3) also revealed that there had been no systematic reviews or meta-ethnographic reviews of the variables central to student engagement in schools in general or science specifically, particularly for children aged 8 to 13 years. I chose this age range as these were not only the ages of the children that I was working with but also this was the age group within which there was reported to be an on-going decline in students' engagement with and the perceived value of science between the ages of 10 and 15 years (Martin et al., 2012; OECD, 2007; Tymms et al., 2008). Most of the accessed studies had focused upon children aged between 4 and 7, and students from 13+ to 18+ including university undergraduates. In addition, within science

education there had not been any published studies that had tested the generalisability of SDT to science education within British schools.

Finally, while some studies have focused upon mixed methods research designs using a combination of questionnaires and interviews, there was a further identified gap in the research. That is, that the findings of the vast majority of the encountered studies were only informed by the use of in-situ data collected through questionnaires. However, the emergent common themes were rarely explored by researchers through discussions with students during focus group interviews, and none of them included online surveys of students who had completed their formal education. The current research addressed these identified gaps.

1.7   Original contributions made by this research

The findings of this research have led to four original contributions to knowledge. The first contribution is, at a simple level, the in-situ testing of the generalisation of SDT within a British school as one way to identify and understand some of the key antecedents that inform engagement within science education lessons. To date, the majority of the published studies testing SDT have taken place in the USA, Canada and Belgium. The meta-ethnographic review (MER) unearthed only two studies based within Britain, both of which had focused upon the informed use of SDT within physical education lessons (see Chapter 3). Only five of the retrieved studies focused upon science education; two in Canada, one in Germany and two in the USA. Of these, two studies had samples of 18-20+ year-olds, one being a sample of 17-18 year-olds studying physics, and the other of 15-year-olds studying high school science. Only one study investigated the perceptions of students as young as 11, focusing on the differences between the perceptions of American and Chinese students towards their teachers perceived autonomy supportive behaviours. An extensive search of ten literature databases revealed that there have not been any published, peer-reviewed tests of the self-determination meta-theory within science education for the 8 to 13 age range in Britain (Chapter 3).

Arising from analysis of the emergent research findings within the meta-ethnographic review (MER), further testing of the generalisability of such findings within the main study, and their confirmed triangulation through the online survey. The second contribution is the assertion, that the three constructs within SDT are variant in their reciprocal impact upon students' perceived motivation for and engagement within the classroom. That is, rather than the three SDT constructs either being of equal impact,

or similar influence, or being manifested simultaneously, the evidence from the three studies has revealed that the strongest influences within SDT are the reciprocal relationships between relatedness and competence. Specifically, it emerged that the perceived quality of the teacher-student relationship has an impact upon students' perceived competence. Both contextual variables appear, in turn, to be predictive of the extent to which students feel the need to be autonomous and / or that they are learning within an autonomy supportive classroom. However, it also emerged that the potential reciprocal relationship between relatedness and competence has a stronger influence upon students' sustained engagement with learning, and that the need to be autonomous (in terms of what and how subject matter should be learnt) is not as strong and has a lesser comparative motivational impact upon students' engagement with learning (see section 7.1.).

The official SDT website (www.selfdeterminationtheory.org. Accessed July 4, 2017) presented fifteen questionnaires that have been used to measure self-determination through participants' self-reported responses. These questionnaires have been developed to assess the impact of the different constructs within the theory. A review of the fifteen SDT-related questionnaires revealed that not one questionnaire nor a series of questionnaires had been developed to measure all three constructs of SDT in a format that would enable the investigation of the students' self-determined perceptions of specific and potentially simultaneously engaging aspects of their science lessons and schooling in general. Therefore, this research also contributes to knowledge through the questionnaires that have been developed for the purposes of the main study, which, through their evolution and testing, may be added to the bank of SDT-informed questionnaires that may be used with younger students (Appendices N to R).

Based upon the MER, together with the cumulative findings across the research herein, the final contribution to knowledge is a proposed motivational pathway for the impact of SDT constructs upon engagement: that is, that relatedness and competence have a variant and combined reinforcing impact upon students' self-determined engagement and autonomy with learning (see Figures 7.2 and 7.3). This pathway is based upon the proposal that there are posited reciprocal interaction between the students' perceived relationship with their teacher and the enhancement of students' domain-specific competence, and the teacher behaviours and learning methods that influence students' sense of relatedness and competence within an autonomy-supportive learning environment.

1.8   Outline and Development of the Current Research

Within the current research, I investigated students' engagement with learning activities through the theoretical lens of SDT. SDT is a sociocultural motivational theory that, through extensive empirical classroom-based testing, has revealed its potential to be applied by teachers within their own classrooms as a basis for enhanced evidence-based practice in education. For such findings to be more applicable as the basis of evidence-informed practice, the outcomes of this research have been presented so that they may form the starting point for further research involving teachers within their own classrooms.

