School of Education

Investigating the Relationships between Motivation, Self-Regulation, the Learning Environment, and Cooperative Learning in Middle School Classrooms in Abu Dhabi

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DECLARATION

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgement has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university

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ABSTRACT

What motivates students, continues to be an important subject of educational research. Students’ motivational beliefs and self-regulatory behaviours have been established as playing an essential role in students’ learning, yet motivation, in STEM subjects in particular, is declining. Given both the essential role that motivation plays in learning, as well as the substantial evidence suggesting that the psychosocial learning environment has a strong influence on students’ learning outcomes, this study focused on examining the relationships between students’ motivation, self-regulation, and the psychosocial learning environment in middle school science classrooms. The study was situated within the context of an education system undergoing an extensive educational reform: Abu Dhabi, an emirate of the United Arab Emirates. Of particular interest was investigating whether differences existed in terms of students’ motivation, self-regulation, and perceptions of the learning environment between classes with teachers that had been identified as implementing effective cooperative learning strategies, and classes that did not have such teachers.

Within a pragmatist paradigm, and informed by a social cognitive epistemology, quantitative data were collected from 338 female students from 16 grade 6 to 9 science classes, enrolled in six Abu Dhabi government schools. One group of students (n=175) were in classes with teachers identified as effectively implementing cooperative learning strategies, and another group were not in such classes (n=163). Data were collected using two questionnaires: one to assess students’ motivation and self-regulation, and another to assess students’ perceptions of their learning environment. To establish the validity and reliability of the modified and translated questionnaires for use with this sample, the data were analysed to establish the factor structure, internal consistency reliability, discriminant validity, and concurrent validity. The results supported the validity of both questionnaires for use in my study.

Structural equation modelling was used to examine the hypothesised relationships by first generating descriptive statistics to summarise the data. Confirmatory factor analysis (CFA) was then used to assess the measurement properties of the research model. CFA indicated good reliability, convergent validity, and discriminant validity for the measurement model. Finally, the structural model was evaluated in terms of

good model fit, the model's ability to explain the variance in the dependent variables, and by examining the statistical significance of the estimated path coefficients.

In terms of investigating the relationships between students' motivation, self-regulation, and the learning environment, the results indicated that 10 out of a possible 17 hypothesised relationships were statistically significant and positive in direction. With regard to the influence of the learning environment on the three motivational constructs used in my study (these being learning goal orientation, task value, and self-efficacy), three out of four learning environment constructs had a statistically significant ($p<0.05$) and positive influence on students' motivation (these being teacher support, involvement, and cooperation), the exception being the learning environment construct of student cohesiveness. It was found that students' perception of the learning environment did not have a statistically significant influence on students' self-regulation. All three constructs used to assess students' motivation (learning goal orientation, task value and self-efficacy) had a statistically significant ($p<0.05$) influence on students' self-regulation of effort.

To investigate whether differences exist between students' motivation towards learning, self-regulation, and perceptions of the learning environment in classes with teachers identified as effectively implementing cooperative learning practices, and in classes that did not have such teachers, multivariate analysis of variance was used, yielding significant results overall for the set of eight independent variables. The univariate analysis of variance results indicated that there were statistically significant ($p<0.01$) differences between these two groups, with students in classes with teachers identified as effectively implementing cooperative learning practices experiencing higher levels of motivation and self-regulation, and more positive perceptions of the learning environment than students not in such classes. In addition, effect sizes, used to establish the magnitude of differences between the two groups of students, were large; ranging from 0.547 to 0.988 standard deviations.

This study contributes to the literatures of learning environment, motivation, and self-regulation as very few studies have previously investigated all of these constructs at the same time, with no studies previously conducted within middle school science classrooms in Abu Dhabi government schools. The results of this study provide

exigent information to both teachers, policy-makers and researchers with regard to the influences of the psychosocial learning environment on middle school students' motivation towards science, as well as the influence of motivation on students' self-regulatory behaviour. Understanding the influence of students' perceptions of their psychosocial classroom learning environment can support transformed pedagogical practice, as it is possible for teachers to make tangible changes in the learning environment (for example, increasing the level of teacher support), that are likely to result in increased motivation and self-regulation; significantly less tangible constructs. While my study perhaps has greatest significance for Abu Dhabi government schools, it may be possible for the findings to be generalised beyond this context. My study may be of value to researchers and educators generally, with regard to understanding some of the influences on students' motivation and self-regulation; two essential attributes for today's learners.

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It has been said that completing a PhD is similar to an ant consuming an elephant. It can only be tackled one bite at a time. When I look back on the length of time spent, the amount of support provided, and the difficulty of the task, I believe the analogy is apt. The only thing that has made it possible is that, thankfully, I've had some wonderful "support ants" that have made the task possible.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ADEC	Abu Dhabi Education Council
AMS	Academic Motivation Scale
ANOVA	Analysis of Variance
AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
CEQ	Classroom Environment Questionnaire
CES	Classroom Environment Scale
CLES	Classroom Learning Environment Survey
CUCEI	College and University Classroom Environment Inventory
EELLS	Engagement in English Language Learning and Self-Regulation
EFA	Exploratory Factor Analysis
ICEQ	Individualised Classroom Environment Questionnaire
LASSI	Learning and Study Strategies Inventory
LEI	Learning Environment Inventory
MANOVA	Multivariate Analysis of Variance
MCI	My Class Inventory
MMI	Multidimensional Motivation Instrument
MSLQ	Motivated Strategies for Learning Questionnaire
NSM	New School Model
QTI	Questionnaire on Teacher Interaction
SALES	Students' Adaptive Learning Engagement Survey
SALEM	Students' Adaptive Learning Engagement Mathematics
SEM	Structural Equation Modelling
SMQ	Science Motivation Questionnaire
SMTSL	Students' Motivation Towards Science Learning
SNIP	Snapshot in Pedagogy
STEM	Science Technology Engineering and Mathematics
TROFLEI	Technology-Rich Outcomes Focused Learning Environment Inventory
UAE	United Arab Emirates
WIHIC	What Is Happening In this Class

Chapter 1

INTRODUCTION

> *Researchers interested in basic questions about how and why some students seem to learn and thrive in school contexts, while other students seem to struggle to develop the knowledge and cognitive resources to be successful academically, must consider the role of motivation.* (Pintrich, 2003a, p. 667)

Motivation has long been recognised as a cornerstone of effective learning and, as such, is a "precious commodity" (Furrer, Skinner, & Pitzer, 2014, p. 102). Despite its importance—reflected in the breadth and depth of the literature dedicated to studying it—understanding the influences on motivation remain somewhat elusive (Hancock, 2004). As an educator, the concept of motivation—what fosters it, what inhibits it, and my role in facilitating it—has always been the driving force behind why, what, and how I do what I do. I can corroborate Furrer, Skinner, and Pitzer's comment that "one of the most exhilarating experiences a teacher can have is to lead a class of enthusiastic, engaged students" (2014, p. 101). More important, of course, is the beneficial impact motivation towards a subject can have on students' cognitive and affective outcomes. Self-efficacy, a core component of motivation, has been found to be a positive influence on students' cognitive and affective learning outcomes; if people expect to do well and believe in their ability to complete a task, they generally try hard, persist when confronted with challenge, and perform better (Pajares, 2001; Pintrich, 2003a). The combination of my own passion for fostering motivation in students, together with the importance of motivation for educational success, and the opportunity to investigate motivational influences within the context I was working at the time of this study, provided the impetus for this research.

At the time that I began my study, I was working in the United Arab Emirates (UAE), employed by the Abu Dhabi Education Council (ADEC) as an education advisor[1]. Together with many other educational expatriates, I was involved in the sweeping

[1] Education advisors were appointed by ADEC as curriculum experts to support teachers in government schools to implement relevant aspects of the educational reform in their subject areas.

educational reform of public schools that the Abu Dhabi Emirate had begun with the formation of ADEC in 2005. The reform was instigated because the nation's leaders recognised the urgent need for an improvement of the education system in order to improve student achievement, achieve high quality education for all, and ensure the nation's progress and future prosperity (Abu Dhabi Education Council, 2009). The task of ADEC was to oversee the shift from a textbook-based curriculum, delivered within a traditional teaching and learning context, to student-centred, outcomes-based learning within a constructivist context. My work involved coaching and mentoring Emirati and Arabic[2] teachers to support the implementation of the ADEC curriculum using internationally accepted pedagogical best practice.

The educational reform in Abu Dhabi had begun several years before my arrival in 2010. Because changing pedagogical practice is not an overnight occurrence, the process of educational reform within Abu Dhabi government schools was inevitably a slow one. At the time that I began working with teachers, I observed a range of teaching practices, from a traditional, teacher-centred approach to the beginnings of a more student-centred style of learning. The variety of teaching practices that were in place resulted in students learning within a range of learning environments.

The interrelationship between students' levels of motivation and their perceptions of the learning environment was one that I wanted to investigate further. Interest, an important aspect of motivation, has been described "…as an interactive relation between an individual and certain aspects of his or her environment…" (Hidi & Harackiewicz, 2000, p. 152). Because students were experiencing differing learning environments as a result of the reform, Abu Dhabi Cycle 2[3] government school classrooms provided an ideal context within which to explore the influence of the learning environment on students' motivation and self-regulation.

One pedagogy that was utilised to facilitate the transition within ADEC public schools from a rote-learning teaching approach with an emphasis on memorisation, to a constructivist approach, was cooperative learning. ADEC regarded collaboration as an

[2] The term Arabic teachers refers to non-Emirati teachers from other Arabic speaking nations such as Egypt, Syria, and Iraq.
[3] Middle schools (grades 6 to 9) are called Cycle 2 in Abu Dhabi government schools.

important 21st century skill and endorsed the inclusion of cooperative learning strategies within the ADEC science curriculum. Despite the expectation for cooperative learning strategies to be implemented in every Cycle 2 science classroom, cooperative learning was not yet well understood or embedded within many classroom learning environments. Given my interest in what motivates students, combined with both a connection in the research literature between motivation and the learning environment (Ames & Archer, 1988; Brophy, 1998; Koul, Roy, & Lerdpornkulrat, 2012; Mazer & Stowe, 2016; Pintrich & Schunk, 1996; Tapola & Niemivirta, 2008) as well as the influence of motivation on students' self-regulation (Andrade & Heritage, 2017; Bouffard-Bouchard, Parent, & Larivee, 1991; Wolters, 2010), I decided that the investigation of influences on students' motivation and self-regulation through the assessment of students' perceptions of their learning environment would be an ideal context for my study. In addition, the learning environment changes that were taking place within Abu Dhabi government schools' Cycle 2 science classrooms provided an opportunity to also investigate whether there were any differences in students' motivation, self-regulation, and perceptions of the learning environment between students in classes with teachers identified as effectively implementing cooperative learning strategies and students not in such classes.

The purpose of this chapter is to introduce the focus of my thesis and to give an overview of the study. The chapter is organised under the following headings:

- Context of the study (Section 1.1);
- Research paradigm of the study (Section 1.2);
- Conceptual framework (Section 1.3);
- Research objectives of the study (Section 1.4);
- Significance of the research (Section 1.5); and
- Thesis overview (Section 1.6).

1.1 Context of the Study

This section provides information about the unique context within which my study took place. First, the history and background of the UAE is described (Section 1.1.1). Next, the education system in Abu Dhabi, and the educational reform that has taken place within Abu Dhabi government schools, is outlined (Section 1.1.2). Finally, the introduction of cooperative learning into the ADEC curriculum as a result of the educational reform is detailed (Section 1.1.3).

1.1.1 The United Arab Emirates

The UAE, a country nearly fifty years old, is situated on the Arabian Gulf, between the borders of Saudi Arabia to the west and Oman to the east, as shown in Figure 1.1.

Figure 1.1. Map of the United Arab Emirates (UAE), with surrounding countries[4]

The UAE was founded on December 2, 1971. It consists of seven emirates (states): Abu Dhabi; Dubai; Ajman; Sharjah; Umm Al-Qawain; Ras Al-Khaimah; and Fujairah, as shown in Figure 1.2. The official language of the country is Arabic and the national

[4] Map source: https://www.google.ae. Map re-produced in accordance with Google Maps' terms of use.

religion is Islam. Sheikh Zayed Bin Sultan Al-Nahyan is seen as the founding father of the UAE and appears to be much revered by the citizens of the UAE.

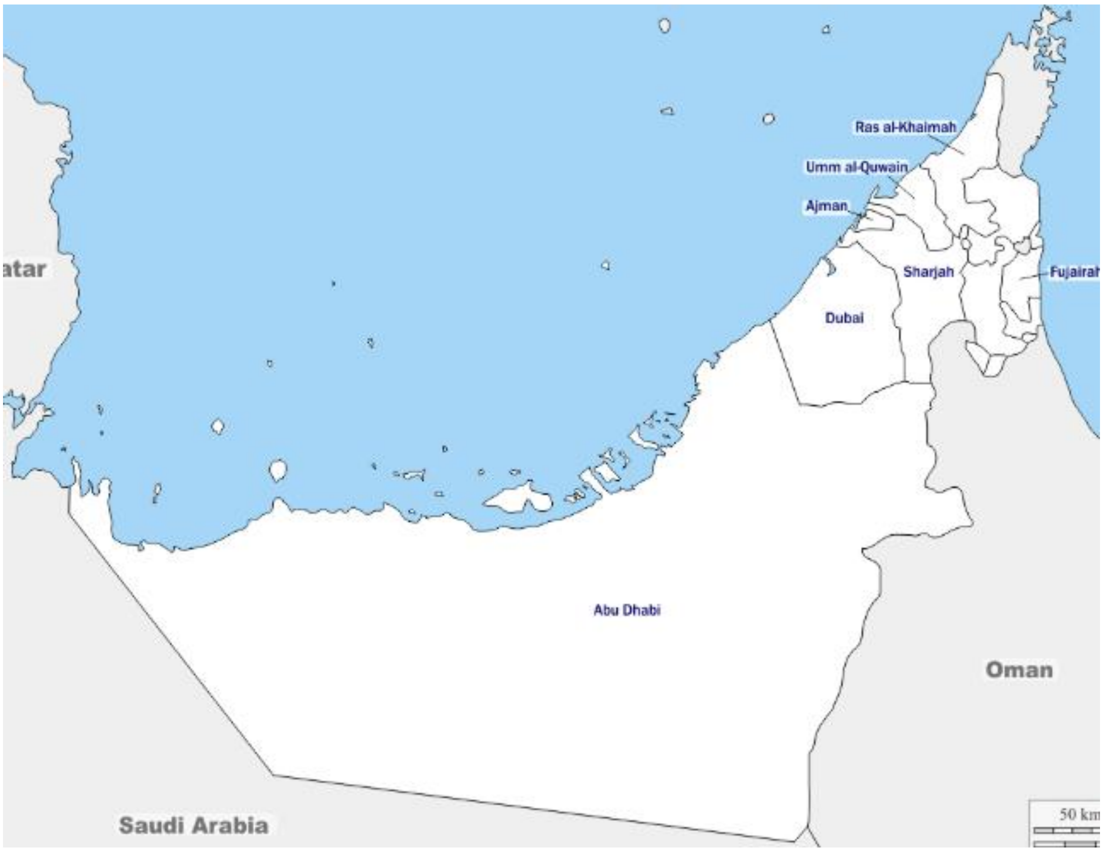


Figure 1.2. Insert showing the seven emirates of the UAE[5]

Before the twentieth century, the region that is now the UAE was a hot, dry area with a sparsely populated desert terrain. It was inhabited as early as the third millennium BC. The inhabitants of the region were comprised of nomadic Bedouin tribes (Bedouin means ‘desert dweller’), people in fishing villages, and farmers of date plantations (“The Story of the UAE,” 2015). The Bedouin tribes form the bedrock of UAE society, and many of their traditions, such as generous hospitality and the honouring of guests, remain important UAE customs today (“The Story of the UAE,” 2015). The city of Abu Dhabi, now a bustling metropolis, was once a small settlement with a Ruler’s

[5] Map source: https://d-maps.com/carte.php?num_car=27138&lang=en. Map produced in accordance with *d-maps'* terms of use.

Fort, date palm huts, and a few other small buildings. Dubai, further along the coast, was a larger settlement with a trading port (“The Story of the UAE,” 2015).

The Portuguese arrived on the region’s shores in 1498, and evidence of their existence is still visible in some locations in the UAE and in Oman (“The Story of the UAE,” 2015). The English then followed, with their presence in the Gulf region dating back to the maritime truces of 1835, and increasing in population from 1853, following the end of piracy in the coastal region (El Mallakh, 1970). The colonial concerns of the English in the area was primarily the protection of their trade with India from other European competitors (“The Story of the UAE,” 2015). From 1853 to 1971, the name for the Arab tribal regions along the Persian Gulf under British administration was the ‘Trucial States’ (Kjeilen, 2018). Following the 1892 treaty signed with the British, Abu Dhabi accepted military protection and agreed to British representation with regard to foreign relations (El Mallakh, 1970).

Despite the presence of the British, the region remained undeveloped and poor. Survival was predicated on the pearl industry, with limited agricultural output from the Liwa and Buraymi oases (El Mallakh, 1970). The pearl industry was decimated in the 1930s with the development of the Japanese cultured pearl, but the nation’s fortunes changed, with the discovery of oil in the early 1950s (“Sheikh Zayed Bin Sultan Al Nahyan,” n.d.). The UAE, led by the emirates of Abu Dhabi and Dubai, has experienced phenomenal economic growth since that time (Aswad, Vidican, & Samulewicz, 2011).

Essential to the story of the development of the UAE is the country’s founder, Sheikh Zayed Bin Sultan Al Nahyan, who played a crucial role in its fortunes. At the time of the oil discovery in the 1950s, Sheikh Zayed’s cautious older brother, Sheikh Shakbut, was the ruler of the region of Abu Dhabi. Having seen the hardships of the 1930s, Sheikh Shakbut wanted to save the oil revenue rather than invest it in the future of the region. However, Sheikh Zayed had already established himself as a strong and successful leader with his involvement in the development of Al Ain, a smaller town inland from the settlement of Abu Dhabi. The ruling Al Nahyan family realised that Sheikh Zayed had a clear vision of how the emirate could progress and the skills to tap the potential created by the arrival of oil. The family subsequently replaced him as ruler of the region (“Sheikh Zayed Bin Sultan Al Nahyan,” n.d.).

One of Sheikh Zayed’s immediate initiatives was the export of crude oil, resulting in the rapid transformation of Abu Dhabi from one of the poorest regions in the area to the richest. Sheikh Zayed was a firm believer in public welfare and putting the needs of the people first. This resulted in a huge investment in social construction—schools, hospitals, housing, and roads. Sheikh Zayed perceived the need for tribal collaboration and invested heavily in the Trucial States Development Fund (“Sheikh Zayed Bin Sultan Al Nahyan,” n.d.). Therefore, when the British announced their departure from the area, Sheikh Zayed was in a position of influence with the rulers of other emirates in the area. He subsequently led the call for the establishment of a federation consisting of the Trucial States as well as Qatar and Bahrain. This federation did not succeed, but Sheikh Zayed’s collaborative leadership style resulted in the formation of the UAE on 2 December, 1971, and Sheikh Zayed being unanimously elected President (“Sheikh Zayed Bin Sultan Al Nahyan,” n.d.).

Since that time, largely due to the phenomenal wealth the discovery of oil has provided, the UAE has been transformed into a modern, ambitious, and thriving economy, with one of the highest per capita incomes in the world (“The Story of the UAE,” 2015). The country no longer relies solely on oil revenue, but has revenue streams including construction, tourism, and trade. Its population has increased dramatically from approximately 250,000 at its inception in 1971 to over nine million today (“United Nations,” 2016). Despite the rapid population increase, Emirati people comprise just 10% of the population, the rest made up from a wide range of expatriates—a large construction labour force, teachers, doctors, lawyers, hospitality workers, and many others seeking work in the UAE. As the education system began its large-scale reform, many expatriate teachers and advisors—such as myself—arrived.

In this section, background on the formation of the UAE has been provided. The next section describes the education system within the emirate of Abu Dhabi itself, the region in which I worked at the time of this study.

1.1.2 The Education System within the Abu Dhabi Emirate

A cornerstone of Sheikh Zayed's vision was education. He viewed people as a nation's greatest resource and believed that education was key to a progressive and successful society, saying, "The greatest use that can be made of wealth is to invest it in creating generations of educated and trained people" ("Sheikh Zayed Bin Sultan Al Nahyan," n.d., p. 20). Prior to the formation of the UAE, education was limited and literacy rates were low, just over 50% for males and 31% for women (Embassy of the United Arab Emirates, 2017). Education as known in Western countries was non-existent before 1971, when the UAE was founded (Godwin, 2006). Following significant investment as a result of the oil boom, the UAE soon offered a comprehensive education system from kindergarten to university ("Sheikh Zayed Bin Sultan Al Nahyan," n.d.). Literacy rates for both genders are now approximately 95% (United Nations Education Scientific and Cultural Organisation Institute of Statistics, 2018). While the numbers of children receiving public education increased significantly after the formation of the UAE, with resultant reductions in illiteracy, educational pedagogy in primary and secondary education was traditional and textbook based, involving a great deal of memorisation of content.

The rulers of the UAE, most of whom had been educated in Western countries, could see that if there was to be a future for the UAE beyond the oil wealth that had been generated, educational improvement was vital to enable Emiratis to become valuable, contributing members of society ("Sheikh Zayed Bin Sultan Al Nahyan," n.d.). The desire for reform was also motivated by poor educational outcomes when compared to international educational standards in mathematics and science as measured in the Trends in International Mathematics and Science Study (TIMMS; Martin, Mullis, Foy, & Stanco, 2012; Mullis, Martin, Foy, & Arora, 2012) and reading as measured in the Progress in International Reading Literacy Study (PIRLS; Mullis, Martin, Foy, & Drucker, 2012). The nation's leaders wanted to continue Sheikh Zayed's legacy by establishing the UAE as a world leader in education.

This desire, combined with the recognition that there were manifold shortcomings within the current educational system (Abu Dhabi Education Council, 2012), led to an extensive educational reform, heralded by the establishment of the Abu Dhabi

Education Council (ADEC) in 2005. The intention of the education reform was transformational—an attempt "…to bring about a systematic change in educational practice…" (Badri & Al Khaili, 2014, p. 202), and to address the low numbers (35%) of graduates being ready to attend university (Abu Dhabi Education Council, 2012).

At the time of my study, ADEC's vision was to be "recognised as a world class education system that supports all learners in reaching their full potential to compete in the global market" (Abu Dhabi Education Council, n.d., p. 1). ADEC identified four key educational priorities to address immediately:

1. Elevate Schools Quality in Abu Dhabi to International Standards;
2. Improve Access to P-12[6] Education;
3. Provide Students with Affordable Options of High Quality Private Education; and
4. Preserve UAE Culture and Heritage and Develop Successful Careers.

ADEC launched the New School Model[7] (NSM) in 2010 (Abu Dhabi Education Council, 2009). The overall aim of the NSM was that "all schools will move progressively to a unified model of delivery of instruction, developed and based on best practices and international benchmarks" (Abu Dhabi Education Council, 2010, p. 16). The intention of this model was to use a mentoring system, bringing in highly skilled Western teachers to demonstrate up-to-date and innovative teaching strategies to Emirati and Arabic teachers working within the public school system. The Director General of ADEC at the time the NSM was launched, Dr Mugheer Khamis Al Khaili, described the NSM as a curriculum where "… advanced teacher methods and learning materials and resources are introduced in order to enhance student performance as a communicator, a thinker and a problem-solver, appreciative of the UAE heritage and culture, confident, healthy, creative and innovative person" ("Abu Dhabi," 2010, p.5). The NSM was initially trialled with kindergarten and grade 1 students, with the extremely ambitious aim of the initiative being implemented in all schools across the Abu Dhabi Emirate within six years ("Abu Dhabi," 2010).

[6] This refers to having access to education from pre-school through to grade 12.
[7] This is now called the Abu Dhabi School Model, but, because it was called the New School Model (NSM) at the time of this study, this term is used in my thesis.

The NSM in place at the time of my study was a long-term strategy that was being progressively introduced across the school cycles, beginning with grade 1. However, it was important to immediately address the low standard of teaching and learning currently present in all grades, in order to facilitate an improvement of the educational performance and outcomes of approximately 67,000 students who would be graduating before the NSM implementation (Abu Dhabi Education Council, 2009). There was a need for a rapid improvement programme to be put in place that included the enhancement of the capabilities of both principals and teachers; the improvement of students' mathematics and English skills; better equipping students for university entrance examinations; the raising of expectations with regard to school attendance; the improvement of discipline within schools; and the adoption of a robust assessment strategy.

When I undertook my study, the newly installed ADEC curriculum was being implemented in the subject areas of English, mathematics, science, and Arabic. Curriculum design, implementation, and assessment in English, mathematics, and science subjects were managed by Western educators, in response to ADEC's commitment to "rely on the expertise of best-in-class international operators to drive the reform" (Abu Dhabi Education Council 2012). This resulted in the presence of a team of education advisors such as myself working with teachers in schools. The advisors were charged with mentoring each subject faculty to plan, implement, and assess each respective subject with up-to-date, research-based best practice. It is therefore not surprising, given the acknowledged reliance on external advisors, that a strategy such as cooperative learning found its way into the ADEC curriculum reform, considering the establishment of cooperative learning as an effective teaching and learning strategy within constructivist educational pedagogy, particularly in science learning environments.

This section gives a background to the educational system of the Abu Dhabi Emirate. In the next section, cooperative learning strategies being implemented within the ADEC science curriculum at the time of my study are described. This is followed by a description of the cooperative learning approach; Cooperative Learning and Assessment, which, at the time of my study, had been incorporated within the science curriculum for Cycle 2 (grades 6 to 9) government schools in Abu Dhabi. Following that, the make-up of cooperative learning teams as well as the cooperative learning assessment process are described.

1.1.3 Cooperative Learning within the ADEC Curriculum

A core value within ADEC's mission and vision was "Teamwork: Emphasiz[ing] the virtues of cooperation and coordination" (Abu Dhabi Education Council, 2013, p. 1). Given this mission and vision, ADEC was receptive to cooperative learning strategies being used within the curriculum. In September 2011, the ADEC senior curriculum specialist for science in grades 6 to 11 (Cycles 2 and 3) introduced a teaching strategy called Cooperative Learning and Assessment (Lowe, 2004) into the ADEC science curriculum, beginning with Cycle 2 schools (grades 6 to 9). The purpose of incorporating cooperative learning within the science curriculum was to foster motivation and enjoyment of learning science, and to facilitate the move away from traditional teaching methods towards a more constructivist approach.

Despite the curriculum expectation for cooperative learning to be the primary teaching and learning strategy in Cycle 2 science classrooms, in reality, the implementation of clearly structured cooperative learning practices varied in both quality and consistency. There were several possible reasons for this. First, the majority of teachers in Abu Dhabi government schools came from a traditional teaching background, were not used to constructivist learning strategies such as cooperative learning, and were therefore required to make substantial changes in their teaching practice. Second, societal and cultural expectations with regard to education remained traditional in nature, with both parents and teachers possibly being sceptical and/or resistant to the modernisation of the educational system. Third, pedagogical changes take time to embed to any level of quality and consistency, and the majority of teachers were relatively unfamiliar with cooperative learning strategies at the time of my study. Last, the support in terms of professional development, programme design, and resources was not necessarily systematic, resulting in varied understandings with regard to how this new approach should be implemented.

In order to facilitate the implementation of cooperative learning strategies, science education advisors and teachers received professional development with regard to the overall aims and objectives of cooperative learning, protocols for organising and working in groups, specific teacher instructions, group roles, and cooperative learning activity resources. The overall objectives involved group task setting (including assessment procedures), cooperative learning, and students taking personal responsibility for their learning and development. Teachers were encouraged to use a range of cooperative learning strategies, such as those recommended by Kagan (1989) and Slavin (1980), in order to facilitate science learning. Part of the science advisors' role was to continue to support teachers with the implementation of cooperative learning strategies within science classrooms, using ideas within the Cooperative Learning and Assessment document (a copy of which can be found in Appendix 1).

An essential aspect with regard to the implementation of the cooperative learning strategy was teamwork. Students were expected to choose their own teams, with three students per team. The rationale behind this team selection approach was the belief that student selection naturally resulted in heterogeneous teams (Lowe, 2004), and this, rather than ability-grouped teams, was an important component of the teaching strategy. The team selection process appeared to be somewhat controversial for teachers. Teachers generally wanted to select teams themselves, usually involving a combination of a high achieving student with two lower achieving students. As a result, it was possible that the teams within each cooperative learning classroom were formed in different ways; some being student selected, while others were teacher selected. Regardless of the way in which teams were formed, there were specific expectations and guidelines to ensure positive interdependence, such as each team member having a specific role (manager, technician, recorder /reporter) and these roles being rotated regularly. All practical lessons, fieldwork, assignments, and tests were completed with the same team.

The way in which students were now being assessed in science was perhaps the most dramatic difference between this new cooperative learning approach and previous assessment practices. Assessment was now a largely collaborative endeavour, with the majority of assessments being conducted cooperatively within the team, and the team's assessment scores also contributing to an individual student's end-of-term mark. This was a significant ideological shift away from how assessment was traditionally conducted. Previously, the assessment focus was on end-of-year exams, which comprised the total of a student’s grade. Within the cooperative learning strategy, however, 80% of an individual student’s assessment was derived from team work and 20% from individual written tests. The tests were intended to be used as a diagnostic assessment tool to inform teachers as to ongoing learning needs in order to prepare students thoroughly for the end-of-year examination. The tests were intended to be formative more than summative in nature, although they did contribute to the overall grade. Assessment in teams included a variety of assessment tasks, such as experiments, research, inquiry, investigations, and written work. The team and individual test results were then combined with the end-of-year individual examination results to give an overall grade to each student.

This approach to assessment was radical in nature, particularly within a previously traditional educational context that largely involved the memorisation of textbook content matter and a high-stakes summative exam in every subject at the end of the academic year. This assessment procedure was likely to have been new and strange for teachers and students alike, involving significant adjustments to both teaching and learning. Previously, students appear to have been largely passive learners, viewing their teacher as the expert; expecting him or her to tell them when they got something wrong (Von Oppell & Aldridge, 2015).

The information in this section provided background as to the formation of the United Arab Emirates (Section 1.1.1) and briefly described the rapid transition of the UAE from an undeveloped to a highly developed nation. The educational context within which my study took place (described in Section 1.1.2) had begun an educational reform which was still in its nascent phase; involving considerable shifts in ideology and pedagogy in relation to educational practice, and resulting in significant educational changes occurring at different rates within Abu Dhabi government schools. Details regarding the introduction of cooperative learning to the ADEC science curriculum were provided in Section 1.1.3. The following section discusses the research paradigm underpinning my study.

1.2 Research Paradigm of the Study

Research and inquiry are generally accepted as being situated within one or more paradigms. The term 'paradigm' is often used interchangeably with 'worldview' (Creswell, 2014) and has been defined in a range of ways. I have chosen to use Creswell's definition of worldview as "a general philosophical orientation about the world and the nature of research that a researcher brings to a study" (Creswell, 2014, p. 6). While this 'paradigm first' belief is widely held, some theorists hold that not all research needs to be paradigm driven, and that within methodological theory, there are two predominant ways that research can proceed: a paradigm-driven approach or a pragmatic approach (Punch, 2014). With a pragmatic approach, research begins with questions that need answers and an appropriate method is chosen to gain answers to those questions (Punch, 2014).

The worldview of pragmatism involves not being wedded to a particular paradigm that, in turn, determines the research method (Creswell, 2014). It is centred on the belief of freedom of choice with regard to selecting a methodology for a research project. Researchers adhering to pragmatism are focused on what the problem is, or what questions they are trying to obtain answers for, and what method or combination of methods would yield the most information to best answer those questions. In fact, pragmatism could be argued to be an 'anti-paradigm' even though it is often described in the literature as a paradigm (Creswell, 2014; Crotty, 1998).

In pragmatism, the research questions determine the methodology used. Pragmatists recognise the existence of paradigms but do not allow a paradigm to dictate the methodology; they want to explore research questions with a range of methods, depending on their suitability to answer their research questions (Bryman, 2008). Pragmatism generally lends itself towards a mixed methods approach as this is usually perceived as providing the best understanding of a problem (Creswell, 2014). However, Denscombe (2007, p. 116) states that "for some mixed methods researchers, [the] tenets of pragmatism leave the door open for the use of purely quantitative research or purely qualitative research – providing the use of either in isolation work sufficiently well to answer a research problem." Crotty's (1998) suggestion that there can be an interchange between any theoretical perspective, methodology, and method supports the argument for flexibility between these research concepts.

Pragmatism shaped the approach I took to my research because I had specific objectives that were driving my research, and I was not wedded to any one methodology within which I needed to operate to address those objectives. Punch (2014) argues that in research generally, questions should drive the methodology; choosing the method first is illogical, resulting in “methodolatry” (p. 25). I determined that a quantitative methodology would best address the research objectives I had (see Section 1.4 for a description of, and rationale for, the research objectives in my study). The research objectives of my study were considered best addressed using a tightly structured design with pre-identified variables because I was investigating the impact of a pedagogy in terms of the relationship between one group of variables, and comparing this to another group that did not receive the same pedagogy.

1.3 Conceptual Framework of the Study

My study draws on social cognitive theory, which is situated within an agentic perspective; describing behaviour in terms of human agency. The applicable definition of the word ‘agency’ in this context is “the capacity, condition, or state of acting or of exerting power [over oneself]” (“Agency,” 2018). Bandura (1989, p. 1175) states that “the capacity to exercise control over one’s thought processes, motivation and action is a distinctively human characteristic.” Bandura (1986) developed social cognitive theory based on the argument that people are “neither driven by inner forces nor automatically shaped and controlled by external stimuli” (p. 18). Within the social cognitive framework, each person has a self-regulating system that affects beliefs, develops motivation and influences behaviour (Glynn, Taasoobshirazi, & Brickman, 2007).

Social cognitive theory involves the exploration of factors that regulate and motivate action (Bandura, 1986; Bandura, 1991). Bandura (2005) argues that self-efficacy is the foundation of human agency. According to social cognitive theory, we have a measure of control over what happens in our lives, although the idea that individuals “operate as entirely independent agents has few serious advocates” (Bandura, 1999, p. 2). The level of control that we have is influenced by our self-efficacy beliefs. When we are unable to exert the desired level of control, or we perceive that another is better placed to ensure our well-being, we can engage proxy agency or have someone to act on our behalf who has the knowledge, control, or resources to provide for our needs. For example, I would be confident to exercise personal agency in the field I specialise in but would engage the proxy agency of a doctor if I was unwell as they would be better able to facilitate my return to good health. At other times we engage in collective agency when our well-being is best assured by working collectively to achieve an outcome, goal, or reality, for example, joining a union to ensure greater bargaining power.

Social cognitive theory postulates that human development, growth, learning, adaptation, and interaction all take place within a triad of bidirectional determinants: environmental, behavioural, and personal. Bandura (1977, 1986, 1989, 1999a, 1999b) called this interaction a triadic reciprocal causation (illustrated in Figure 1.3). The environmental determinant in an educational context for most students is the physical and psychosocial learning environment of the classroom. Personal determinants include students' belief systems; motivational orientation (such as self-efficacy), and mastery experiences. Behavioural determinants include self-regulation and the self-regulatory behaviours that students display within the learning environment. According to social cognitive theory, these determinants influence one another reciprocally. For example, as self-efficacy beliefs "may be self-aiding or self-hindering" (Bandura, 1989, p. 1175) and determine students' motivation, a student with a low self-efficacy belief (formed due to a combination of personal, behavioural, and environmental factors) will likely lack confidence regarding their ability to achieve a task as well as a possible lack of motivation to complete the task. They may engage in task avoidant behaviour, such as distracting other students—a maladaptive self-regulatory behaviour. In addition, the psychosocial dynamics of the learning environment at that time, may influence that student's ongoing self-efficacy beliefs and self-regulation. This hypothetical example demonstrates a possible triadic reciprocal causation effect.

In a classroom, the learning environment is usually imposed on students. In many instances, the only choice students have is in terms of their reaction to their environment, which is, in turn, determined by the interaction between their personality and the behavioural choices they make—the dynamic interplay between these triadic reciprocal forces. However, both the physical and psychosocial learning environment determinants are malleable so that, while the learning environment is imposed upon the student, teachers have the ability to adapt or provide a learning environment which may result in a positive influence on behavioural and personal determinants. Educators can therefore use social cognitive theory to explore, adapt, and change environmental factors in order to positively influence students' motivation and self-regulation.

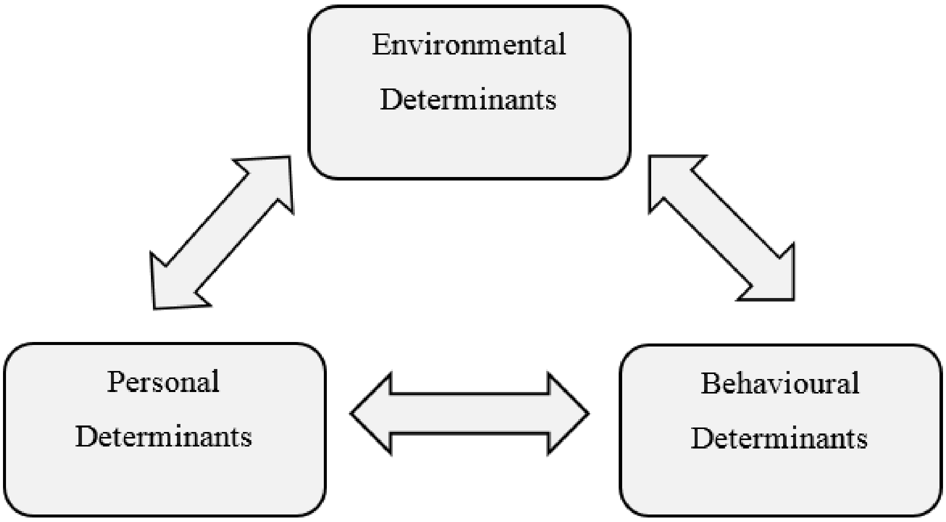


Figure 1.3. Social Cognitive Theory (adapted from Bandura, (1977)

In this section, the theoretical underpinning of my study; social cognitive theory, was defined, described, and situated within an educational context. This theory was considered a suitable and relevant framework through which to investigate the relationships between the constructs I was assessing in my study—motivation, self-regulation, and the learning environment. In the next section, the hypothetical research model of my study is described, beginning with the three hypotheses that developed as a result of theorising and a review of literature.

1.3.1 Hypotheses Developed for the Study

In this section, the hypotheses leading to the development of the hypothetical research model are described, followed by an illustration of the research model. Based on Bandura's (1986) social cognitive theory and a review of the literature (see Chapter 2), three hypotheses were developed for my study (depicted in Figure 1.4), in terms of investigating the relationships between motivation, self-regulation, and the learning environment. The learning environment was hypothesised to influence students' motivation (H_1) and self-regulation (H_2). Motivation was hypothesised to influence self-regulation (H_3).

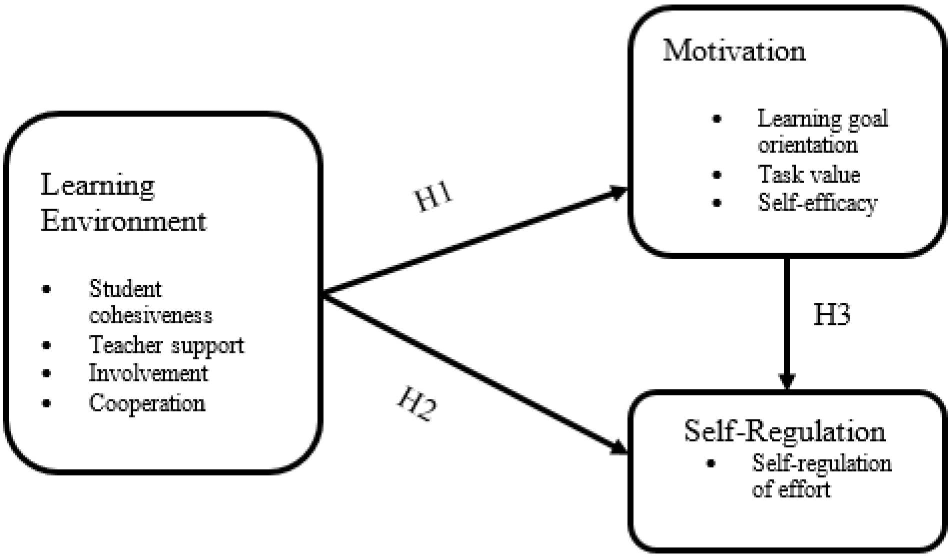


Figure 1.4. Hypothetical Research Model

1.3.1.1 Hypothesis 1: The Learning Environment is related to Students' Motivation

Extensive prior research has established that the psychosocial learning environment has a strong influence on student outcomes, with resultant evidence indicating that not only does the learning environment influence students' cognitive and affective outcomes, but that changes in the learning environment can result in subsequent changes in student outcomes (Dorman, 2001; Fraser, 2007). Learning environment –

outcome associations have been investigated in a number of studies, such as Chipangura and Aldridge (2017), and Tas (2016), who found that the learning environment had a positive and statistically significant influence on the affective learning outcome of motivation. A more extensive review of the studies investigating learning environment – motivation associations can be found in Chapter 2, Section 2.3.3.2. Given the length of time students spend in classroom learning environments, it is logical to suggest that the psychosocial aspects of the learning environment (for example, the extent to which students perceive a sense of belonging, or that the teachers supports them), may influence their levels of motivation. Therefore, based on theorising and a review of literature, the first hypothesis made was that students' perceptions of the four learning environment constructs utilised in my study (student cohesiveness, teacher support, involvement, and cooperation) would influence their motivation, as assessed in my study by the motivational constructs of learning goal orientation, task value, and self-efficacy.

1.3.1.2 Hypothesis 2: The Learning Environment is related to Students' Self-Regulation

The second hypothesis developed for my study was that the learning environment would also influence the behavioural determinant of students' self-regulation. The research in the literature that has investigated learning environment – self-regulation associations has indicated mixed results with regard to this relationship. Some studies have found a positive and statistically significant relationship between the learning environment and students' self-regulation (Agina, Kommers, & Steehouder, 2011; Alzubaidi, Aldridge, & Khine, 2016). Other researchers, such as Velayutham and Aldridge (2013), and Chipangura and Aldridge (2017), found that some, but not necessarily all learning environment constructs had an influence on students' self-regulation.

Despite the mixed results within the literature concerning the relationship between the learning environment and self-regulation, the specific context within my study involved students experiencing varied learning environments due to the introduction of cooperative learning into the Cycle 2[8] science curriculum within Abu Dhabi government schools. The use of cooperative learning strategies was considered as likely, based on findings within the research (Fernandez-Rio, Cecchini, Méndez-Gimenez, Mendez-Alonso, & Prieto, 2017), to result in changes in students' self-regulatory behaviour.

1.3.1.3 Hypothesis 3: Motivation is related to Students' Self-Regulation

The final hypothesis in my study was that motivation would also influence students' self-regulation. A relationship has been established within the literature between motivation and self-regulation, supporting Bandura's (1986) social cognitive theory that personal and behavioural determinants are interrelated (Andrade & Heritage, 2018; Zimmerman & Schunk, 2012). The hypothesis, that motivation would influence self-regulation, was drawn from a review of literature where most studies found that motivation predicted self-regulated behaviour, rather than the other way around. A detailed review of literature investigating this relationship can be found in Chapter 2, Section 2.3.3.4.