As the research process unfolded, it was repeatedly clear that whilst "... there is generally accepted to be no particular, no correct or proper way of generating or marshalling evidence" (Thomas, 2004, p. 3). One of the best outcomes of the interpretation of such evidence would be to create a more lucid image of how SDT-related motivational variables have an impact upon students' engagement with learning activities. Indeed, given the social and interpretative context of the evidence herein, through the application of theory as an explanatory framework, 'rational belief is perhaps all that can be hoped for in practical circumstances, and it is unlikely that a practitioner will find conclusive evidence for a proposition' (Thomas, 2004, p. 7). In addition, given that researchers have asserted that causal connections can be inferred without the use of randomised controlled trials (RCT: Goldstein, 2002, p. 2), the qualitative and mixed methods inquiries herein are asserted as viable means of gaining an understanding of students' motivation and engagement through intuitive thinking that has taken prior evidence into account as the basis for contextualising the new evidence generated (Thomas, 2004, p. 12).

The adopted research approach is a phenomenological one in that the evidence collected has enabled the exploration and understanding of students' experiences and how such experiences are interpreted by the students within the different sample populations (Savin-Baden and Major, 2013). Phenomenological research, based upon the underlying philosophy of phenomenology, is built upon the assumption that knowledge is formed, developed and modified through experiences (p. 223). That is, that individuals gain a personal knowledge of their own worldview as they regard them to be through their consciousness of experiences based upon intuitive reflection.

SDT (Ryan and Deci, 2000) was selected as a focal theoretical lens which has supported researchers facilitated understanding of sociocultural conditions within the classroom that satisfy as opposed to thwarting the

psychological needs central to students' engagement with learning. Therefore, the impetus throughout this research study has been upon the utilisation of SDT as an applied theoretical means of gaining a more informed understanding of motivating students' engagement with learning (Southerland et al., 2014). Prior empirical testing has shown the positive application of SDT to be a reliable predictor of motivation and engagement of students within the classroom (Reeve, 2002, 2012; Ryan and Deci, 2009) results in the interplay between the teacher behaviours and methods conducive to engagement with activities and the psychological motivational drive to initiate and sustain engagement. Indeed, throughout this research, the data collection process central to each of the research methods has been more simplistic and "…very down-to-earth" in comparison to the theorising at the heart of the analysis (Brewer and Hunter, 2006, p. 18).

The three motivational constructs (BPNs) central to SDT were used to define the theoretical boundaries for the research within the research. As discussed (Chapter 2), the starting point, prior to formation of the research process and data collection, was upon the development of an informed understanding of the defining characteristics and indicators of students' engagement with learning. This understanding was then traced backwards from the behaviours indicative of engagement to the underlying psychological processes informing an individual's motivation for learning.

Between September 2011 and October 2013, I was a part-time volunteer within the school that was the research setting for the questionnaires and focus group interviews. Initially, the plan was that the research design would centre upon the principles of action research. Indeed, during meetings with the science teachers in the school, the agreed objective was to use Self-Determination Theory as the basis for the design, implementation, evaluation and evolution of interventions that may enhance the students' current levels of engagement within science lessons. However, the research design had to be modified after the pilot study (March 2013) and before the second wave of questionnaires (June 2013). This was because of the constraints of access to different sections of the student population due to differing accountability pressures upon the three science teachers, in addition to numerous unforeseen and late changes to the science timetable due to the school's very busy events calendar. This led to the decision in late May 2013 that, given that an action research approach using interventions would not be possible, a retrospective research design would be used.

Despite the changes in the research design of the main study, the same timetable for data collection and the same questionnaires that had been

designed for the pilot study could be utilised (see Figure 1.1). In addition to the use of questionnaires, focus group interviews were chosen as a method for exploring the self-perceptions of the students' responses regarding their experiences within science lessons: these included students' interpretations of their self-perceptions and how these informed their expectations of their competence, their opportunities to be autonomous, and the extent of the influence that teacher behaviours and relationships have upon these self-perceptions.

One of the aims of the research was, further to the view that '"It is teachers who in the end will change the world of the school by understanding it" (Stenhouse, 1981, p.104), to build upon prior research by generating sufficient primary evidence that had the potential to be both corroborative and confirmatory in nature as the basis for practitioners' assured use of such evidence and the accompanying interpretations within their own settings. The sufficiency of the evidence herein is asserted, based upon the definition of sufficiency as "corroboration with other instances of the same kind of evidence or other kinds of evidence"' (Thomas, 2004, p.5).

The sufficiency of the evidence within the current research was assured through the collection and collation of good quality, reliable evidence, with the evidence from the MER being used as the basis for the collection of evidence that has not only tested the emergent proposition in the light of the two research questions but has also resulted in additional corroborative evidence (Thomas, 2004, p. 8). Sufficiency was one of the central guiding principle from the original inspiration from the literature review that led to the two research questions, the discovery stage being an initial proposition that emerged from the MER through the generation of corroborative evidence during the school-based research study (Chapters 4 and 5) and online survey (Chapter 6). This led to the formation and support of inductive beliefs and three proposed claims to knowledge. The evidence generated was sufficient to enable the corroboration of the proposition, which became three claims that were tested and corroborated by the online survey. Therefore, the discovery stage – the MER - has been successfully tested for sufficiency through corroborative and confirmatory research (further to Thomas, 2004, p. 10).

Various forms of internal triangulation were used to ensure the consistency of student responses across questionnaires and during the focus group interviews: to ensure, as much as it is possible to do so, that students were not stating what they thought the teacher-research wanted to hear but were, instead, presenting their own perceptions in a variety of