1.4 Research Objectives of the Study

To investigate what relationships exist between students' motivation, self-regulation, and perceptions of the learning environment, four research objectives were developed. First, in order to ensure that the results of this study emerged from a strong foundation, it was important to establish the validity and reliability of the two instruments, or questionnaires, for use in the context where my research was conducted; the UAE. Within my study, the terms instrument and questionnaire are used interchangeably. These questionnaires were the Students' Adaptive Learning Engagement in Science (SALES; Velayutham, Aldridge, & Fraser, 2011) to assess students' motivation and self-regulation, and a modified version of the What Is Happening In this Class? (WIHIC; Fraser, McRobbie, & Fisher, 1996), to assess students' perceptions of the learning environment. Therefore, my first research objective was:

[8] Middle schools (grades 6 to 9) are called Cycle 2 in Abu Dhabi government schools

> *Research Objective 1:* To establish the validity and reliability of two surveys when modified and translated for use in the UAE to assess students' motivation towards learning, self-regulation, and perceptions of the learning environment.

Theorising and a review of literature (see Chapter 2), finding that motivation has had a profound impact on student outcomes as well as their self-regulation of effort, and that associations have been made between students' perception of their learning environment, their motivation, and their self-regulation, resulted in the formation of the hypotheses described in Section 1.3.1. Almost all of the existing literature investigating these interrelationships has emerged from Western educational contexts. Therefore, examining the associations between students' motivation, self-regulation, and the learning environment within an Arabic context such as the UAE was considered to be a worthwhile endeavour. As such, the second and third research objectives in my study were:

> *Research Objective 2*: To examine the influence of the learning environment on students' motivation and self-regulation.

> *Research Objective 3:* To examine the influence of motivation on students' self-regulation.

There has been substantial research to suggest that cooperative learning strategies have had a positive impact on a range of cognitive and affective student outcomes, including motivation (reviewed in Chapter 2, Section 2.4.2.1). A common factor within such research was the presence of particular cooperative learning elements (Johnson & Johnson, 2008; Sharan, 2010; Slavin, 1980). The most important element that is widely agreed to be essential within effective cooperative learning instruction is positive interdependence, which is when a student perceives that their individual success is dependent on the success of the group as a whole (Sharan, 2010). As indicated in Section 1.1.3, cooperative learning was a new concept to many teachers within ADEC schools and, while there was an expectation for all students to be engaged in cooperative learning within science lessons, it appeared that cooperative learning strategies were frequently not being implemented effectively. In order to investigate the impact that cooperative learning strategies were having on students' motivation, self-regulation, and perceptions of the learning environment, I needed to establish whether there was a difference between these variables among students in classes with teachers identified as implementing effective cooperative learning strategies and those who were not in such classes. Therefore, my fourth and final research objective was:

> *Research Objective 4*: To investigate whether differences exist between students' motivation towards learning, self-regulation, and perceptions of the learning environment in classes with teachers identified as effectively implementing cooperative learning practices and classes that did not have such teachers.

In this section, the research objectives that shaped the research direction of this study have been outlined. The following section describes the significance of the study and its possible contribution to the research fields of motivation, learning environments, and cooperative learning.

1.5 Significance of the Research

The findings of my study offer contributions of a practical nature for teachers, contributions towards policy development and decision making for ADEC, and more general theoretical and methodological contributions. These contributions are summarised here and expanded upon in Section 6.6 of Chapter 6.

The results of my study have the greatest significance for the educational context within which my study took place—the Abu Dhabi Emirate in the UAE—with significance for both teachers in Abu Dhabi Cycle 2 school science classrooms and possibly beyond, as well as for Abu Dhabi educational policymakers. As a result of my study, teachers will have both the means to assess students' perceptions of their learning environment, as well as the ability to gain insight into how the learning environment within their classrooms is influencing students' motivation and self-regulation. The finding, that students' perceptions of the learning environment had an influence on students' motivation, is of significance for teachers as they will be able to make adjustments to the learning environment in order to improve students' motivation towards learning science.

The findings of my study have significance for ADEC and any other relevant organisation in the emirate charged with improving educational outcomes for students. Information as to how students perceive their learning environment, the influence of the learning environment on students' motivation and self-regulation, and also in what ways students' motivation influences students' self-regulation of effort, is now available to guide policy and decision making. Should ADEC want to evaluate any of the variables investigated in this study—students' motivation, self-regulation, perceptions of the learning environment, as well as the influence of cooperative learning— they now have two validated and economical questionnaires available that have already been used within Abu Dhabi government schools.

More broadly, while the field of motivation towards learning has been widely studied, very little research has been dedicated to investigating the influences on motivation and self-regulation in a Middle Eastern context. My study is significant in that it explores the influence of the learning environment on students' motivation and self-regulation within the context of the UAE, an Arab nation in the Middle East. My study also contributes to the body of relatively limited educational research that has thus far emerged from the UAE generally and from the Abu Dhabi reform process in particular (Badri & Al Khaili, 2014).

Despite the body of research that has examined cooperative learning and its subsequent impact on a range of cognitive and affective student outcomes, there is little research regarding the impact of cooperative learning practices on student outcomes within a non-Western context, specifically the UAE. In addition, to my knowledge, there has been almost no research exploring the influence of cooperative learning practices on students' motivation towards science learning and/or students' perceptions of their learning environment in a Middle Eastern context. This study therefore contributes to the fields of learning environment research, cooperative learning, as well as to how motivation may be influenced by cooperative learning practices in a Middle Eastern context.

This study establishes the validity and reliability of pre-existing questionnaires that have been developed in Western countries when modified and translated for use in the UAE. The study is likely to be helpful to other researchers because it provides a validated, Arabic translation of a modified version of the WIHIC, a widely utilised questionnaire that assesses students' perceptions of the learning environment. It also provides a validated Arabic translation of the SALES questionnaire, a newly developed questionnaire designed to assess students' motivation towards learning (Velayutham et al., 2011).

At the time this study was undertaken, educational reform in the UAE was undergoing significant and extremely rapid change. The movement away from traditional teaching techniques to internationally recognised best practice was a challenging one. To the best of my knowledge, there had been no research conducted in the UAE at the time of my study looking at the impact of cooperative learning on students' motivation, self-regulation and perceptions of the learning environment. Cooperative learning practices had been established as an expected component when implementing the science curriculum, so research that evaluated the impact of these practices on students' motivation and how it influenced students' perception of their learning environment was very timely.

Finally, this study may inform the implementation, reception, and perception of cooperative learning strategies within a non-Western culture, as the vast majority of cooperative learning research has been conducted in Western countries. In addition, while the field of learning environments has been broadly researched, particularly in Western countries but increasingly in non-Western cultures, there has been little research regarding how the learning environment is perceived by Arabic students. There has been little research conducted as to the impact of cooperative learning strategies on motivation and perceptions of the learning environment worldwide, and extremely little research conducted with Arabic students. Therefore, this study extends the literature in these fields.

1.6 Thesis Overview

This thesis is organised into six chapters. Chapter 1 has provided a context for my study; describing the background and educational setting in which the study took place. In this chapter, the research paradigm and conceptual framework underpinning my study were described, including the development of the hypotheses and subsequent hypothetical research model. This was followed by a description of the research objectives. Finally, the potential significance of my study to various stakeholders was outlined.

Chapter 2 consists of a review of the literature relevant to the aims of my study. First, the conceptual framework drawn upon in my study, is described. Next, literature from the fields that informed my study are reviewed in separate sections: motivation (Section 2.1); self-regulation (Section 2.2); learning environments (Section 2.3); and cooperative learning (Section 2.4). Included within the motivation, self-regulation, and learning environment sections is a review of instruments that have been used to assess each of these constructs. Also reviewed in this chapter is literature pertaining to the interrelationships between the constructs used in my study.

In Chapter 3, a description of the methodology used in my study is provided. First, the design of the study is described and justified. Second, information is provided with regard to the study sample, a detailed description of the modified questionnaires used in the study, the translation and back translation processes, and how the pilot survey was implemented. Third, the administration of the survey proper, as well as the data collection procedures used during the administration of the survey, are described. Fourth, a description of the analyses used to investigate each of my research questions is provided. This chapter concludes with a discussion of the ethical considerations made throughout my study, and how these were addressed.

In Chapter 4, results are reported pertaining to the first research objective of my study; establishing the validity and reliability of the questionnaires when used in middle school science classrooms in the UAE. Data analyses include an examination of the factor structure, internal consistency reliability, and discriminant validity.

In Chapter 5, results are reported firstly with regard to the second and third research objectives of my study; investigating the relationships between students' motivation, self-regulation, and the learning environment. To examine these relationships, data analyses were conducted using structural equation modelling. This chapter concludes with a presentation of results, using multivariate analysis of variance and effect size, related to research objective 4; investigating whether differences exist in students' motivation, self-regulation, and perceptions of the learning environment, between classes with teachers identified as effectively implementing cooperative learning strategies, and classes that did not have such teachers.

In Chapter 6, the concluding chapter of my thesis, the results of my study are summarised, interpreted, and discussed in terms of the theoretical and research literature. The limitations of the study are identified and acknowledged. Educational implications arising from my study are then discussed, followed by a series of recommendations made in terms of future research. This chapter concludes with a discussion of the potential significance of my study, followed by final remarks.

Chapter 2

LITERATURE REVIEW

This chapter presents a review of the literature relevant to the aims and objectives of my study. The focus of my study was two-fold; (1) to examine what relationships exist between students' motivation, self-regulation, and perceptions of the learning environment, and (2) to investigate whether differences exist between students' motivation towards learning, self-regulation, and perceptions of the learning environment in classes with teachers identified as effectively implementing cooperative learning practices and classes that did not have such teachers. The review of literature is organised using the following headings:

- Motivation (Section 2.1);
- Self-regulation (Section 2.2);
- Learning environments (Section 2.3);
- Cooperative learning (Section 2.4); and
- Chapter summary (Section 2.5).

2.1 Motivation

Motivation is "one of the most researched constructs in education" (Alzubaidi et al., 2016, p. 2). A reason for this could very well be the widespread realisation that motivation is a critical part of effective learning. As Ainley (2004) puts it, "…just about everyone wants students to be more engaged" (p. 1). Despite this desire, factors affecting motivation are still not well understood (Hancock, 2004). Many questions still remain about the causes of, and influences on motivation, despite its importance to the learning process. The wide-sweeping reform taking place in the UAE (described in Chapter 1) involved significant changes in both teaching practice and the learning environment. These changes provided an opportunity to investigate the influence of students' perceptions of the learning environment on their motivation towards learning within this evolving educational context.

This section begins with a definition of motivation. Next, literature is reviewed in relation to the three motivation theoretical constructs used in my study: learning goal orientation (Section 2.1.1); task value (Section 2.1.2); and self-efficacy (Section 2.1.3). After this, a range of instruments used to assess motivation in educational contexts is described (Section 2.1.4). Finally, studies that have found associations between the three motivation constructs used in my study are reviewed (Section 2.1.5).

The word 'motivation' comes from the latin 'movere' which means 'to move' (Eccles & Wigfield, 2002; Pintrich, 2003a). Pintrich (2003b, p. 669) asserts that motivational theories "attempt to answer questions about what gets individuals moving." Glynn et al. (2007, p. 1089) suggest that "Motivation is the internal state that arouses, directs, and sustains students' behaviour toward achieving certain goals." Urdan and Schoenfelder (2006, p. 332) state that "Motivation is a complex part of human psychology and behaviour that influences how individuals choose to invest their time, how much energy they exert in any given task, how they think and feel about the task, and how long they persist at the task." Common definitions of motivation all involve a response to, or reaction to circumstances and/or set of events, and that this response can be both internally and externally stimulated.

A key idea in motivation theory is the concept of 'self,' conceived in such terms as self-concept, self-efficacy, self-actualisation, self-hood, self-esteem, self-determination, and self-competence (Uguroglu, Schiller, & Walberg, 1981). Two dominant concepts that have driven much research in motivation have been self-efficacy and self-concept beliefs (DiBenedetto & Schunk, 2018; Pajares, 2001; Pajares & Schunk, 2001a, 2001b). Seifert (2004) suggests that theories of motivation strive to explain students' behaviour in academic settings. Seifert asserts that while each theory has its own unique constructs, they are closely linked.

This section entailed a definition and brief description of motivation, as investigating what motivates students to learn was a key objective of my study. The following sections review literature relevant to the specific motivational constructs used in my study: learning goal orientation (reviewed in Section 2.1.1), task value (reviewed in Section 2.1.2), and self-efficacy (reviewed in Section 2.1.3).

2.1.1 Learning Goal Orientation

This section begins with situating learning goal orientation within achievement goal theory. Next, a justification is given as to why this goal orientation, rather than a performance-avoid or performance-approach goal orientation, is assessed in my study. Finally, the findings of research using learning goal orientation to investigate motivation in a range of contexts are described.

Goals, according to goal theory, give meaning or purpose to an activity (Kaplan & Maehr, 2007). Achievement goals are seen as the purpose for engaging in achievement-related behaviour (Maehr, 1989). Achievement goal theory is not concerned with *what* is trying to be achieved as, for example, having a goal to get an ‘A’ grade on a test, but more with *why* it is important to get that ‘A.’ Achievement goal theory was developed from collaborative efforts in the late 1970s and early 1980s (Ames, 1984; Dweck, 1986; Nicholls, 1984) and is a leading theory with regard to student motivation (Anderman & Patrick, 2012; Elliot & McGregor, 2001; Kaplan & Maehr, 2007). Much of the research has centred around two contrasting goal orientations, which have been labelled variously as learning versus performance goals (Dweck, 1986; Dweck & Leggett, 1988; Elliott & Dweck, 1988), task versus ego involvement goals (Nicholls, 1984), and mastery versus performance goals (Ames & Archer, 1988). I have used the terms ‘learning goal orientation’ and ‘performance goal orientation’ when referring to these goal orientations in my study.

One reason I selected a learning rather than a performance goal orientation is because they have different purposes according to the literature. The purpose of a learning goal orientation is “to develop competence and task mastery” (Elliot, Murayama, & Pekrun, 2011, p. 632). Central to a learning goal orientation is a belief in the intrinsic value of learning and that outcomes are linked to effort (Ames, 1992; Weiner, 1979, 1990). Students with learning goal orientations seek challenge and persevere when presented with difficulties (Dweck & Leggett, 1988). A learning goal orientation within a science context “refers to the degree to which the student perceives him/herself to be participating in a science classroom for the purpose of learning, understanding, and mastering science concepts, as well as improving science skills” (Velayutham et al., 2011, p. 9).

With performance goal orientation, as opposed to learning goal orientation, self-worth is linked to one's ability, and ability is perceived as doing better than others or achieving mastery with little effort (Ames, 1992), and ability is valued over effort (Ames & Archer, 1988; Nichols, 1996). Middleton and Midgley (1997) summarise the difference between performance and learning goal orientations by saying that the purpose of a learning goal orientation is to "develop and improve ability [whereas with a performance goal orientation it is to] demonstrate and prove ability" (p. 4).

While there has been some research indicating a positive relationship between a performance-approach goal orientation and achievement (Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000), there is not yet a consistent pattern established concerning the role of a performance-approach goal orientation (Wang, Shim, & Wolters, 2017). In addition, there is extensive research indicating negative outcomes associated with performance-avoidance goal orientation (Bereby-Meyer & Kaplan, 2005; Jang, Dunlop, Park, & van der Boom, 2015; Kaplan & Maehr, 1999; Urdan & Schoenfelder, 2006; Yan, 2018). In summary, I decided to incorporate only the learning goal orientation aspect of achievement goal theory for four reasons. First, utilising a learning goal orientation better suited my study; second, there were significant mal-adaptive elements associated with performance avoid orientations; third, my study did not assess students' motivation in terms of academic achievement; and last, there is a lack of clarity concerning performance-approach goal orientation as a motivation construct (Harackiewicz, Barron, & Elliot, 1998; Midgley, Kaplan, & Middleton, 2001; Senko & Tropiano, 2016).

Positive cognitive and affective learning outcomes regarding student motivation situated within a learning goal orientation have been widely accepted. For example, there are: positive effects on persistence and effort (Ames & Archer, 1988; Elliot, 1999; Elliott & Dweck, 1988; Kaplan & Maehr, 1999; Urdan & Schoenfelder, 2006); positive attitudes towards others in a social context (Kaplan, 2004; Levy, Kaplan, & Patrick, 2004; Sideridis & Mouratidis, 2008); effective problem solving strategy use and achievement (Bereby-Meyer & Kaplan, 2005); well-being and behaviour (Huff, Stripling, Boyer, & Stephens, 2016; Kaplan & Maehr, 1999; Roeser, Midgley, & Urdan, 1996); deeper processing strategies and purpose for learning (Froiland, 2018); response to feedback (Jang et al., 2015); cultural influences on goal orientations

(Unger-Aviram & Erez); parental influences on goal orientations (Jang et al., 2015); achievement (Hacieminoglu, Yilmaz-Tuzun, & Ertepinar, 2009; Kitsantas, Steen, & Huie, 2009; Roeser et al., 1996); test anxiety (Mohammadi, Kazemi, Tahan, & Lalozaee, 2017; Skaalvik, 1997; Wolters, Yu, & Pintrich, 1996); and achievement goal orientation trajectories over time (Middleton & Midgley, 1997; Schwinger & Wild, 2012). The consistency of research findings indicating the positive relationship between a learning goal orientation and positive affective learning outcomes justified its inclusion as a motivational construct in my study.

In this section, literature concerning learning goal orientation, one of the motivational constructs assessed in my study, has been reviewed. Students with a learning goal orientation have been found to be intrinsically motivated to learn and are generally motivated to develop and improve, rather than prove, their learning ability. It was a relevant construct to assess motivation within the context of my study because many students in science classes in Abu Dhabi at the time of my study were being exposed to a new pedagogical approach (cooperative learning). Examining whether this learning environment influences these students' motivational goal orientation has relevance in relation to assessing the impact of this educational innovation within Abu Dhabi government schools. Having reviewed literature relevant to this motivation construct, the next section reviews literature with regard to the second motivational construct in my study—task value.

2.1.2 Task Value

In this section, the concept of task value is defined and situated within expectancy value theory. After this, a brief historical background regarding the development of this motivational construct is provided. Next, the components of task value are described and how the three components or sub-values—attainment, intrinsic, and utility values—were combined into the task value scale in my study is explained. After this, the literature in the field is reviewed. Last is a description of the contribution of my study to research in task value.

Task value is a component of expectancy value theory (Wigfield, Tonks, & Klauda, 2009), a well-recognised motivational framework. This framework claims that two elements play an important role in motivation towards learning; “having an *expectancy* of being successful in a task and having a *value* for engaging in the task” (Barron & Hulleman, 2015, p. 1). Higgins (2007) suggests that the concept of ‘value’ is complex and multileveled but provides a working definition of value as “something about an object, action, activity or event that makes it good or bad to some perceiver” (p. 455). Expectancy value theory argues that a person’s expectations of success and the extent to which they value succeeding determines his or her motivation towards performing achievement tasks (Wigfield, 1994). Expectancy value theorists argue that the value of a task determines task choice; students will engage in tasks that they value positively and avoid tasks with a perceived negative value (Wigfield & Eccles, 1992, 2000). Gilbert et al. (2014) state that “Task values relate to benefits, rewards and advantages that an individual believes can accrue as a result of participating in a task…or activity” (p. 289).

Atkinson (1957) developed the first recognised expectancy-value model in mathematics to explain behaviour around achievement, such as persistence and striving for success. Atkinson was influenced by Murray’s (1938) needs-press model in which a person’s needs influence his or her subsequent behaviour. Modern expectancy-value theories, such as those of Eccles and colleagues (Eccles, 1987, 1993, 2005; Eccles et al., 1983; Eccles & Wigfield, 1995; Meece, Wigfield, & Eccles, 1990; Wigfield, 1994; Wigfield & Eccles, 1992, 2000) are based on Atkinson’s (1957) expectancy-value model but extend his work in several ways. The expectancy and value aspects of the model have been more richly defined and are linked to a broader range of psychosocial and cultural determinants. In addition, Atkinson’s work was primarily laboratory based whereas modern theorists have tested the model in real life contexts (Wigfield & Cambria, 2010; Wigfield et al., 2009).

Task value has been categorised into four sub-values: attainment (importance); intrinsic or interest; utility (usefulness); and cost (Wigfield & Cambria, 2010; Wigfield & Eccles, 1992). Wigfield and Cambria (2010) define these four sub-values as follows: intrinsic value, which Wigfield et al. (2009) suggest is the first of these sub-values to be developed, relates to the level of enjoyment gained from engaging in a task without any specific gain or benefit needed. Attainment value is linked to identity in that a task is valued if it is seen as being central to one’s sense of self. Attainment value develops as one's sense of identity, and what is important to maintaining that identity, is established (Wigfield et al., 2009). Utility value relates to how useful the task is perceived by the individual, such as completing an assignment that contributes to a broader qualification. In this regard, it is similar to aspects of extrinsic motivation. Utility value develops as a child progresses through different stages of schooling (Wigfield et al., 2009). Cost value relates to what an individual perceives they will have to give up in order to complete the task as well as how much effort will be required. Cost value is the least researched aspect of the four components of task value (Barron & Hulleman, 2015; Wigfield & Cambria, 2010). In my study, the first three task value components (intrinsic value, attainment value, and utility value) were combined into one task value scale.

Many researchers have used the expectancy value framework to explore motivation, resulting in a considerable amount of research that supports the theoretical link between the value a student ascribes to a task and the resulting cognitive and affective outcomes. The expectancy value framework has been used to investigate: how procrastination versus effort and persistence is influenced by levels of self-efficacy and task value in college students (Wu & Fan, 2017); parental influences in predicting achievement and achievement choices as a result of expectancies of success (Harackiewicz, Rozek, Hulleman, & Hyde, 2012; Rozek, Hyde, Svoboda, Hulleman, & Harackiewicz, 2015; Svoboda, Rozek, Hyde, Harackiewicz, & Destin, 2016; Taskinen, Dietrich, & Kracke, 2015); changes in motivational trajectories over time towards science (Kosovich, Flake, & Hulleman, 2017; Phelan, Ing, Nylund - Gibson, & Brown, 2017; Simpkins, Davis-Kean, & Eccles, 2006; Wang, Chow, Degol, & Eccles, 2017); how expectations of success and task value influence achievement behaviour (Cox & Whaley, 2004; Denissen, Zarrett, & Eccles, 2007); and bi-directional aspects of competency beliefs and task value (Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005). Students' task value influences the effort students apply to a range of tasks (Greene, Debacker, Ravindran, & Krows, 1999; Nagengast et al., 2011; Trautwein & Lüdtke, 2007; Yang, Cho, Mathew, & Worth, 2011). The breadth of the research and consistency of findings concerning task value supported the inclusion of it as a motivational construct for my study.

In this section, expectancy value theory has been defined, its theoretical development described, and task value defined as a component of this theory as well as the components of task value itself. Finally, I have reviewed studies using expectancy value theory to investigate motivation. Task value is an essential element of motivation towards learning because if there is little value perceived in a learning task, students are unlikely to exert effort into learning that task (Andrade & Heritage, 2018). Having reviewed literature relevant to the motivational construct of task value, the next section in this chapter reviews self-efficacy as another essential component in motivation towards learning.

2.1.3 Self-Efficacy

This section begins by situating self-efficacy within social cognitive theory. Next, self-efficacy is defined. Following this, theoretical ideas as to how self-efficacy develops are discussed. Finally, literature investigating the influences on self-efficacy as well as the impact of self-efficacy on learning is reviewed.

According to social cognitive theory, self-efficacy beliefs influence the choices people make; people tend to be more motivated to participate in and complete tasks that they feel confident about achieving (Pajares & Schunk, 2001a, 2001b). Bandura (1986) suggests that one of the most influential aspects in people's lives is the conception they have of their personal efficacy. He describes self-efficacy as one's belief in one's ability to succeed in specific situations. Schunk (1991, p. 207) stated that self-efficacy is "an individual's judgments of his or her capabilities to perform given actions."

It is widely acknowledged that self-efficacy beliefs influence motivation and learning outcomes (Bandura, 1986; Jinks & Lorsbach, 2003; Nelson & Ketelhut, 2008; Zimmerman, 2000b). Persistence in a difficult task is linked to efficacy—the greater the persistence, the higher the efficacy and, the higher the efficacy, the greater persistence likely to occur when confronted with a challenging task. Several researchers have found a positive relationship between self-efficacy scores and students' perceptions of the intrinsic value of a learning task (Pintrich & De Groot, 1990; Pokay & Blumenfeld, 1990). Students with strong self-efficacy see learning tasks as opportunities in which to be challenged and to learn. They anticipate success and increase their efforts when challenged. They also recover quickly from setbacks and attribute failure to insufficient preparation or readiness rather than an inherent failure (Pajares & Schunk, 2001a, 2001b).

Bandura (1977) created a model explaining self-efficacy as derived from four primary sources. The first and most influential source is performance accomplishments, which are based on the mastery of one's experiences, and success or unsuccessful experiences raise or lower master expectations, respectively. Strong efficacy expectations allow one to experience failure with minimal negative impact. The second source of self-efficacy belief is vicarious experience; seeing others achieving a desired task can facilitate the belief that success is possible. The effectiveness of this source in developing self-efficacy depends on the similarity of the observed model to the observer (Britner, 2008). The third source of self-efficacy belief is verbal persuasion as people can be persuaded by others to believe they can succeed in something they initially believed impossible. Success is dependent upon a successful experience, which then becomes a personal accomplishment. Essential to the effectiveness of verbal persuasion is scaffolding during the personal experience (Bandura, 1977). The fourth source of self-efficacy belief is the physiological state, or emotional arousal (Bandura, 1977). High arousal, usually presenting as stress or anxiety, generally lowers a person's ability to perform well and lessens the likelihood of experiencing success. Modelling of the experience, or vicarious experience, can influence one's physiological state and, in turn, one's perceived self-efficacy.

There is disagreement regarding the cause of self-efficacy (Pajares & Schunk, 2001a); whether a student's academic self-efficacy determines achievement, or academic achievement influences perceived self-efficacy. Researchers with a self-enhancement orientation argue that self-efficacy determines achievement whereas researchers with a skill-development orientation view self-efficacy as a result of academic achievement (Pajares, 2001; Pajares & Schunk, 2001a, 2001b). This has implications for practice. If students do well because of their *belief* in their ability to do well, then educators should focus on improving students' perceptions of self-efficacy. However, if students have strong self-efficacy *because* they do well, then efforts should focus on skill development, which will result in positive self-efficacy (Pajares & Schunk, 2001a).

Regardless of its cause, research widely supports the notion that self-efficacy plays an important and positive role in academic engagement and achievement in various learning contexts (Multon, Brown, & Lent, 1991; Zimmerman, 2000b). Researchers have investigated self-efficacy in a variety of contexts, such as: parental influences on self-efficacy (Sha, Schunn, Bathgate, & Ben-Eliyahu, 2016; Zimmerman, Bandura, & Martinez-Pons, 1992); responding to challenge and gaining new knowledge (Komarraju & Nadler, 2013); cultural differences in self-efficacy beliefs (Meissel & Rubie-Davies, 2016); investigating the influences of Bandura's (1977) four sources of self-efficacy (Britner, 2008; Usher & Pajares, 2006); the relationship between self-efficacy and gifted students (Wang & Neihart, 2015); the positive impact of modelling on children's self-efficacy (Schunk & Zimmerman, 2007); the positive influence of teacher enthusiasm on self-efficacy (Zhang, 2014); the influence of self-efficacy on positive beliefs about learning (Genç, Kuluşaklı, & Aydın, 2016); the positive impact of direct instruction on students' self-efficacy (Hushman & Marley, 2015); and the direct effect of self-efficacy on academic performance (Stegers-Jager, Cohen-Schotanus, & Themmen, 2012).

Research has found differences in self-efficacy beliefs in a variety of contexts. For example, Meissel and Rubie-Davies (2016) found differences in motivation levels and self-efficacy beliefs between different cultures in New Zealand, with Māori and Polynesian middle school students more affected by their self-efficacy beliefs than their New Zealand European peers. Bong (2004) found that self-efficacy levels in students varied according to subject, with differences in self-efficacy across multiple learning domains in a public, all girls' high school in Korea. Leonard et al. (2016) found that students' self-efficacy was either positively or negatively affected by different learning environments. Kim, Wang, Ahn and Bong (2015) found differing self-efficacy profiles between male and female English language learners at a Korean university.

While there are relatively few studies focused on the impact of self-efficacy with regards to students learning science, research supports the notion that self-efficacy positively influences students' learning outcomes in this subject (Velayutham, Aldridge, & Afari, 2013; Velayutham & Aldridge, 2013; Velayutham, Aldridge, & Fraser, 2012). Britner (2002, 2008) and Chen and Pajares (2010) found that self-efficacy was positively linked with students' science achievement in middle school, with Hushman and Marley (2015) finding that direct instruction in particular had a positive influence on students' self-efficacy. Bartimote-Aufflick, Bridgeman, Walker, Sharma, and Smith (2016) found a strong association between self-efficacy and science learning outcomes with university students. Middle school science students' perceptions of job accessibility in STEM fields were influenced by their levels of self-efficacy (Vervecken & Hannover, 2015). Science learning through a game-based approach benefited students' science content learning and self-efficacy beliefs (Meluso, Zheng, Spires, & Lester, 2012), and Jansen, Scherer, and Schroeders (2015) found that self-efficacy in science was positively related to inquiry learning.

In this section, self-efficacy has been situated within social cognitive theory. Self-efficacy has been defined, the four sources of self-efficacy (Bandura, 1977) have been described, and possible causes of self-efficacy reviewed. Finally, I have cited research that has investigated the role of self-efficacy in science learning and studies investigating self-efficacy within science contexts in particular. Self-efficacy has been widely recognised as an important element of students' motivation. This reason, and the fact that self-efficacy in students has been found to vary in different contexts, justified its inclusion as an important motivational construct to assess within the context of my study. The following section describes a range of questionnaires designed to assess students' motivation and justifies the selection of the questionnaire I used to assess students' motivation in my study.

2.1.4 Instruments Used to Assess Motivation

There have been several questionnaires developed to assess motivation. However, a review of the literature indicated that most of these instruments assess motivation towards learning in general rather than levels of motivation towards a specific subject (Velayutham et al., 2012). Most of those that do investigate motivation towards science learning have not been designed for use at the middle school level; the educational level of the sample in my study. In this section, seven instruments, used to assess motivation and potentially applicable for use in my study, are reviewed: the Multidimensional Motivation Instrument (Section 2.1.4.1); the Motivated Strategies for Learning Questionnaire (Section 2.1.4.2); the Academic Motivation Scale (Section

2.1.4.3); the Science Motivation Questionnaire (Section 2.1.4.4); the Students Motivation Towards Science Learning Questionnaire (Section 2.1.4.5); the Patterns of Adaptive Learning Survey (Section 2.1.4.6); and the Students Adaptive Learning Engagement Survey (Section 2.1.4.7).

2.1.4.1 The Multidimensional Motivation Instrument (MMI)

The MMI (Uguroglu et al., 1981) was developed to provide a "more comprehensive motivation measure through a multidimensional instrument" (p. 280) after an extensive examination of many motivation instruments by the researchers revealed a need for such a measure. The MMI consists of six scales: academic self-concept, achievement motivation, social self-concept, locus of control, emotional self-concept, and physical self-concept. The instrument assesses elementary students' (grades 3 to 8) motivation generally rather than in specific subjects. This instrument was not considered to be suitable for my study for a number of reasons. First, the phrasing and complexity of the items posed problems for translation. Second, it was not clear which motivation scale the items in the questionnaire related to. Third, the instrument included numerous items that were not relevant to my study. Finally, the scale used to respond to items was considered overly complex for the purposes of my study.

2.1.4.2 The Motivated Strategies for Learning Questionnaire (MSLQ)

The development of the MSLQ began in the late 1980s and evolved from a general model of college student motivation and self-regulated learning (Pintrich, Smith, García, & McKeachie, 1993). The MSLQ examines college students' motivational orientations and use of learning strategies (Pintrich et al., 1993). It consists of two sections—one to assess motivational strategies and the other to assess learning strategies. It has 81 items in total. The 31 items in the motivation section are based on the motivational constructs of expectancy, value, and affect, and these items assess students' goals, values, self-efficacy beliefs, and test anxiety (Duncan & McKeachie, 2005). Research by Duncan and McKeachie (2005) found different factor structures when the instrument was used in high school and college settings. This finding has raised concerns regarding the reliability of the MSLQ. Further, an examination of the items in the questionnaire revealed a complexity in phrasing that may have been difficult for middle school students to understand. There were also some negatively worded items that could have caused confusion for students. Finally, scrutiny of the items indicated that many were not relevant for the purposes of my study. Given these concerns the MSLQ was not considered suitable for my study.

2.1.4.3 The Academic Motivation Scale (AMS)

The AMS, developed by Vallerand, Pelletier, Blais et al., (1992), was initially created to cross-validate the English version of the Eschelle de Motivation en Education (EME). The AMS is founded on self-determination theory and consists of 28 items that are subdivided into seven sub-scales. The sub-scales incorporate three aspects of intrinsic motivation (to know, to accomplish things, and to experience stimulation), extrinsic motivation (external regulation, internal regulation, and identification), and amotivation (lack of either intrinsic or extrinsic motivation). This instrument has been found to be valid and reliable but was not considered suitable for the purposes of my study for two reasons. First, it was designed for university students and, as such, some items were not considered suitable for the developmental level of the sample used in my study, and, second, it was not designed to assess motivation in science contexts.

2.1.4.4 The Science Motivation Questionnaire (SMQ)

The SMQ was developed by Glynn and Koballa (2006) to assess university students' motivation towards science. Its purpose was to gather information on the effectiveness of both science lectures and advisement sessions for university students struggling with science learning as well as to evaluate the efficacy of instructional approaches as well as materials being used to increase students' motivation (Glynn, Taasoobshirazi, & Brickman, 2009). Glynn et al. wanted to further investigate the six motivational dimensions in the instrument, found in the literature to influence self-regulatory learning (intrinsic motivation, extrinsic motivation, personal relevance, assessment anxiety, self-determination, and self-efficacy), and "establish evidence for its construct validity" (2009, p. 138). After exploratory factor analysis, the six dimensions were combined into five scales: intrinsic motivation and personal relevance, self-efficacy and assessment anxiety, self-determination, career motivation, and grade motivation. The questionnaire was found to be "a good measure of motivation to learn science"

(Glynn et al., 2009, p. 138). Despite this, there were three reasons why this instrument was not selected for use in my study: first, the instrument had only been used with university students and not with the educational level of the sample in my study; second, one of the scales (career motivation) had only two items which the researchers admit is less than desirable; and, third, one scale (grade motivation) had low reliability.

2.1.4.5 The Students Motivation Towards Science Learning (SMTSL)

The SMTSL (Tuan, Chin, & Shieh, 2005) was developed specifically to assess students' motivation towards learning science. It consists of six scales: self-efficacy, active learning strategies, science learning value, performance goal, achievement goal, and learning environment stimulation. There are different numbers of items in each scale with a total of 35 items in the questionnaire. While the SMTSL met the criteria of being orientated towards science and was applicable for secondary school students, there were some concerns with regard to utilising this instrument for my study. Scrutiny of the survey revealed that not all of the constructs appeared to be directly related to students' motivational beliefs about learning science, particularly the items within the 'active learning' scale. In addition, while this instrument contained a learning environment scale, I wanted to utilise specific scales to assess students' perceptions of their learning environment that were not present within the learning environment scale in this instrument. Further, there was a lack of clarity with regard to the intellection and quantification of some of the constructs, which raised questions about the theoretical soundness of the instrument. Lastly, there were concerns with regard to the wording of some of the items; the self-efficacy scale had several negatively worded items, and the wording of several items in the instrument was considered to be overly lengthy.

2.1.4.6 The Patterns of Adaptive Learning Survey (PALS)

The PALS was developed by Midgley et al. (1996) using goal orientation to examine the relationships between the learning environment and students' motivation, affect, and behaviour (Midgley et al., 2000). It consists of five scales that assess personal achievement goal orientations; perceptions of teachers' goals; perceptions of the goal structures in the classroom; achievement-related attitudes, beliefs, and strategies; and perceptions of parents and home life. While this instrument had some constructs that were relevant for the purposes of my study, it did not specifically address students' motivation in science learning and was not, therefore, for use in my study.

2.1.4.7 The Students' Adaptive Learning Engagement Survey (SALES)

The SALES instrument (Velayutham et al., 2011) was developed to assess students' motivation and self-regulation in science learning with grade 8 to 10 students, similar to the grade level used in my study. Items from relevant questionnaires, such as the MSLQ (Pintrich et al., 1993), the PALS (Midgley et al., 2000), the SMTSL (Tuan et al., 2005), and the SMQ (Glynn et al., 2007), were modified for use when appropriate, while others were created specifically for the SALES questionnaire. Development of the instrument involved a multi-stage approach to "ensure that Trochim and Donnelly's (2006) framework for construct validity was satisfied" (Velayutham et al., 2011, p. 14).

The instrument consists of four scales: three that assess constructs associated with motivational beliefs (learning goal orientation, task value, and self-efficacy); and one scale to assess students' self-regulation of effort or "the degree to which students meta-cognitively and motivationally participate in their own learning" (Velayutham et al., 2011, p. 126). Each scale has eight items, with 32 items in total. A more detailed description of this instrument can be found in Chapter 3, Section 3.3.1. This instrument was chosen for my study for several reasons: first, it was designed to assess students' motivation in science, the same context as my study; second, it was created to be implemented at the same grade level as the sample in my study; and last, it had very sound validity and reliability (Velayutham et al., 2011). Given that this instrument was considered to be the best overall fit with the purposes of my study, this section provides a brief review of past research involving the SALES.

As the SALES instrument was developed relatively recently, there has been limited research to date involving its use. However, it has already been used in both Western and non-Western contexts and has consistently been found to have strong construct validity. It was originally developed and used in Perth, Western Australia, in a study that collected quantitative data from 1,371 students from science classes in grades 8 to

10 and in-depth qualitative data from 10 science teachers and 12 students (Velayutham et al., 2011). The findings suggest that the final version of the survey has "high content, face, convergent, discriminant, predictive and concurrent validity when used in lower secondary classes" (Velayutham et al., 2011, p. 15).

Further to validating the instrument itself, the results indicated that the motivational beliefs of learning goal orientation, task value, and self-efficacy influenced students' self-regulation when learning science, and that gender had a moderating effect on these relationships (Velayutham et al., 2012). However, task value, one of the motivational constructs within the SALES, was found to have a statistically significant influence on boys' self-regulation only. It was anticipated that my study, using a female sample only, may further contribute to understanding gender differences in task value.

In another study, an adapted version of the SALES was used, together with an instrument to assess students' perceptions of the learning environment, to investigate whether students frequently exposed to multimedia had different perceptions of the learning environment and engagement compared to students less frequently exposed (Chipangura & Aldridge, 2017). The study was conducted in Perth, Western Australia with a sample of 365 high school students in 16 mathematics classes. The SALES was modified to be suitable for mathematics students and was re-named the Students' Adaptive Learning Engagement in Mathematics (SALEM). The SALEM was found to have satisfactory factorial validity once six items were removed, and the findings supported the overall validity and reliability of the SALEM instrument. The findings of this study suggest that students frequently exposed to multimedia in mathematics classes had higher motivation and self-regulation than those not exposed (Chipangura & Aldridge, 2017).

The SALES was also adapted for use in Jordan to investigate students' perception of their learning environment and whether learning environment perceptions influenced motivation and self-regulation when learning English as a second language (Alzubaidi et al., 2016). The instrument was modified for use in an English language learning context and was re-named the Engagement in English Language Learning and Self-Regulation (EELLS). The sample for this study included 994 students from humanities, health sciences and engineering faculties within one university in Jordan.

The results strongly supported the validity and reliability of the SALES at the university level in Jordan, and statistically significant relationships were found between students' perceptions of their learning environment, their motivation, and self-regulation.

Despite being a relatively new instrument, studies that have utilised the SALES all support its strong factorial validity and reliability. As stated previously, it was these findings, in combination with the alignment of this instrument to both the objectives and context of my study that resulted in the selection of the SALES to assess students' motivation towards learning and self-regulation of effort.

In this section, instruments used to assess motivation have been described, and a justification provided as to the selection of the SALES for use in my study to assess students' motivation and self-regulation. In the next section, the interrelationships between the motivational constructs used in my study are discussed, and a description of the contribution of my study with regard to gaps in motivation research is provided.

2.1.5 Learning Goal Orientation, Task Value, and Self-Efficacy Associations in the Literature

While the motivation constructs of learning goal orientation, task value, and self-efficacy have been investigated in a range of studies, there is relatively little research that has examined these specific motivation constructs within a science context. Therefore, studies that have found interrelationships between these motivation constructs within the literature are reviewed in this section.

There has been considerable research that has found an interrelationship between self-efficacy and goal orientation (Anderman & Young, 1994; Dweck & Leggett, 1988; Hacieminoglu, 2016; Huff et al., 2016; Kang, Scharmann, Noh, & Koh, 2005; Kaplan & Maehr, 1999; Middleton & Midgley, 1997; Multon et al., 1991; Pajares, Britner, & Valiante, 2000; Roeser et al., 1996; Simzar, Martinez, Rutherford, Domina, & Conley, 2015; Skaalvik, 1997; Wolters et al., 1996). Most of the research supports the claim that self-efficacy is more strongly related to learning goal rather than performance goal orientation (Elliott & Dweck, 1988; Meece, Blumenfeld, & Hoyle, 1988). Although there are fewer studies investigating the relationship between self-efficacy and goal orientation in a science setting, my review of the literature indicated that, in many of these studies, self-efficacy was often interrelated with both a learning and performance-approach orientation but not with a performance-avoid orientation (Hacieminoglu, 2016; Hacieminoglu et al., 2009; Huff et al., 2016).

While the majority of research findings support a positive link between learning goal orientation and self-efficacy, a small number of studies indicate contradictory findings. For example, Kang et al. (2005) found that learning goal orientation and self-efficacy failed to account for the variation in conception test scores—a contradictory finding within the research that might be due to Pintrich's (1999) suggestion that goal orientation and self-efficacy are situation specific. Kizelgunes et al. (2009) explored the relationship between epistemological beliefs, achievement motivation, learning approach, and achievement with sixth grade science students in Turkey. Surprisingly, they found a negative relationship between learning goal orientation and self-efficacy. The researchers placed a caution on these findings and attributed the anomaly to the possibility of a mismatch between actual and reported self-efficacy due to more unreliable self-judgements at this age. Anderman and Young (1994) investigated how motivational constructs vary within individuals and how teachers' practices can influence motivation with middle school science students in the United States. These researchers found that both learning and performance orientations varied among different classrooms but that higher levels of self-efficacy contributed to a learning goal orientation.

Findings within the literature with regard to the associations between the motivation constructs of self-efficacy and task value indicate that this association is generally positive in nature, with more evidence in the research suggesting that self-efficacy or self-concept beliefs have a positive influence on a student's task value, rather than the other way around. This finding is not surprising, as the expectancy of being successful in a task is likely to result in having a value for engagement in that task (Bong, 2001; Marsh et al., 2005; Usher & Pajares, 2006; Wu & Fan, 2017). According to Bandura's (1997) self-efficacy theory, self-belief should have an effect on task value development. Bandura (1997) purported that self-efficacious children should be more interested in challenging tasks than children with lower levels of self-efficacy. This proposition is supported by the research of Marsh, Trautwein, Lüdtke et al., (2005), who found that prior self-concept beliefs (used interchangeably with self-efficacy beliefs) influenced interest in mathematics tasks, but that this influence was not reciprocal. However, Wigfield (1994) suggested that competence and task value are initially independent in children but may become intertwined as children may attach more value to tasks that they succeed in. Contradictory to these findings, in their review of interventions promoting motivation in academic contexts, Harackiewicz et al. (2014) suggested it may be easier in academic tasks to influence task value rather than self-efficacy.

My review of literature found some research that indicates a positive relationship between students' learning goal orientation and the intrinsic value that they place on a task (Ames & Archer, 1988; Nichols & Miller, 1994; Pintrich & De Groot, 1990; Pokay & Blumenfeld, 1990). For example, Harackiewicz et al. (2008) found a reciprocal relationship between task values and a learning goal orientation. Keimer et al. (2015) found that developing interest in a task and valuing that task is an important influence in developing a learning rather than a performance goal orientation. There is also some evidence to suggest that a performance goal orientation may contribute to task value as students performing well on exams and other academic tasks may, in turn, influence the enjoyment and value students place on those tasks (Wigfield & Eccles, 1992; Zimmerman, 1985).

The importance that has been placed on motivation as an essential aspect of learning has led to a large body of literature in this field. The specific constructs of motivation that I used in my study (learning goal orientation, task value, and self-efficacy) have been investigated in studies to varying degrees. However, only limited research has been conducted specifically within science learning contexts. As my study was focused specifically on these constructs with respect to science learning, the findings will build on and extend this past research. In addition, given the scarcity of studies that have investigated these three motivation constructs in the Middle East, the findings of my study help to fill this gap in the research.

It is clear from the literature reviewed in this section that the three motivational constructs selected to assess students' motivation towards learning in my study (learning goal orientation, task value, and self-efficacy) have considerable interrelatedness and are all important motivational constructs. The information above further justifies their selection within the SALES instrument to assess students' motivation in middle school science classrooms in the UAE. Having reviewed how the motivational constructs in my study are interconnected, the following section reviews literature pertinent to self-regulation—the behavioural determinant within the social cognitive framework used in my study.

2.2 Self-Regulation

The information with regard to self-regulation is organised into five categories in this section. First, self-regulation is defined and situated within social cognitive theory. A brief history is then provided with regard to the theoretical development of this construct. Next, self-regulation theoretical models are described (Section 2.2.1), after which, past research investigating the role and impact of self-regulation on learning is reviewed (Section 2.2.2). The relationship between self-regulation and motivation is then examined (Section 2.2.3). Finally, instruments utilised for the assessment of self-regulation are briefly described (Section 2.2.4).

Zimmerman (2002, p. 65) defines self-regulation as a "self-directive process by which learners transform their mental abilities into academic skills." Boekaerts and Cascellar (2006, p. 206) expanded their definition of self-regulation to include "what students are thinking, feeling and doing while pursuing a learning goal." Schunk and Ertmer (2000, p. 632) state that "…the hallmarks of self-regulation are choice and control…" Some researchers state that defining self-regulation is not straightforward, particularly as the understanding of self-regulation processes has evolved over time (Boekaerts & Corno, 2005).

Bandura (1986, p. 20) posits that self-regulatory functions are a distinctive component of social cognitive theory and that people's behaviour is largely motivated by "internal standards and self-evaluative reactions to their own actions." Viewing self-regulation through a social cognitive lens proposes that self-regulation develops through a series of levels: observational, imitative, self-controlled, and self-regulated (Schunk, 1996; Zimmerman, 2000a). Schunk (1996) asserts that self-regulation involves: selfobservation, such as attending to one's behaviour to include determinants and effects; self-judgement, such as comparing present performance with the desired goal to gauge progress; and self-reaction, such as evaluating one's performance as satisfactory or unsatisfactory.

In the nineteenth century, failure to learn was ascribed to either a lack of intelligence or diligence. However, with the advent of psychology in the twentieth century, awareness dawned that individual differences could perhaps play a more significant role in academic achievement than initially realised (Zimmerman, 2002). In the 1970s, research on metacognition revealed the importance of being aware of and understanding one's thinking processes (metacognition). As a result, for the first time, students were asked to set personal learning goals and to reflect on their learning. This was the dawning of self-regulatory processes in learning (Zimmerman, 2002).

Up until the 1990s, self-regulation was seen as a relatively stable tendency to respond in a typical way. It was thought to be situation specific, with an academic focus that regarded self-regulation in terms of learning and achievement goals (Boekaerts & Corno, 2005). Since 2000, however, there has been a shift in thinking; moving from seeing self-regulation as predicting outcomes, to self-regulation being seen as a developing process, dependent on the situation. For example, social and emotional factors, as well as other aspects of the learning environment, can provide triggers that cause self-regulatory behaviours to change across specific domains (Boekaerts & Cascallar, 2006; Boekaerts & Corno, 2005).

In this section, the theoretical background of self-regulation and the development of self-regulation concepts over time have been briefly described. In the next section, I describe key self-regulation models in the literature.

2.2.1 Self-regulation Models

The efforts to understand self-regulatory processes have led to the conception of several self-regulation models. Boekaerts and Corno (2005, p. 201) argue that all self-regulation models share two basic assumptions. First, students who "…self-regulate their learning are engaged actively and constructively in a process of meaning generation and that they adapt their thoughts, feelings and actions as needed to affect their learning and motivation." Second, "…biological, developmental, contextual and individual difference constraints may all interfere with or support efforts at regulation."

Pintrich and colleagues (Pintrich, 2000a, 2003b; Pintrich & De Groot, 1990; Wolters, 2004) advance Schunk and Zimmerman's (1997; Zimmerman, 2000a) social cognitive model, developing a model where self-regulated learning is comprised of four interdependent phases or components (Wolters, 2010). One phase is forethought, planning, setting goals, and accessing prior knowledge (Zimmerman, 2000b). A second phase is monitoring (Pintrich, 2004), and this relates to students' efforts to stay focused and be aware of their progress in a learning task. A third phase is labelled control and concerns the use of management strategies to complete a task, including an ability to modify a task in order to maintain effectiveness (Pintrich, 2004; Zimmerman, 2000b). The last phase is labelled reflection or reaction when new meta-knowledge about the task, strategies used, and one's self is generated (Wolters, 2010).

Boekaerts and colleagues developed a dual processing self-regulation model that attempts to help researchers and teachers understand how students self-regulate their learning within the classroom (Boekaerts, 1993; Boekaerts & Corno, 2005). It attempts to investigate why self-regulation changes across a range of domains and is present in some learning contexts but not in others. This model has two pathways: the growth pathway and the well-being pathway. Within each of these pathways, self-regulation is developed from two different perspectives—a top-down, or a bottom-up perspective. Energising self-regulation from a top-down perspective involves the growth pathway; students value a goal as important and are prepared to expend effort on realising it (Boekaerts & Cascallar, 2006; Boekaerts & Corno, 2005). One could say they are working from a learning goal orientation. Energising self-regulation from a bottom-up perspective involves the well-being pathway. A student on this pathway is focused on negative cues within the learning environment, such as anything that causes anxiety or presents a barrier in some way, and energy is expended in avoiding further negative events occurring (Boekaerts & Cascallar, 2006; Boekaerts & Corno, 2005). At this point, one could say a student has a performance-avoid goal orientation.

Research has indicated that students can switch from one pathway to the other, depending on circumstances.

My study drew on Pintrich and De Groot's (1990) model of self-regulation: assessing students metacognitive strategies, use of cognitive strategies, and management and control of effort. Researchers argue that while research has investigated metacognitive strategies and the use of cognitive strategies, management and control of effort has been neglected (Boekaerts, 1993; Boekaerts & Cascallar, 2006; Pintrich, 2000b). Importantly, the self-regulation scale used in my study was designed to also measure an aspect of self-regulation often neglected in the research—motivation for learning and effort investment (Velayutham et al., 2011). Self-regulation of effort is the extent to which students control and regulate their effort when learning specific tasks. My study builds on previous research as it uses an instrument that measures an aspect of self-regulation not investigated sufficiently in previous research.

In this section I have described several self-regulation models and identified what model I drew on for my study. In the next section, I review past research in self-regulation.

2.2.2 Past Research in Self-Regulation

There has been a significant amount of research that has determined a positive relationship between self-regulation and students' learning and academic achievement (Baker, Chard, Ketterlin-Geller, Apichatabutra, & Doabler, 2009; Blair, Ursache, & Vernon-Feagans, 2015; Butler & Winne, 1995; Dignath, Buettner, & Langfeldt, 2008; Edens, 2008; Lauriola et al., 2015; Schmitt, McClelland, Tominey, & Acock, 2015; Zimmerman, 2002, 2008). Given the strong link between self-regulation and achievement, as well as self-regulation having a positive relationship with other learning outcomes, several researchers have spoken of the need for teachers to consciously attend to the development of students' self-regulatory processes alongside cognitive learning (Drake, Belsky, & Pasco Fearon, 2014; Montroy, Bowles, & Skibbe, 2016; Schunk & Ertmer, 2000; Skibbe, Connor, Morrison, & Jewkes, 2011; Todorovich, 2012). A self-regulation model has been developed specifically for this purpose (Webb, Johnson, Meek, Herzog, & Clohessy, 2018).

In response to the recognition of the importance of self-regulation, there have been a range of interventions implemented that have resulted in improvement in students' self-regulation. These interventions have largely shown positive results, including transfer into other contexts, and becoming generalised over time (Schunk, 2005; Schunk & Ertmer, 2000). Interventions include: greater persistence and higher academic achievement by promoting a self-transcendent purpose (oriented towards helping others) towards learning (Yeager et al., 2014); using feedback, both external and self-evaluative, to promote self-regulation (Brown, Peterson, & Yao, 2016; Schunk & Ertmer, 1999; Schunk & Swartz, 1993a, 1993b); investigating the impact of positive emotions on self-regulation and academic achievement (Villavicencio & Bernardo, 2013); using an electronic student response system to improve self-regulation (Edens, 2008); goal setting (Zimmerman & Bandura, 1994; Zimmerman & Kitsantas, 1996, 1997); specific training in self-regulation (Perels, Gürtler, & Schmitz, 2005); and having high expectations of success (Pokay & Blumenfeld, 1990).

Schraw, Crippen, and Hartley (2006) identified six instructional strategies to improve self-regulation in science: inquiry; collaborative support; strategic instruction regarding problem-solving and critical thinking; strategies to support students constructing mental models; using technology; and teacher/student behaviour. In addition to examining the influence of the learning environment on students' motivation and self-regulation, my study also investigates the impact of one of Schraw et al.'s (2006) instructional strategies—collaborative support. This inclusion is because one of the study's objectives is to investigate whether there is a difference in self-regulation between students in classes with teachers identified as effectively implementing cooperative learning and those not in such classes.

It is clear that self-regulation is an important influence on cognitive and affective learning outcomes, which was why it was included as a construct to investigate within my study. Despite the increased research undertaken with regard to self-regulation, there is little research investigating self-regulation in a science context, and very little, if any, exploring self-regulation within science learning in the Middle East. My study contributes to the literature in these regards.

In the above sections, I have defined self-regulation and situated this construct within the social cognitive theoretical perspective I have used as a framework for my study. I have described some of the self-regulation models in the field and cited examples of research conducted investigating self-regulation and a range of learning outcomes. Finally, the inclusion of a self-regulation focus within my study has been justified. In the next section, literature related to the relationship between self-regulation and motivation is reviewed.

2.2.3 Self-Regulation and Motivation

There is evidence in the literature to suggest that self-regulation and motivation are inextricably linked, but there are differing views as to the nature of the relationship between the two constructs. Some researchers have found motivation to predict self-regulation (Andrade & Heritage, 2018; Bouffard-Bouchard et al., 1991; Wolters, 2010; Zimmerman et al., 1992; Zimmerman & Schunk, 2008) and to be important during efforts to self-regulate learning (Schunk & Zimmerman, 2007). Also included in the literature is research that suggests the relationship between the two constructs is complex. Schunk and Zimmerman (2007) proposed that a student can be taught self-regulation strategies, but if he or she is not motivated towards attending to these processes, it is not likely to benefit his or her learning. Hijzen, Boekaerts and Vedder (2007) found motivation to be “an intricate part of the students’ self-regulation process” (p. 673). Pintrich (2003b) suggested that students who have higher levels of self-regulation are more likely to be academically motivated. Efklides (2014) proposed that self-regulation is a dynamic process involving goal direction and feedback. Wolters (1999, 2004) found that self-regulation strategies improved motivation and that various sources of motivation had different self-regulatory roles. The relationship between motivation and self-regulation is perhaps summarised best by Zimmerman’s (2002) suggestion that a combination of factors are involved in the process of becoming a self-regulated learner; the use of effective learning strategies, self-awareness, and motivational beliefs, all combine to create a self-regulated learner who views learning in a proactive way, and that learning is something they engage in for themselves, rather than passively receive.

The research found in the literature with regard to the interrelationship between self-regulation and motivation suggest that the three specific motivation constructs selected for use in my study; learning goal orientation, task value, and self-efficacy, have a precursor, mediator, and concomitant role in developing self-regulation (Zimmerman & Schunk, 2012). With regard to the relationship between self-regulation and learning goal orientation, evidence exists to suggest that self-regulation processes are goal related (Boekaerts, 2006). Learning goal orientation has been found to have a positive interrelationship with self-evaluation, a self-regulatory behaviour (Schunk, 1996; Schunk & Ertmer, 1999). Schunk (1996) found that engaging in daily self-evaluation resulted in higher self-efficacy, self-regulation, achievement, and task orientation for students with a learning goal orientation. Kitsantas, Steen, and Huie (2009) found that a mastery (learning) goal orientation predicted students' achievement in some subjects, but not others. The researchers found, however, that self-regulation strategies predicted achievement in all subject areas. Dekker et al. (2016) investigated the impact of different goal orientations on achievement and found that self-regulation had a mediating effect, with higher levels of self-regulation resulting in higher achievement. Wang et al. (2017) investigated the relationship between the mediating role of motivational self-talk (a self-regulating learning strategy), achievement goals, and engagement with 10th-grade Chinese high school students. Pursuing a learning goal orientation led to students accessing all types of motivational strategies available and engaging in beneficial self-talk.

Another motivation construct used in my study, task value, is considered integral to self-regulation, because if there is little perceived value in a task, students do not bring "a goal-oriented perspective to their learning" and are unlikely to be motivated or to self-regulate their effort regarding completion of the task (Andrade & Heritage, 2018, p.35). Empirical research supports the claim that, if students are interested in completing a task or see a task as valuable, they are more likely to engage in adaptive self-regulatory behaviours (Pintrich & De Groot, 1990; Simpkins et al., 2006; Wolters et al., 1996; Zimmerman & Schunk, 2008). Wolters and Rosenthal (2000) investigated the relationship between the motivational constructs of task value, self-efficacy, learning goal orientation and performance goal orientation, and the use of self-regulation strategies with eighth grade algebra students. The results indicated that task value was positively related to self-regulation and individually predicted specific aspects of self-regulatory behaviour.

The third motivation construct in my study; self-efficacy, has also been found to have a positive, reciprocal relationship with self-regulation (Bernacki, Nokes-Malach, & Aleven, 2015; Cleary & Kitsantas, 2017; Cleary, Velardi, & Schnaidman, 2017; Dweck & Master, 2008; Schunk & Ertmer, 2000; Zimmerman & Schunk, 2008). For example, Cleary and Kitsantas (2017) investigated the relationships between students' background, self-regulation, motivation, and achievement with middle school mathematics students. They found that motivational beliefs (self-efficacy, task interest, and school connectedness) predicted self-regulatory behaviour with students' perceptions of self-efficacy positively related to self-regulation and achievement. In another study, Bernacki et al. (2015) found that self-efficacy varied depending on the learning context, with changes in self-efficacy influencing self-regulatory processes with ninth grade algebra students. Supporting these findings, a recent study by Chong, Huan, Liem, Kit, and Ang (2017) found that supportive teacher–student relationships build self-regulation which, in turn, develops self-efficacy.

Based on theorising and a review of literature, it was hypothesised that the motivation constructs used in my study (learning goal orientation, task value, and self-efficacy) would all influence students' self-regulation. In addition, while there have been studies that have investigated the relationship between self-regulation and motivation, few have investigated the relationship in a science learning context, still fewer at a middle school level, and, to the best of my knowledge, none situated within a science middle school context in the Middle East. My study addresses a gap in the literature as it assesses the influence of motivation on students' self-regulation in middle school science classes in the UAE. Having described the ways in which self-regulation and motivation are interrelated in the above section, the next section briefly describes self-regulation instruments.

2.2.4 Instruments Used to Assess Self-Regulation

The interrelatedness of self-regulation and motivation, as described in Section 2.2.3, has resulted in these constructs being assessed within one instrument, as is the case with the MSLQ (described in Section 2.1.4.2) and the SALES (described in Section 2.1.4.7). As explained previously, the MSLQ was designed for university students and was found to have complex phrasing that may have caused difficulty for middle school students, factor structure issues when used at a high school level, and a number of irrelevant items for the purposes of my study. For those reasons, the MSLQ was not considered for my study.

Another instrument used to assess self-regulation is the Learning And Study Strategies Inventory (LASSI; Weinstein, Schulte, & Palmer, 1987). This 81-item instrument was designed to assess university students' self-regulation. It consists of ten scales, measuring attitude, motivation, time management, information processing, test-taking strategies, anxiety management, concentration, ability to select main ideas, use of study aids, and implementation of self-testing strategies. Despite its use in assessing self-regulation at the university level, the complexity and length of scales made it inappropriate for use in my study.

My review of the literature indicated that only one instrument has been developed to assess self-regulation on its own (the LASSI) and two instruments have incorporated self-regulation scales within an instrument assessing motivation (the MSLQ and the SALES). Based on this review, combined with a consideration as to the research objectives being addressed in my study, the SALES instrument was considered to be most appropriate to address these objectives and was thus selected for use in my study to assess students' motivation and self-regulation.

The review of literature in Section 2.2 indicates the important role that self-regulation plays in students' learning. A major focus of today's education is to develop life-long learning skills that extend beyond formal learning environments, such as schools and universities (Zimmerman, 2002), and self-regulation has been identified as a key 21st century learning skill (National Research Council, 2011). In addition, socially constructed learning environments common in many classrooms today, as well as the growing popularity of self-directed learning environments, place growing demands on the self-regulatory capacities of students (Boekaerts, de Koning, & Vedder, 2006). The educational reform taking place in Abu Dhabi government schools at the time of my study involved the implementation of socially constructed learning environments including the implementation of cooperative learning strategies within middle school science classrooms. This change from a traditional, teacher-centred approach will very likely have resulted in changes in self-regulatory behaviour. It is hoped that investigating possible influences on these students' self-regulation will contribute to a better understanding of self-regulatory processes. Having established the relevance of investigating students' self-regulation, the next section reviews research in the field of the learning environment, the third construct being investigated within my study.

2.3 Learning Environments

This section begins with a definition of 'learning environment' as referred to and investigated within my study. Next, a history of the field of learning environment research is provided (Section 2.3.1). After that, a range of available learning environment instruments are described, and the choice of the What Is Happening In this Class? (WIHIC) instrument used in my study is justified (Section 2.3.2). Finally, past research in learning environments is reviewed (Section 2.3.3).

The concept of learning environment has its origins in Lewin's work, investigating the interaction between the learning environment, the individual, and behaviour (Lewin, 1935) and as such, can be situated within social cognitive theory. Learning environment is a term that in research generally refers to the psychological, social, emotional, and cultural influences within an environment (Afari, Aldridge, Fraser, & Khine, 2013) and is used interchangeably with 'classroom environment' or 'classroom climate.' Backman et al. (2012) researched the influences of the physical environment on learning, but it is the psychosocial learning environment that is the focus of my study. Fraser (2001, p. 2) defines the classroom environment as "…the shared perceptions of the students and sometimes the teachers in that environment." It has been defined more generally as the "atmosphere, ambience, tone, or climate that pervades the particular setting" (Dorman & Fraser, 2009, p. 78). In my study, I use the term learning environment to refer to the psychosocial aspects of the classroom learning environment.

Students spend about 20,000 hours in a classroom from their earliest school years to when they graduate from university (Fraser, 2001). Over the past several decades, there has been a plethora of research undertaken that provides clear evidence that the quality of the learning environment has a profound influence on learning itself. Dorman and Fraser (2009, p. 78) state that "students learn better when they view the classroom environment more positively." My review of literature indicated that the learning environment has been found to be a powerful influence on a range of cognitive and affective learning outcomes. This finding resulted in the study reported in this thesis: to investigate the relationships between students' motivation, self-regulation and perceptions of the learning environment.

In this section, I have defined learning environment concepts and situated learning environment within relevant theoretical constructs. In the next section, the theoretical origins and history of learning environment research are described.

2.3.1 History of the Field of Learning Environments

The vast body of learning environment research is, to a large extent, founded on the theoretical ideas of Lewin (1935) and Murray (1938). Lewin's (1935) seminal work on field theory, conducted in business settings, recognised that interactions between individuals and their environment play an important role in determining human behaviour. Lewin created a formula—B = *f*(P,E),—proposing that behaviour is a function of the interaction between a person and the environment, given that B = behaviour, *f* = function, P = person, and E = environment. Murray (1938) expanded on Lewin's ideas with his needs press model. Murray (1938) purported that a person's environment "largely determines…behaviour… [and that it was important to define the environment because]…what an organism knows or believes is, in some measure, a product of formerly encountered situations [environments]" (p. 39).

Murray (1938) defined the specific aspect of the environment that a person attends or reacts to as the "stimulus situation… [and proposed that this reaction could have a] …facilitating or obstructing effect" (p. 40). Murray (1938) called this aspect within the environment a 'press'. In order to more accurately identify press, he distinguished between *alpha* press "…in which the press actually exists, as far as scientific inquiry can determine it… [and *beta* press, being] "…the subject's own interpretation of the phenomena that he perceives" (p. 122). In Murray's needs-press model, 'needs' refers to a person's motivation to achieve goals, and 'press' refers to the extent to which the environment fosters or negates that motivation.

Stern, Stein, and Bloom (1956) further developed Murray's (1938) theories by distinguishing between two types of beta press: *private* beta press being perceptions of the environment that were unique to the individual and *consensual* beta press, being perceptions of the environment shared among the group. Stern (1965) adapted thirty of Murray's needs-press variables and created a needs-press scale that he and others used in studies of higher education environments. Stern formulated a theory of person-environment congruence, positing that student outcomes could be enhanced as a result of a combination of personal needs and environmental press.

In the late 1960s and 1970s, two subsequently influential researchers, Walberg and Moos, expanded upon Lewin (1935) and Murray's (1938) work by beginning research programmes concurrently, the result of which were the development of the first learning environment questionnaires, or instruments. Walberg investigated the relationship between the structural and affective aspects of the classroom environment and developed the Classroom Climate Questionnaire along with evaluation and research being conducted by the Harvard Project Physics (Walberg & Anderson, 1968). However, Walberg found this instrument to be insufficiently reliable and subsequently developed and used a questionnaire to measure a range of psychosocial aspects of the learning environment called the 'Learning Environment Inventory' (LEI; Anderson & Walberg, 1974; Walberg & Anderson, 1972). This questionnaire is described more fully in Section 2.3.2.1). The Getzels Thelen Model (1960), which created a framework to analyse the social systems within classrooms, was used as a guide when developing this instrument (Walberg, 1968). Walberg created a model of educational productivity that proposed that the educational environment was one of a range of factors that determined student outcomes (Walberg, 1980; Walberg, Pascarella, Haertel, Junker, & Boulanger, 1982).

At approximately the same time, Moos (1979) focused on "trying to understand how environments function" (p. vii), particularly with respect to the interaction between the social and physical climate. Moos' work involved a range of settings, including prisons and hospitals. From this work, Moos and Houts (1968) created a 'Ward Atmosphere

Scale' to measure social atmospheres in different psychiatric in-patient wards in a range of hospitals. This research indicated that other psychosocial dimensions needed to be taken into account when comparing wards beyond easily measurable physical aspects. In the 1970s, Moos extended his work into educational settings. This led him, together with his colleague Trickett, to develop the Classroom Environment Scale (CES; Moos & Trickett, 1974), which is described in more detail in Section 2.3.2.2.

Moos (1979) designed a "social-ecological framework to evaluate educational settings…" (p. 2). This conceptual framework incorporates environmental and personal systems, both of which influence each other. Moos conceptualised the environmental system as having four primary domains: the physical setting, organisational factors, the human aggregate, and social climate. He asserted that each of these factors influence educational outcomes. The personal system was conceptualised as varied individual characteristics that explain how individuals respond to environmental settings. These characteristics include age, ability, interests, and values, among many others, and determine what an environment means to an individual and how they adapt to that environment. Moos (1979) developed scales that organised social-environmental variables into three dimensions in order to measure the social environments in a range of settings. These dimensions are; relationship, personal growth or goal orientations, and system maintenance and change. Moos' (1979) framework has provided a theoretical construct that has been utilised in the development of a range of learning environment instruments. Table 2.1 provides a brief description of each domain.

The work of Walberg and Moos resulted in the increase of worldwide research specifically related to classroom learning environments (Fraser, 2012). In the Netherlands, Wubbels and Levy (1991) investigated interactions between teachers and students using the Questionnaire on Teacher Interaction (QTI). In Australia, Rentoul and Fraser (1979) also began programmatic research, initially using the Individualised Classroom Environment Questionnaire (ICEQ), to investigate students' perceptions of the learning environment in student-centred classrooms. This work has resulted in the development of other learning environment instruments, such as the Science Laboratory Environment Inventory (SLEI; Fraser, Giddings, & McRobbie, 1995; Fraser & McRobbie, 1995), the Constructivist Learning Environment Survey (CLES;

Taylor, Fraser, & Fisher, 1997), and the What Is Happening In this Class (WIHIC; Fraser et al., 1996), which were cross-validated and used for a range of research purposes around the world (Fraser, 2012). These instruments are described in Section 2.3.2 below.

Table 2.1 Three dimensions of social environments

Dimensions	Description
Relationship	Assess the extent to which people are involved in the setting, the extent to which they support and help one another, and the extent to which they express themselves freely and openly.
Personal growth/Goal orientation	Measure the basic goals of the setting, the areas in which personal development and self-enhancement tend to occur.
System maintenance and change	Measure the extent to which the environment is orderly and clear in its expectations, maintains control, and responds to change.

Source: Moos, 1979

While learning environment research originated in Western countries, important contributions have been made, in particular by Asian countries, over the past decade. Several questionnaires have been adapted, cross-validated, and, in many cases, translated for use in Asian countries, including: Korea (Fraser & Lee, 2009); Indonesia (Fraser, Aldridge, & Adolphe, 2010), Brunei Darussalam (Fraser, 2002); Taiwan (Fraser, 2012; Liu, Zandvliet, & Ling, 2012); China (Yang, 2015); Singapore (Peer & Fraser, 2015); Thailand (Koul et al., 2012); Malaysia (Jelas, Azman, Zulnaidi, & Ahmad, 2016); and India (Smith, 2013). Other non-Western countries that have also conducted learning environment research include the United Arab Emirates (Khalil, 2015; MacLeod & Fraser, 2010), Qatar (Knight, Parker, Zimmerman, & Ikhlief, 2014); and Turkey (den Brok, Telli, Cakiroglu, Taconis, & Tekkaya, 2010).

The history of learning environment research indicates the important role learning environment has played as a lens through which to explore a range of educational outcomes. In the above section, the theoretical constructs within which learning environment research is situated and the history of learning environment research has been reviewed. In the next section, learning environment instruments are reviewed, including the instrument used to assess students' perceptions of the learning environment in my study.

2.3.2 Learning Environment Instruments

The extensive growth of learning environment research over the past few decades has led to a range of questionnaires being developed. A significant aspect of learning environment research is the range and variety of questionnaires, utilising perceptual measures, which are available for researchers (Fraser, 2002, 2007, 2012). These instruments have been utilised in a number of educational contexts within a large number of countries. In this section, a brief description is provided with regard to nine questionnaires that have historical significance and/or contemporary relevance including: the Learning Environments Inventory (Section 2.3.2.1); the Classroom Environment Scale (Section 2.3.2.2); the Individualised Classroom Environment Questionnaire (Section 2.3.2.3); the My Class Inventory (Section 2.3.2.4); the College and University Classroom Environment Inventory (Section 2.3.2.5); the Questionnaire for Teacher Interaction (Section 2.3.2.6); the Science Laboratory Environment Inventory (Section 2.3.2.7); the Constructivist Learning Environment Survey (Section 2.3.2.8) and the What Is Happening In this Class (Section 2.3.2.9). Table 2.2 provides an overview of each of these surveys, classified according to Moos' three dimensions.

2.3.2.1 The Learning Environment Instrument (LEI)

The LEI (Anderson & Walberg, 1974) was developed to expand and improve the Classroom Climate Questionnaire that had been created by Walberg and Anderson (1968). The LEI initially had 14 scales but was expanded to 15 in 1969, namely, cohesiveness, friction, favouritism, cliqueness, satisfaction, apathy, speed, difficulty, competitiveness, diversity, formality, material environment, goal direction, democracy, and disorganisation. The final version of this instrument has 105 items, 7 per scale. The instrument uses a four-point response scale, namely: strongly disagree; disagree; agree; and strongly agree. The scoring is reversed for almost half of the items.

Fraser, Anderson, and Walberg (1982) reported on the internal consistency reliability and discriminant validity of the LEI, but factor structure was not established. Despite this, the LEI has been widely used to investigate the relationship between students' perception of their learning environment and learning outcomes (Hirata & Sako, 1998; Hofstein, Gluzman, Ben Zvi, & Samuel, 1979; Lawrenz, 1976; Power & Tisher, 1979; Rentoul & Fraser, 1979; Walberg, Singh, & Rasher, 1977). While LEI was found to be useful and widely applicable, it was rejected for my study for three reasons: first, the factor structure has not been established; second, it was designed to assess the learning environments of traditional classroom settings, whereas my study involved assessing the learning environment in an environment where cooperative learning was being implemented within science classes; and third, it does not include some aspects of the learning environment found in individualised or inquiry-based classroom settings (Fraser, 1986, 2014).

2.3.2.2 The Classroom Environment Scale (CES)

The CES was developed in the US by Moos and Trickett (1974) and formed part of Moos' nine social climate scales, which were designed to assess various human environments in a range of contexts such as psychiatric hospitals, prisons, university residences, and work environments. The CES is the only instrument of Moos' climate scales that was designed to assess classroom learning environments (Moos & Trickett, 1974). The original version had 242 items, encapsulating 13 dimensions (Trickett & Moos, 1973) which, after trials, was reduced to 208 items. The final version has nine scales; involvement, affiliation, teacher support, task orientation, competition, order and organisation, rule clarity, teacher control, and innovation. Each scale has 10 items requiring true or false responses. It is designed to measure actual and preferred environments (Fraser, 1986). The CES has been used by several researchers (Fisher & Fraser, 1983; Fraser & Fisher, 1986; Keyser & Barling, 1981; Koul et al., 2012; McRobbie & Tobin, 1997; Moos & Moos, 1978; Paige, 1979; Trickett & Moos, 1973).

Table 2.2 Overview of scales contained in nine learning environment instruments[9]

Instrument	Class level	Items per scale	Scales classified as per Moos' scheme			Source
			Relationship dimensions	Personal development dimensions	System maintenance and change dimensions	
Learning Environment Inventory (LEI)	Secondary	7	Cohesiveness Friction Favouritism Cliqueness Satisfaction Apathy	Speed Difficulty Competitiveness	Diversity Formality Material Environment Goal direction Disorganisation Democracy	Fraser, Anderson, & Walberg (1982)
Classroom Environment Scale (CES)	Secondary	4	Involvement Affiliation Teacher support	Task orientation	Order and organisation Rule clarity	Moos & Trickett (1987)
Individualised Classroom Environment Questionnaire (ICEQ)	Secondary	5	Personalisation Participation	Independence Investigation	Differentiation	Fraser (1990)
My Class Inventory (MCI)	Primary	6-9	Cohesiveness Friction Satisfaction	Difficulty Competitiveness		Fraser, Anderson, & Walberg (1982)

[9] Adapted from Fraser (2012) with permission

Instrument	Class level	Items per scale	Scales classified as per Moos' scheme			Source
			Relationship dimensions	Personal development dimensions	System maintenance and change dimensions	
College and University Classroom Environment Inventory (CUCEI)	Tertiary	7	Personalisation Involvement Student cohesiveness Satisfaction	Task orientation	Innovation Individualisation	Fraser & Treagust (1986)
Questionnaire on Teacher Interaction (QTI)	Secondary/ Primary	8-10	Helpful/Friendly Understanding Dissatisfied Admonishing		Leadership Student responsibility and freedom Uncertain Strict	Wubbels & Levy (1993)
Science Laboratory Environment Inventory (SLEI)	Upper Secondary/ Tertiary	7	Student cohesiveness	Open-endedness Integration	Rule clarity Material environment	Fraser, Giddings, & McRobbie (1995)
Constructivists' Learning Environment Survey (CLES)	Secondary	7	Personal relevance Uncertainty	Critical voice Shared control	Student negotiation	Taylor, Fraser, & Fisher (1997)
What Is Happening In this Classroom (WIHIC)	Secondary, Primary	8	Student cohesiveness Teacher support Involvement	Investigation Task orientation Cooperation	Equity	Aldridge & Fraser (2000)

This instrument was not considered to be suitable for my study because its factor structure has not been established, and it is more suitable to traditional learning environments (Fraser, 2014).

2.3.2.3 The Individualised Classroom Environment Questionnaire (ICEQ)

The ICEQ was developed by Rentoul and Fraser (1979), specifically to measure dimensions that differentiate inquiry-based classrooms from conventional ones and was one of the first learning environment questionnaires to be founded on a constructivist philosophy. The final version has 50 items, divided equally over five scales, namely, personalisation, participation, independence, investigation, and differentiation. The response format consists of a five-point frequency scale, including almost never, seldom, sometimes, often, and very often. The scoring direction is reversed for many of the items. There have been some studies that have validated the ICEQ in classroom contexts (Abell, Jung, & Taylor, 2011; Fraser & Butts, 1982; Fraser & Pearse, 1982; Yates, 2011) but, given the continuing embrace of individualised learning, there is potential for this instrument to gain wider use. As the focus of my study was not to differentiate between inquiry-based and traditional learning environments, the ICEQ was not considered to be suitable.

2.3.2.4 The My Class Inventory (MCI)

The MCI was a simplified version of the LEI, designed for use with children aged 8 to 12 years, as well as for students in early high school settings and for those students with reading difficulties (Fisher & Fraser, 1981; Fraser et al., 1982; Fraser & O'Brien, 1985). The LEI had been used primarily to measure perceptions of the actual rather than preferred environment, but the MCI assesses both the actual and preferred learning environment (Fraser, 1986). It differs from the LEI, in order to better fit the needs of younger children, in the following ways: only five out of the 15 scales are used; item wording has been simplified; the four-point response form has been reduced to answers requiring only 'yes' or 'no'; and respondents answer on the questionnaire itself rather than on a different sheet (Fraser, 1986). As such, the MCI provides an instrument that is economical, and easy to administer and score so that teachers can efficiently gather data to inform their understanding of how students are perceiving their learning environment. The original version of the MCI had nine items per scale, but the most recent version has 38 items in the long form or 25 items in the short form, within the five scales of cohesiveness, friction, satisfaction, difficulty, and competitiveness. The MCI has been widely used and validated in learning environment research (Ferguson & Fraser, 1998; Houston, Fraser, & Ledbetter, 2008; Majeed, Fraser, & Aldridge, 2002; Mink & Fraser, 2005; Monsen & Frederickson, 2004; Sink & Spencer, 2005).

The MCI was not considered for my study because while used in previous research, its factor structure has not been established. Also, while this instrument has been tailored for the students in the appropriate age group for my study, some of the questions are negatively worded. Although negatively worded items were traditionally used in surveys to guard against passive responses, these can be confusing for students to understand (McRobbie & Tobin, 1997).

2.3.2.5 The College and University Classroom Environment Inventory (CUCEI)

In response to a relative lack of research assessing learning environments in tertiary institutions, Fraser and Treagust (1986) developed the CUCEI to be used in small classes or seminars at the university level. The final version of the CUCEI contains seven scales, namely, personalisation, involvement, student cohesiveness, satisfaction, task orientation, innovation, and individualisation. Each scale consists of seven items, and has a four-point response scale: strongly agree, agree, disagree, and strongly disagree. The scoring direction is reversed for approximately half of the items. This questionnaire has been utilised and validated by various researchers (Fraser, Williamson, & Tobin, 1987; Hasan & Fraser, 2015; Joiner, Malone, & Haimes, 2002; Logan, Crump, & Rennie, 2006; Nair & Fisher, 2000; Strayer, 2012; Yarrow, Millwater, & Fraser, 1997). It was not appropriate to use in my study because of the education level for which it was designed.

2.3.2.6 The Questionnaire for Teacher Interaction (QTI)

The QTI was developed in the Netherlands and was created with a particular focus on student–teacher interpersonal relationships (Wubbels & Levy, 1991). The researchers used Leary's (1957) communication model as a framework to develop the QTI. Leary proposed that people communicate according to two dimensions: a dominance-submission (or influence) dimension; who is controlling communication, and a cooperation-opposition (or proximity) dimension; how much cooperation exists between the people who are communicating. The researchers applied Leary's model to the classroom and divided Leary's two dimensions into eight aspects of behaviour (Van Tartwijk, Brekelmans, Wubbels, Fisher, & Fraser, 1998). The QTI has eight scales; leadership, helping/friendly, understanding, student responsibility/freedom, uncertain, dissatisfied, admonishing, and strict behaviour. Each scale examines a dimension of relationships, and there are 8-10 items per scale. Each item is responded to using a frequency scale ranging from never, to always. While this instrument originated in the Netherlands, it has been used in the US (Wubbels & Levy, 1993), Singapore (Goh & Fraser, 1996), and Australia (Ferguson & Fraser, 1998; Fisher, Henderson, & Fraser, 1995). There have been several other studies undertaken in Asia that have validated this instrument (Fraser, Aldridge, & Soerjaningsih, 2010; Kim, Fisher, & Fraser, 2000; Lang, Wong, & Fraser, 2005; Lee, Fraser, & Fisher, 2003; Scott & Fisher, 2004). The QTI has also been used in cross-national studies (Aldridge, Fraser, Taylor, & Chen, 2000). Despite its wide use and support for its validity in a range of contexts, this instrument only focuses on student–teacher relationships. Therefore, it was not selected for my study as I needed an instrument that assessed a broader range of variables.

2.3.2.7 The Science Laboratory Environment Inventory (SLEI)

The importance of laboratory settings in science education and the need to have an instrument that assessed this particular environment resulted in the development of the Science Laboratory Environment Inventory (SLEI; Fraser et al., 1995; Fraser & McRobbie, 1995). The SLEI has five scales; student cohesiveness, open-endedness, integration, rule clarity, and material environment. Each scale has seven items, which are responded to using a five-point frequency response scale of almost never, seldom, sometimes, often, and very often. This instrument has been validated and cross-validated in several countries including: Australia (Fisher, Henderson, & Fraser, 1997; Fraser & McRobbie, 1995); Korea (Fraser & Lee, 2009; Kim & Kim, 1995, 1996; Kim & Lee, 1997); Singapore (Lang et al., 2005; Wong & Fraser, 1995, 1996); Brunei (Riah

& Fraser, 1998); and the US (Lightburn & Fraser, 2007). The SLEI was not considered because it is designed to assess the learning environment in laboratory settings, which was not the context for my study.

2.3.2.8 The Constructivist Learning Environment Survey (CLES)

The CLES (Taylor et al., 1997) was developed to help researchers and teachers evaluate the extent to which the learning environment is aligned with a constructivist pedagogy. It was designed to be used as a framework for teachers to reflect on and adapt their practice in terms of this pedagogy so that it supported a constructivist teaching and learning approach (Fraser, 2007, 2012). From the constructivist viewpoint, "meaningful learning is a cognitive process in which individuals make sense of the world in relation to the knowledge which they already have constructed…" (Fraser, 2012, p. 1202).

The CLES has five scales, namely, personal relevance, uncertainty, critical voice, shared control, and student negotiation, with five items per scale, 30 items in total. Items are responded to using a five-point response scale with responses ranging from almost never, to almost always. The CLES has strong validity and has been used and translated, where necessary, in a range of studies around the world: South Africa (Aldridge, Fraser, & Sebela, 2004); the US (Canon, 1995; Harwell, Gunter, Montgomery, Sheldon, & West, 2001; Ogbuehi & Fraser, 2007); Korea (Kim, Fisher, & Fraser, 1999; Oh & Yager, 2004); Hong Kong (Kwan & Wong, 2014); Iran (Ebrahimi, 2015); and in cross-national studies in Australia and Taiwan (Aldridge, Fraser, & Huang, 1999; Aldridge et al., 2000; She & Fisher, 2000). Johnson and McClure (2004) developed a condensed rendition of the CLES that was found to have strong validity and reliability. While I consider constructivist pedagogy to be an essential aspect of science learning, assessing the learning environment in terms of the degree to which it supported a constructivist epistemology was not the focus of my study and, therefore, this instrument was not selected.

2.3.2.9 The What Is Happening In this Class? (WIHIC) Questionnaire

The WIHIC questionnaire is quite possibly the most widely used learning environment instrument today (Fraser, 2012). It has, according to Dorman (2008) "achieved almost bandwagon status in the assessment of classroom environments" (p. 181). The WIHIC, based on a constructivist epistemology, was developed by Fraser, McRobbie, and Fisher (1996) in order to bring parsimony to the learning environment field and to include relevant educational concerns. The most salient scales from a range of existing learning environment instruments were combined with contemporary and relevant dimensions to address present day educational issues (Aldridge et al., 1999). The WIHIC has been revised and refined several times, going from the original version of nine scales and 90 items to a final version consisting of seven scales, namely, student cohesiveness, teacher support, involvement, task orientation, investigation, cooperation, and equity, with 56 items evenly spread across each scale. The WIHIC was field tested in Australia and Taiwan (Aldridge et al., 1999). It has a five-point scale response including; almost never, seldom, sometimes, often, and very often.

The 56 item version of the WIHIC has been implemented across various subject areas and age levels and has been used and validated in many countries: Australia (Dorman, 2008; Velayutham et al., 2013; Velayutham & Aldridge, 2013; Velayutham et al., 2011, 2012; Waldrip, Fisher, & Dorman, 2009); Australia & Canada (Zandvliet & Fraser, 2004); Australia and Taiwan (Aldridge & Fraser, 2000; Aldridge et al., 1999); Australia and Indonesia (Fraser, Aldridge, & Adolphe, 2010); Australia, the United Kingdom (UK), and Canada (Dorman, 2003); Canada (Raaflaub & Fraser, 2002); China (Bi, 2015), India (Koul & Fisher, 2005; Smith, 2013); Indonesia (Soebari & Aldridge, 2015; Treagust, 2004); Jordan (Alzubaidi et al., 2016); Korea (Kim et al., 2000); Singapore (Chionh & Fraser, 2009; Peer & Fraser, 2015); Turkey (den Brok et al., 2010); the UAE (Afari et al., 2013; Khalil, 2015; MacLeod & Fraser, 2010); Uganda (Opolot-Okurut, 2010); and the US (Adamski, Fraser, & Peiro, 2013; Allen & Fraser, 2007; Helding & Fraser, 2013; Martin-Dunlop & Fraser, 2008; Ogbuehi & Fraser, 2007; Robinson & Fraser, 2013; Taylor & Fraser, 2013; Wolf & Fraser, 2008; Zaragoza & Fraser, 2016). The WIHIC has also been translated into numerous languages, such as: Korean (Kim et al., 2000); Bahasa Indonesian (Fraser, Aldridge, & Adolphe, 2010; Soebari & Aldridge, 2015; Wahyudi & Treagust, 2004); Mandarin

(Aldridge & Fraser, 2000); Spanish (Adamski et al., 2013; Allen & Fraser, 2007; Robinson & Fraser, 2013; Soto-Rodriguez & Fraser, 2004); Greek (Giallousi, Gialamas, Spyrellis, & Pavlaton, 2010); Sepedi (Aldridge, Laugksch, Seopa, & Fraser, 2006); IsiZulu (Aldridge, Fraser, & Ntuli, 2009); and Arabic (Afari, 2013; Afari et al., 2013; Alzubaidi et al., 2016; Khalil, 2015; MacLeod & Fraser, 2010).

Given the robustness, validity, and reliability of the WIHIC (Dorman, 2008), the wide range of contexts and countries that it has been used in, and the extensive utilisation of this instrument to investigate associations between the learning environment and student outcomes (one of the learning environment research areas applicable to my study), the WIHIC was selected for use in my study. For a summary of studies that used the WIHIC to investigate learning environment – outcome associations, please see Appendix 2.

In this section, nine historically important, relevant and contemporary questionnaires, used to assess a range of learning environment variables, have been briefly reviewed. Reasons have been given as to the selection of the WIHIC instrument to assess students' perceptions of the learning environment in my study. The following section reviews past research in learning environments.

2.3.3 Past Research in Learning Environments

In the next five sections, past research in learning environments is reviewed, in particular with regard to the two learning environment research areas relevant to my study (environment-outcomes associations in general, Section 2.3.3.1; environment-motivation associations, Section 2.3.3.2; and educational innovations, Section 2.3.3.3). Finally, this section ends with a review of studies that have investigated the relationship between the learning environment and students' self-regulation (Section 2.3.3.4).

Enormous progress has been made in the field of learning environment research over the past few decades (Fraser, 2007). Although learning environment research began in Western countries, it has now expanded across many parts of the world. The breadth of learning environment research led Fraser (2007, 2012) to classify the field into a number of research areas that have made valuable contributions to educational research, such as: the association between the learning environment and student outcomes (Barile et al., 2012; Chang, Hsiao, & Chang, 2011; Cohn & Fraser, 2016; Dorman, 2001; Dorman & Fraser, 2009; Fraser, 2007, 2012; Nguyen, Newby, & Skordi, 2015; Passini, Molinari, & Speltini, 2015; Wolf & Fraser, 2008); the evaluation of educational innovations (Hartley & Treagust, 2014; Nix, Fraser, & Ledbetter, 2005; Pickett & Fraser, 2009; Soebari & Aldridge, 2015); differences between teachers' and students' perceptions of the learning environment (Afari et al., 2013; Ahmad, Osman, & Halim, 2013; Alzubaidi et al., 2016; Bakhshialiabad, Bakhshi, & Hassanshahi, 2015; Bell & Aldridge, 2014; Chipangura & Aldridge, 2017; Cohn & Fraser, 2016; De Juan et al., 2016; Fisher & Fraser, 1983; Fraser & McRobbie, 1995; Khine, Fraser, Afari, Oo, & Kyaw, 2018; Monsen, Ewing, & Kwoka, 2014; Robinson & Fraser, 2013; Tas, 2016; Waldrip et al., 2014); determinants of the classroom environment (Chipangura & Aldridge, 2017; den Brok et al., 2010; Dorman, Aldridge, & Fraser, 2006; Koul et al., 2012; Lang et al., 2005; Rickards, den Brok, & Fisher, 2005; Velayutham et al., 2012); combining qualitative and quantitative research methods (Aldridge et al., 1999; Chipangura & Aldridge, 2017); cross-national studies (Aldridge et al., 1999; Fraser, Aldridge, & Adolphe, 2010; Fraser, Aldridge, & Soerjaningsih, 2010; Lee et al., 2003; MacLeod & Fraser, 2010; Sirrakos & Fraser, 2017); transitions between different levels of schooling (Deieso & Fraser, 2018; Ferguson & Fraser, 1998); teacher action research (Aldridge, Fraser, Bell, & Dorman, 2012; Aldridge et al., 2004; Fraser & Aldridge, 2017; Sinclair & Fraser, 2002); programme evaluation (Hartley & Treagust, 2014; Martin-Dunlop & Fraser, 2008; Nix et al., 2005; Pickett & Fraser, 2009; Seng & Fraser, 2008; Soebari & Aldridge, 2015; Wolf & Fraser, 2008); links between learning environments (Aldridge, Fraser, & Laugksch, 2011; Fraser & Kahle, 2007); and typologies of classroom environments (Moos, 1978, 1979; Rickards et al., 2005; Wubbels, Brekelmans, den Brok, & van Tartwijk, 2006). A summary of learning environment research areas by Fraser (2012), and a brief description of the research focus for each area can be found in Table 2.3.

Table 2.3 Areas of learning environment research[10]

Research area	Research focus
Learning environment–student outcome associations	Research that investigates the relationship between students' perceptions of their learning environment, and their cognitive and affective learning outcomes.
Evaluation of educational innovations	Research that investigates the impact of educational innovations and programmes on perceptions of the learning environment.
Differences between student and teacher perceptions of the learning environment	Research that investigates the differences between students' and teachers' perceptions of the same actual learning environment and the differences between students and teachers' preferred learning environment.
Determinants of the classroom learning environment	Research that uses learning environment dimensions as criterion variables identifying how the learning environment varies with a range of factors as, for example, teacher personality, class size, grade level, subject matter, type of school, and gender.
Combining quantitative and qualitative research methods	Research that uses a mixed-method or qualitative methodology in addition to quantitative measures to investigate features of the learning environment in greater depth.
Cross-national studies	Research that crosses national boundaries.
Teacher action research	Research conducted by teachers, involving practical efforts to improve their classroom learning environment.
Transition between different levels of schooling	Research that investigates early adolescents' transition from primary to secondary school with regard to learning environment perceptions.
Links between different learning environments	Research that investigates both the links between and mutual influence of two or more environments.
Typologies of classroom environments	Research that examines learning environment orientations or profiles.

Recent studies have further extended the field of learning environment research, investigating such areas as: student participation in designing the learning environment (Mäkelä & Helfenstein, 2016; Mäkelä, Helfenstein, Lerkkanen, & Poikkeus, 2018; McCallum, Schultz, Sellke, & Spartz, 2015); the impact of the whole school learning environment on students' wellbeing (Aldridge, Ala'i, & Fraser, 2016; Aldridge, McChesney, & Afari, 2017; Kyriakides & Creemers, 2016; Read, Aldridge, Ala'i, Fraser, & Fozdar, 2015; Riekie, Aldridge, & Afari, 2017); teacher practices and the learning environment (Alt, 2018; Kwitonda, 2017); validation of learning environment questionnaires in other countries (De Juan et al., 2016; Koh & Fraser, 2014; Passini et al., 2015; Sun, Mainhard, & Wubbels, 2018); development of new learning

[10] Adapted with permission (Fraser, 2007, 2012, 2014)

environment questionnaires (Elvira, Beausaert, Segers, Imants, & Dankbaar, 2016; Hartley & Treagust, 2014); and the impact of modern learning environments (Sha, Looi, Chen, & Zhang, 2012; Sun, Wu, & Lee, 2017).

This section reviews past research in learning environments and indicates to some extent the extensive and multifaceted nature of the field. After reviewing the literature, the areas of learning environment research considered most pertinent to my study were the relationship between the learning environment and student outcomes, including studies investigating learning environment/motivation associations, and the evaluation of educational innovations. These areas are reviewed in Section 2.3.3.1, Section 2.3.3.2, and Section 2.3.3.3, respectively.

2.3.3.1 Learning Environment and Student Outcomes

Research suggests that the impact of the classroom learning environment on students' cognitive and affective outcomes is significant. Indeed, research evidence indicates that "student perceptions account for appreciable amounts of variance in learning outcomes, often beyond that attributable to background student characteristics" (Fraser, 2012, p. 1218). This important area of research is perhaps under-utilised by educators, many of whom may rely overly on standardised test scores, a frequently used measure of student achievement outcomes. However, standardised measures of assessment do not take into account the impact that learning environments have on students' social, emotional, *and* intellectual development. It has been established by learning environment researchers that quantitative measures of learning outcomes alone cannot provide a full picture of the educational process; therefore, there is a need for educators to pay attention to classroom learning environments in order to more fully understand contributors and impediments to improved student outcomes (Fraser, 2014). Haertel et al. (1981), in their extensive meta-analysis of 12 studies involving 17,805 students across four nations, found a positive correlation between the quality of the learning environment and the level of students' cognitive and affective learning outcomes with regard to the following learning environment constructs: cohesiveness, satisfaction, task difficulty, formality, goal direction, democracy, and environment.

Several studies, using a range of learning environment instruments, have investigated the relationship between perceptions of the learning environment and various learning outcomes, the consensus generally being that, not only are learning outcomes affected by the learning environment, but differences in learning outcomes can often be attributed to variances in the psychosocial learning environment (Dorman, 2001; Fraser, 2007). This research area was incorporated into my study because the assessment of students' perceptions of their learning environment enables educational researchers and teachers to gain insight into the influences of the learning environment on intangible learning outcomes, such as motivation, which was one of the constructs being investigated in my study. In addition, because the context of my study involved students learning in an environment that was shifting from a traditional, teacher-centred environment to a more constructivist and innovative learning environment, investigating the influence of students' perceptions of this changing environment, and subsequent impacts on motivation and self-regulation, was warranted.

Much of the research into the association between learning environments and student outcomes has found positive associations, such as: examining relationships between the learning environment and achievement (Barile et al., 2012; Dorman & Fraser, 2009; Kwan & Wong, 2014; Marjoribanks, 2003; Passini et al., 2015; Rita & Martin-Dunlop, 2011); comparing laboratory and non-laboratory learning environments and relationships with regard to students' perceptions of the learning environment, attitudes, and achievement (Wolf & Fraser, 2008); the interrelationship between students' learning environment preferences, instructional approaches, achievement, and attitude (Chang et al., 2011); comparing the relationship between the learning environment and students' attitudes across international borders (Sirrakos & Fraser, 2017); investigating the relationship between students' perceptions of learning environment and their attitudes (Dorman & Fraser, 2009; Fraser & Lee, 2009; Houston et al., 2008; Khalil, 2015; Kim et al., 2000; Koul, Fisher, & Shaw, 2011; Lang et al., 2005; Nguyen et al., 2015; Raaflaub & Fraser, 2002; Telli, Brok, & Cakiroglu, 2010; Telli, Cakiroglu, & den Brok, 2006); investigating the impact of a project-based learning environment on students' achievement and attitudes (Baş & Beyhab, 2017); exploring the relationship between the learning environment aspects of teacher support, involvement, and relevance, and students' academic self-efficacy and enjoyment in mathematics lessons (Afari, 2013); using a Student Response System to improve students' learning environment perceptions, attitude, and achievement (Cohn & Fraser, 2016); and comparing the differences in students' attitudes to science within field-study and classroom learning environments (Zaragoza & Fraser, 2016).

In this section, research investigating associations between the learning environment and a range of student outcomes has been reviewed. Despite the fact that learning environment–outcome associations has been the most frequently studied of all the existing lines of learning environment research (Fraser, 2012), most studies have investigated the influence of learning environment on students' attitudes. There has been limited research investigating learning environment influences on the student outcomes of motivation or self-regulation in particular. This line of research, particularly relevant to my study, is reviewed in the next section.

2.3.3.2 Relationships between the Learning Environment and Student Motivation

Given that my study examined the influence of the learning environment on student motivation, this section reviews literature with regard to learning environment–motivation associations. The section reviews literature that has investigated learning environment–motivation associations from both a bi-directional, and uni-directional, social cognitive perspective. A selection of studies that have used the WIHIC to investigate learning environment–outcome associations, including motivation, are also described in this section.

Social cognitive theories of motivation concentrate on the interaction between environmental characteristics and a range of personal and social variables that are presumed to influence learning (Bandura, 1986). There have been a number of studies suggesting a bi-directional relationship between the learning environment and motivation as illustrated in Figure 1.3. Ames and Archer (1988) found that mastery and performance goals (motivational goal orientations) influenced students' perceptions of their learning environment, and students with a mastery goal orientation had a more positive perspective of the learning environment. Tapola and Niemivirta (2008) investigated the importance of students' dispositional motivational factors in relation to individual perceptions of the learning environment. Results confirmed the researchers' hypothesis that students with different motivational orientations experienced the learning environment differently and had differing learning environment preferences. Conversely, Koul et al. (2012) investigated the relationship between students' learning environment and motivational achievement goal orientations in Thailand with upper secondary students studying Biology and Physics. The results of this study suggested that students' perceptions of their learning environment were influenced by their motivational goal orientations.

While the bi-directional relationship between the learning environment and affective outcomes such as motivation is acknowledged, a significant majority of studies reviewed in the literature investigated the influence of the learning environment on affective outcomes rather than the other way around, investigating learning environment–outcome associations from a uni-directional perspective. Motivational theorists, such as Brophy (1998), and Pintrich and Schunk (1996), have asserted that the learning environment is a strong influence on motivation. Therefore, while my study is grounded in social cognitive theory, my hypotheses rest on the learning environment influencing the personal (in this case, motivation) and behavioural (in this case, self-regulation) determinants, and also that motivation would influence self-regulation. I hypothesised that, in classes with teachers identified as effectively implementing cooperative learning, students would have increased motivation, self-regulation, and more positive perceptions of the learning environment compared to students not in such classes. I perceived that because cooperative learning was being implemented as a core part of the science curriculum within the ADEC educational reform, comparing students' perceptions of the learning environment in classes with teachers identified as effectively implementing cooperative learning strategies and the perceptions of students not in such classes, was a tangible and practical way to investigate various influences of different learning environments on students' motivation and self-regulation.

Much of the research concerning the association between the learning environment and student outcomes has been limited to either cognitive outcomes or the affective outcome of attitudes. However, there have been studies that suggest a positive association between the learning environment and the affective outcome of motivation. In their study investigating the relationships between aspects of classroom climate and motivated behaviour with grade 12 English students, Anderson, Hamilton, and Hattie

(2004) found that the learning environment significantly impacted students' motivated behaviour, with the level of perceived affiliation among students being particularly associated with levels of motivation. Tuan et al. (2005), in their study investigating what motivates ninth grade science students to learn physical science, found that learning environment stimulation was one of the factors that contributed to students' motivation towards learning science. Mazer and Stowe (2016) investigated the effects of teacher immediacy and verbal aggressiveness on students' motivation, affective learning, and perceptions of the learning environment. They found that students who experience high levels of teacher immediacy and low levels of teacher aggression have the most positive perceptions of learning environment. Gilbert, Musu-Gillette, et al. (2014) examined the relationship between students' perception of their learning environment and motivation and achievement. The results indicated that students' perceptions of the extent to which their teachers believe in their mathematical ability positively influenced their mastery and performance goal orientations in mathematics.

Given that my study involved the use of the WIHIC to assess students' perceptions of the learning environment, this section of the review focuses on studies that also used this instrument to investigate environment – motivation associations. A summary of these studies can be found in Appendix 2. Overall, the results of these studies suggest that students' perception of the learning environment was positively related to their motivation. For example, a study by Opolot-Okurut (2010), conducted in Uganda with 80 students in two secondary schools, found that students' perceptions of their learning environment, depending on the type of school they came from, had a bearing on student motivation.

Velayutham and Aldridge (2013), in their study involving a sample of 1360 science students, found that the learning environment influenced students' levels of motivation and self-regulation in science. In particular, the results suggested that student cohesiveness, investigation, and task orientation influenced students' motivation and self-regulation with regard to science learning.

The relationships between students' perceptions of the learning environment and their motivation has also been found at the tertiary level. For example, Bi (2015), in a study involving 1000 students at a South China university, found that the learning environment dimensions of task orientation and involvement predicted the motivation types of social responsibility, individual development, and intrinsic interest. Additionally, the learning environment dimension of teacher support had positive associations with information medium and immediate achievement motivation types. In another study by Aluzbaidi et al. (2016), involving 994 university students in Jordan, a strong and positive relationship was found between students' perceptions of their learning environment and their motivation and self-regulation.

Because motivation is such an important affective learning outcome, knowledge about how students' perceptions of the learning environment influence specific aspects of motivation is an important area of research, to which my study makes a contribution, particularly as there is, to my knowledge, no other study specifically investigating the influence of the learning environment on the motivation constructs of learning goal orientation, task value, self-efficacy, and self-regulation at the same time within cooperative learning environments. There is relatively little research that has investigated students' perceptions of a cooperative learning environment (see Section 2.4.2.3), and even fewer studies investigating this relationship in science classrooms in the Middle East. My study, therefore, adds to the body of research in this area as it investigates whether there are differences in students' motivation, self-regulation, and their perceptions of the learning environment in a Middle Eastern context within a cooperative learning environment.

Having reviewed literature with regard to learning environment–motivation associations in this section, the following section of this chapter reviews studies that have investigated another line of learning environment research relevant to the objectives of my study; utilising learning environment instruments to evaluate the impact of educational innovations.

2.3.3.3 The Learning Environment and Educational Innovations

A review of the literature indicated that learning environment instruments have been a useful means of evaluating educational innovations. One such innovation being implemented within Abu Dhabi government Cycle 2 (middle school) science classrooms was cooperative learning, as described in Chapter 1, Section 1.1.3.

Cooperative learning is an educational innovation that has been widely used at all levels of schooling (Johnson, Johnson, & Stanne, 2000). However, there is a relatively small number of studies that have examined its impact by evaluating students' perceptions of the learning environment. As cooperative learning had been incorporated within the ADEC Cycle 2 science curriculum at the time of my study, an opportunity was thus presented to evaluate this educational innovation through the assessment of students' perceptions of their learning environment. Classroom instruments "have been used as a valuable source of process criteria…" (Fraser, 2014, p. 111) in this regard. In this section, studies are reviewed that have used learning environment instruments to investigate the impact of educational innovations by assessing students' perceptions of the learning environment.

A range of educational innovations have been evaluated through the utilisation of learning environment instruments. Examples of these include: the use of the SLEI to evaluate the efficacy of using anthropometric activities in relation to students' attitudes and achievement (Lightburn & Fraser, 2007); the use of the Technology-Rich Outcomes-Focused Learning Environment Inventory (TROFLEI) to investigate the impact of an outcomes-based learning environment in Western Australian and Tasmanian high school classrooms (Aldridge, Dorman & Fraser, 2008); and the development and use of the Computer-assisted Learning Environment Questionnaire (CALEQ) to evaluate the impact of computer-assisted learning within mathematics classes in a South African secondary school (Hartley & Treagust, 2014).

The WIHIC has been used to evaluate the impact of a range of educational innovations including: the evaluation of computer education programmes with adult learners (Seng & Fraser, 2008); investigating the relationship between the learning environment, attitudes and achievement within inquiry and non-inquiry laboratory settings in middle school science classes in the US (Wolf & Fraser, 2008); examining whether the introduction of games within mathematics learning influenced perceptions of the learning environment and attitudes towards mathematics among first and second year university students in the UAE (Afari et al., 2013); and evaluating the impact of a one year professional development programme on changing teacher practice by assessing students' perceptions of the learning environment before and after the professional development had taken place (Soebari & Aldridge, 2015).

Learning environment instruments have also been utilised to evaluate teacher development programmes. Several studies have involved assessing teachers' as well as students' perceptions of the learning environment. For example, Martin-Dunlop and Fraser (2008) used learning environment instruments to examine the effectiveness of an innovative science course on improving prospective science teachers' perceptions of the learning environment at a large urban university in the US. In another study, Pickett and Fraser (2009) used the WIHIC to evaluate a two year mentoring programme for beginning science teachers by assessing teachers' perceptions of the learning environment as a pretest and posttest. A further example is Nix, Fraser, and Ledbetter's (2005) study that used the CLES to evaluate students' perceptions of the classroom environment of their science teacher, who had participated in a teacher development programme in North Texas, US, that involved the use of constructivist teaching approaches. The CLES was used to assess students' perceptions as to "the degree to which the principles of constructivism were evident" (Nix et al., 2005, p. 117) in these learning environments.

The findings of the above studies suggest that useful information can be garnered with regard to evaluating the impact of a range of educational innovations through the utilisation of instruments to assess students' perceptions of their learning environment. This area of research was considered relevant to my study because the educational innovation of cooperative learning had been incorporated within the ADEC Cycle 2 science curriculum and was being implemented in several Cycle 2 science classrooms at the time my study was conducted.

In this section studies that have utilised learning environment instruments to evaluate the impact of educational innovations have been reviewed. In the next section, I review studies that have investigated the relationships between the learning environment and self-regulation.

2.3.3.4 The Learning Environment and Self-Regulation

Several researchers have investigated the relationship between self-regulation and the learning environment, such as: examining how students' perceptions of their learning environment influence self-regulation and motivation (Alzubaidi et al., 2016;

Chipangura & Aldridge, 2017; Velayutham et al., 2013; Velayutham & Aldridge, 2013; Velayutham et al., 2011, 2012); exploring the suitability of mobile and flipped learning environments in improving self-regulation (Sha et al., 2012; Sun et al., 2017); and investigating changes in self-regulation strategies and motivation beliefs across different learning environments (Cleary & Chen, 2009).

There have been varying findings with regard to the influence of the learning environment on students' self-regulation of effort. While some researchers have found the learning environment to influence self-regulation (Agina et al., 2011; Alzubaidi et al., 2016; Sun et al., 2017), others have found that the learning environment had a somewhat limited influence on students' self-regulation (Chipangura & Aldridge, 2017; Velayutham & Aldridge, 2013). Sha, et al., 2012, found that complex learning environments such as the modern learning environment, required students to have high levels of self-regulation in order to benefit from such environments.

Some aspects of the learning environment have been found to inhibit self-regulation (Boekaerts & Corno, 2005). Boekaerts and Corno's (2005) dual processing self-regulation model is intended to help researchers and educators make sense of when, why, and how students adjust their self-regulatory processes within the classroom (Boekaerts & Cascallar, 2006). For example, students' goal orientation may influence students' self-regulatory behaviour within the learning environment; students who are focused on their wellbeing rather than the pursuit of goals might scan the learning environment for cues regarding any obstacles or unfavourable learning conditions that may negatively impact on their wellbeing. They may then use energy to avoid this happening (Boekaerts & Cascallar, 2006).

In this section, literature relating to the relationship between the learning environment and self-regulation has been reviewed. It is clear from the research that, while there are learning environment–self-regulation associations, the relationship between students' perceptions of their learning environment and self-regulatory behaviour are not yet well understood. My study contributes to filling the gap in the literature regarding this research area as it investigates the relationships between students' motivation, self-regulation, and perceptions of their learning environment. The findings from my study could contribute to an improved understanding of the influence of the learning environment on students' self-regulation of effort. The next section of this chapter reviews literature in relation to cooperative learning, an important aspect that is relevant to the third research objective in my study: to investigate whether there is a difference in students' motivation towards learning, self-regulation, and perceptions of the learning environment between classes with teachers identified as effectively implementing cooperative learning practices and classes that did not have such teachers.

2.4 Cooperative Learning

As explained previously, cooperative learning had been incorporated within the science curriculum for Cycle 2 (middle school) classrooms in Abu Dhabi government schools at the time my study was conducted. Literature relevant to cooperative learning is therefore reviewed in this section. The section begins with a definition of cooperative learning. The theoretical influences on the development of cooperative learning are then described (Section 2.4.1). After this, past research in cooperative learning is reviewed (Section 2.4.2). This chapter concludes with a summary (Section 2.5).

Johnson, Johnson, and Smith (1998, p. 28) define cooperative learning as students working "…together cooperatively to accomplish shared learning goals. Each student achieves his or her learning goal if and only if the other group members achieve theirs." Slavin (2015, p. 8) defines cooperative learning as "... teaching methods in which students work together in small groups to help each other learn academic content." Cooperative learning has been defined as a selection of principles determining how students may learn from and with each other, working together to achieve academic tasks (Hijzen, Boekaerts, & Vedder, 2006). Hancock (2004, p. 159) describes cooperative learning as "students working in mixed ability groups on clearly defined tasks with the expectation that they will be rewarded on the basis of group success." Abrami, Poulsen, and Chambers (2004, p. 201) suggest that cooperative learning differs from other group work because "students' goals are positively linked." For the purpose of my study, I used Johnson, Johnson and Smith's (1998) definition of cooperative learning.

Key theorists agree that there are elements that are essential to cooperative learning, but there is some disagreement about the importance of certain elements and which are most instructionally effective (Johnson & Johnson, 1999, 2002a, 2002b, 2005, 2009; Kagan, 1989; Sharan, 1980; Sharan, 2010; Slavin, 1996). Johnson and Johnson (1999) claim there are five key elements—positive interdependence, individual accountability, face-to-face promotive interaction, appropriate use of social skills, and group processing. Sharan (2010, p. 308) states that "positive interdependence is the one constant principle, or rule, that serves as an anchor for the design of all cooperative learning methods." Despite some difference of opinion regarding the order of importance of certain elements within cooperative learning, the two key aspects that elicit general agreement as being essential to cooperative learning are positive interdependence and individual accountability. As part of the Abu Dhabi Education Council's (ADEC) education reform, cooperative learning strategies were incorporated within the ADEC Cycle 2 (middle school) science curriculum from which the sample for my study was taken. The cooperative learning strategies theoretically being implemented in these classes were designed to incorporate these two elements.

The first essential element, positive interdependence, occurs when the actions of individuals result in the achievement of a joint goal and as such, is the foundation of cooperative learning. When positive interdependence occurs, individuals facilitate one another's efforts. Individuals believe that they can only achieve their individual goals when others, the group they are learning with, also achieve their goals (Johnson & Johnson, 2002b). Positive interdependence is established through mutual learning goals, and not only do individuals in the group need to learn the content within a task, but they also need to make sure every group member learns that content (Johnson & Johnson, 1999).

Individual accountability, the other key element in cooperative learning, strengthens the levels of group interdependence. This element exists when individuals in the group, while working together, are also accountable for their own actions and achievement, and this directly impacts on the group (Dooley & Kossar, 2010). The ways in which this element can be structured include, for example, having the test results of one group member be taken to represent the whole group, or having students explain to other classmates what they have learned (Johnson & Johnson, 1999). This is a very important element as the purpose of cooperative learning is to enable every student to become stronger in their own right through working together (Johnson & Johnson, 2002).

In this section, the concept of cooperative learning was defined, as were the two elements agreed upon by leading theorists in the field as essential to effective cooperative learning—positive interdependence and individual accountability. These elements were theoretically incorporated within the classes in my study that had teachers identified as effectively implementing cooperative learning strategies. The next section reports the theoretical frameworks underpinning cooperative learning research.

2.4.1 Theoretical Influences on Cooperative Learning

Johnson and Johnson (2005) state that cooperative learning is founded on three learning theories: social interdependence theory; cognitive–developmental theory, and behavioural learning theory. Social interdependence theory assumes students are intrinsically motivated, cognitive–developmental theory focuses on what happens within individuals, and behavioural learning theory assumes students work cooperatively to receive an extrinsic reward (Johnson & Johnson, 2002b). While cooperative learning has emerged from this tripartite framework, the majority of research undertaken into cooperative learning has been underpinned by social interdependence theory (Johnson & Johnson, 2002b).

According to Johnson and Johnson (2002b, p. 120), social interdependence theory "views cooperation as resulting from positive interdependence among [an] individual's goals." Early advocates of cooperative learning were the harbingers of social interdependence theory, which developed from social psychology (Dooley & Kossar, 2010). Social interdependence theory was formulated by Morton Deutsch (1949) and developed from the work of the gestalt psychologist, Koffka (1935), and Lewin (1935). Koffka (1935) suggested that groups were dynamic structures within which the interdependence of the group's members could vary. Interdependence in this instance can be defined as mutual dependence between members of a group. Lewin agreed with Koffka and suggested that interdependence was established by creating common goals, and that if a change occurs within a group, all members of the group are affected by it (Johnson & Johnson, 2002b). Deutsch (1949) posited that interdependence can be positive (cooperation), negative (competition), or non-existent (individualistic efforts). Johnson and Johnson (1989) published a conceptualisation of the theory in the 1980s and expanded the concept of no interdependence (individualism) in this research.

2.4.2 Past Research on Cooperative Learning

In this section, I allude briefly to the breadth of research undertaken in this field that indicates that cooperative learning has had a beneficial impact on many aspects of students' learning. After this, I review the literature with regard to the interrelationship between cooperative learning and the three constructs in my study: motivation (Section 2.4.2.1), self-regulation (Section 2.4.2.2), and the learning environment (Section 2.4.2.3).

Johnson, Johnson, and Stanne (2000 p. 1) state that "Cooperative learning is one of the most remarkable and fertile areas of theory, research, and practice in education." Cooperative learning has been broadly promulgated through teacher training programmes, professional development, and practitioner publications (Johnson et al., 2000). According to Johnson et al.'s (2000) meta-analysis, cooperative learning research has covered a wide range of contexts with over 900 studies that have validated the efficacy of cooperative learning over competitive or individualistic learning. The extensiveness of the research in the field of cooperative learning is beyond the scope of this thesis. Therefore, I have only reviewed aspects of the field that relate to my study: the relationship between cooperative learning, motivation, self-regulation, and the psychosocial learning environment.

2.4.2.1 Cooperative Learning and Motivation

The role of cooperative learning with regard to motivational perspectives has largely been focused on students' reward or goal structures (Slavin, 1995, 1996). Slavin argues that cooperative goal structures are inherently motivating as group members attain their own personal goals through the group's success; in order to achieve their personal goals, they need to support one another within the group to ensure the group itself is successful.

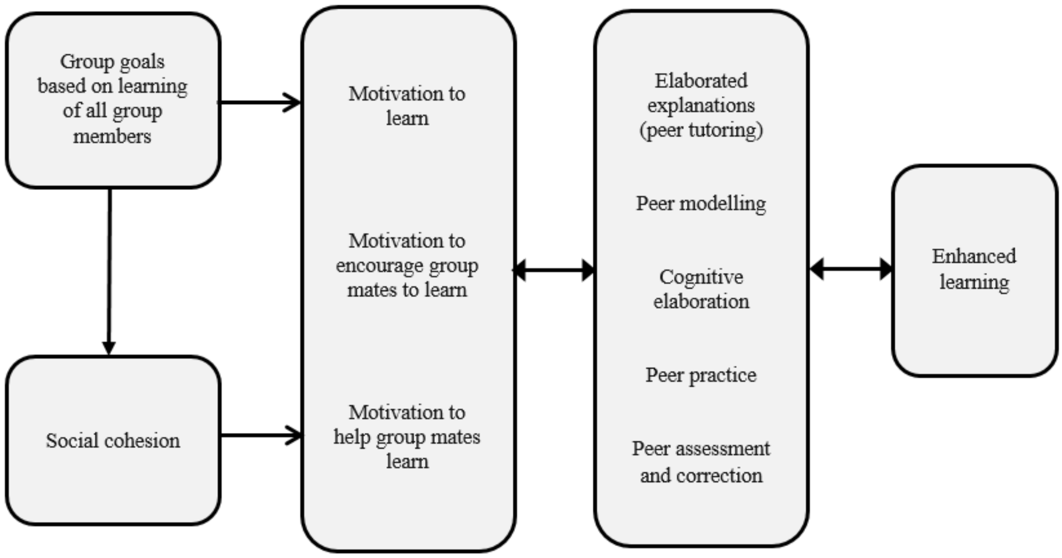


Figure 2.1. A path-model of cooperative learning processes and effects on learning (adapted from Slavin, 1995, p. 45)

The model in Figure 2.1 (Slavin, 1995, 2015) assumes that motivation to learn and to help others learn promotes cooperative behaviours that result in learning. This process involves both task motivation and the motivation to work in a group. According to Slavin (2015), the motivation to succeed drives the behaviour and attitudes needed for group cohesion, which, in turn, creates the attributes that contribute towards enhanced learning and academic achievement (peer modelling, equilibration, and cognitive elaboration). These relationships are reciprocal as, for example, task motivation may promote group cohesion, which, in turn, may develop task motivation.

More recently, researchers have attempted to understand motivational constructs within cooperative group work (Kim, Chung, Kim, & Svinicki, 2015), although it is not always clear whether the cooperative group work being studied contains the elements of positive interdependence and individual accountability that key cooperative learning theorists have deemed essential. Johnson, Johnson, Roseth, and

Shin's (2014, p. 2) meta-analysis studied the relationship between motivation and achievement in interdependent situations and found that "Positive interdependence resulted in greater motivation and achievement than did negative or no interdependence." The researchers found that, when positive interdependence was structured, motivation appeared to increase for three reasons. First, when efforts were coordinated to achieve a goal, individuals were able to achieve in areas that they could not achieve in when working alone. Second, there was increased peer pressure to do an equal share of work, and this encouraged group members to work hard as well as increased motivation generally. Third, working to achieve something that affects others as well as oneself tended to result in the task being perceived as having greater meaning and significance. Slavin (1984) suggested that the positive motivational impact of peer support for learning is a possible factor in the success of cooperative learning instruction because it lowers the competitive elements usually present in a typical classroom, thereby directing students to improve knowledge as they pursue a group goal.

Several studies report findings that support Johnson et al.'s (2014) and Slavin's (1984) assertions with regard to the positive impact of cooperative learning on motivation, such as: more adaptive motivational beliefs in a cooperative learning group compared to traditional group but only if cooperative learning was well structured and understood by students (Can & Boz, 2016); increased motivation with specific cooperative learning structures (Fauzi, Usodo, & Subanti, 2017); higher motivation and improved achievement outcomes using a Teams Games Tournament (TGT) cooperative learning structure (Nadrah, Tolla, Ali, & Muris, 2017); and increased motivation as a result of group cohesiveness promoted by cooperative learning (Dörnyei, 1997). Hancock (2004) investigated the influence of peer orientation on motivation and achievement and challenged common findings concerning the positive impact of cooperative learning on achievement. Hancock (2004) found that students with a peer orientation did not necessarily learn more in collaborative settings, but that cooperation was an "important determinant of students' motivation in the classroom" (p. 164).

There has been limited research undertaken that investigated the impact of cooperative learning on the specific motivation constructs of self-efficacy, task value, and goal orientation—the motivational constructs used in my study. Nichols and Miller (1994) found that implementing the cooperative learning strategy of Team Assisted Individualisation (TAI) on student achievement and the motivation variables of efficacy, intrinsic valuing, and goal orientations resulted in higher levels of all variables, including achievement, with the cooperative compared to the non-cooperative learning groups. Umemoto and Yada (2016) found that the perceived usefulness of cooperative learning positively predicted self-efficacy and intrinsic value in learning tasks, and that self-efficacy positively predicted engaged behaviour in a cooperative setting. Some researchers have proposed that goal orientations vary depending on both the context (individual or group) and the goal orientation of the individual within the group (Kim, Chung, Kim & Svinicki, 2015; Kim, Kim, & Svinicki, 2012). My study contributes to the field as it adds to the limited research investigating the relationship between cooperative learning environments and the specific motivational constructs of learning goal orientation, task value, and self-efficacy.

Recently, there has been research conducted that investigated students' motivation, self-regulation, and perceptions of the learning environment, or a combination of these constructs, within a cooperative learning context. Fernandez-Rio, Sanz, Fernandez-Cando, and Santos (2017) investigated the impact of a sustained cooperative learning intervention on secondary students' motivation, perceptions of the cooperative learning class climate, and students' feelings about engaging in a cooperative learning intervention in Spain. The researchers found increased intrinsic motivation and increased positive perceptions of a cooperative learning class climate only in the experimental (cooperative learning) group. In another Spanish study, Fernandez-Rio, Cecchini et al., (2017) explored interactions between self-regulation, cooperative learning, and self-efficacy within a cooperative learning pedagogy and found that self-regulation was more influential than cooperative learning on students' self-efficacy. Hanze and Berger (2007) compared the jigsaw cooperative learning technique with traditional learning in grade 12 science classes in terms of motivation, achievement, and perceptions of the learning environment. The jigsaw classroom was viewed more favourably than the traditional classroom by students. While there were no benefits to cooperative learning in terms of achievement, students in the jigsaw classroom reported stronger intrinsic motivation, greater cognitive activation, and more interest in the topic, suggesting that the jigsaw method had a positive impact on students' affective learning outcomes.

While there have been studies investigating student motivation in cooperative learning settings, a review of the literature found that, to the best of my knowledge, there has been limited research that has examined cooperative learning–motivation associations within middle school science classrooms and no other study specifically investigating this relationship within the UAE. Resulting from my review of the literature and the substantial evidence found that cooperative learning has a positive impact on a range of learning outcomes, I wanted to investigate whether students in classes with teachers identified as implementing effective cooperative learning strategies would have more positive perceptions of the learning environment, resulting in greater learning goal orientation, valuing of learning tasks, and self-efficacy than students not in such classes. Having explored motivation in cooperative learning settings within the literature, the next section reviews literature relevant to the interrelationship between cooperative learning and self-regulation.

2.4.2.2 Cooperative Learning and Self-Regulation

There has been limited research investigating the relationship between cooperative learning and self-regulation. Whereas most research has been dedicated to investigating the influence of collaboration on students' self-regulation, my review found two studies that investigated self-regulated learning, cooperative learning, and academic self-efficacy. In a study conducted by Fernandez-Rio, Cecchini, et al. (2017), it was reported that "students in cooperative learning groups play different roles to regulate their and others' knowledge" (p. 3). However, it was also reported that self-regulation was usually intra-personal; students were most involved in regulating their own knowledge and behaviour. In another study, Arjanngi and Setiowati (2014) found that the cooperative learning structure of Student Teams-Achievement Division (STAD) had a positive impact on nursing students' self-regulation. These studies are set apart from other studies in this area as they considered cooperative learning as a specific technique and utilised cooperative structures that included the elements of positive interdependence and individual accountability, which key cooperative learning researchers agree are essential components of effective cooperative learning practices (Johnson & Johnson, 1999; Sharan, 2010; Slavin, 1980).

While there are limited studies investigating self-regulation and cooperative learning associations, there has been considerably more research undertaken that has investigated self-regulation in collaborative learning environments. Brufee (1995) argues that the concepts of cooperative and collaborative learning are strikingly similar but that originally, cooperative learning was designed for younger learners, less sophisticated in the mastery of interdependence, while collaborative learning was more sophisticated in its conceptualisation of interdependence and was thus better suited for older learners. Brufee (1995) acknowledges that the lines between the two have become blurred over time. Panitz (1999, p. 3) describes cooperation as "a structure of interaction designed to facilitate the accomplishment of a specific end product or goal through people working in group … [and collaboration as a] … philosophy of interaction and personal lifestyle where individuals are responsible for their actions, including learning and respect[ing] the abilities and contributions of their peers." Unlike Brufee, I consider that there are important distinctions to be made between these two concepts, particularly with regard to examining regulatory behaviours of students in group situations. Where collaboration is a philosophy, cooperative learning is a technique that, in its very structure, involving the elements of positive interdependence and individual accountability, may influence self-regulation in different ways from collaborative learning contexts.

Increasingly, researchers investigating the relationship between collaborative learning and self-regulation have broadened the concept from intrapersonal regulation (self-regulation) to interpersonal forms of regulation; social regulation, including the concepts of co-regulation; and shared regulation (Fernandez-Rio, Cecchini, et al., 2017; Grau & Whitebread, 2012; Hayes, Uzuner-Smith, & Shea, 2015; Volet, Vauras, & Salonen, 2009). Co-regulation refers to regulating other members' activity within the group, and shared regulation refers to regulating the collective activity of the group (Grau & Whitebread, 2012). For research investigating the relationship between collaborative learning and self-, co-, and shared regulation, please see Baines, Blatchford and Chowne (2007), Grau and Whitebread (2012), Iiskala, Vauras, Lehtinen and Salonen (2011), Järvelä and Järvenoja (2011), Kutnick, Ota, and

Berdondini (2008), Vauras, Iiskala, Kajamies, Kinnunen, and Lehtinen (2003), Volet, Vauras and Salonen (2009), and Waite and Davis (2006).

There is a scarcity of research investigating the relationship between structured cooperative learning techniques and self-regulation. Given that one of the research foci in my study was to investigate whether differences exist in students' self-reports of self-regulation between classes with teachers identified as effectively implementing cooperative learning strategies and classes that did not have such teachers, my study adds to the limited number of studies in this area. Additionally, while researchers have investigated the relationship between self-efficacy and self-regulation (Schunk, 1990; Zimmerman, 1990) and, to a limited extent, the relationship between self-regulation and cooperative learning, until Fernandez-Rio, Cecchini and colleagues' (2017) study, there has been, to my knowledge, no other study that has investigated the relationships between these three constructs— motivation, self-regulation, and cooperative learning—at the same time. My study helps to fill the gap in this area of research.

2.4.2.3 Cooperative Learning and the Learning Environment

Both cooperative learning and the learning environment are two fields of educational research that have been widely studied, with a broad range of educational outcomes investigated (Fraser, 2014; Slavin, 2015). Despite the depth and breadth of research in both fields, there is surprisingly little research that has examined students' perceptions of cooperative learning environments. A review of literature indicated that while there have been a small number of studies investigating students' perceptions of collaborative learning environments (reviewed later in this section), to the best of my knowledge there have been no published studies that have investigated cooperative learning / learning environment associations specifically. Given the positive impact that cooperative learning has had on a range of student outcomes (Johnson et al., 2000), as well as evidence within the research that students' perceptions of the learning environment influence a variety of student outcomes (as reviewed in Sections 2.3.3.1 and 2.3.3.2), exploring the associations between cooperative learning and students' perceptions of their learning environment is warranted. My study, therefore, contributes to research in this area. In this section, I review the limited number of studies that have looked at the association between cooperative, or collaborative learning, and the learning environment.

Heflin, Shewmaker, and Nguyen (2017) evaluated the ways university students learn in collaborative learning environments with and without mobile technology to assess students' critical thinking, engagement, and attitudes towards the collaborative learning environment. They found that while a mobile application was useful and resulted in positive perceptions of collaborative learning, it did not result in higher levels of engagement or output. Khalil (2015) investigated the impact of a cooperative learning environment on middle school students' attitudes towards learning science in the UAE. The findings of this study suggest that implementing cooperative learning strategies in science lessons positively influenced students' attitudes. Chen and Chen (2015) investigated university students' perspectives of cooperative learning in a flipped classroom environment, and found that students identified cooperative learning as an effective strategy. While these studies investigated the impact of cooperative and collaborative learning environments, with the exception of Khalil (2015), they did not use established, validated learning environment instruments to assess students' perceptions of their learning environment, such as were utilised in my study.

Strayer (2012) examined university students' perceptions of the learning environment within a traditional and an inverted classroom. In an inverted classroom environment, technology was used to introduce students to content outside of the classroom so that they could engage in deeper thinking, and practical and collaborative work inside the classroom (Strayer, 2012). Strayer found that students working in the inverted classroom had more favourable perceptions of the collaborative learning environment compared to traditional classrooms. However, while both the inverted and traditional participants preferred similar levels of task orientation, students in the inverted classroom perceived task orientation at a lower level that those in the traditional classroom.

Associations between the learning environment and cooperative learning have been found in a few studies that did not assess students' perceptions of the learning environment directly. Boersma, Dam, Wardekker, and Volman (2016) used cooperative principles by using student participation and responses to design a learning environment based on a community of learners, resulting in positive learning environment perceptions and students experiencing learning in a shared and meaningful way compared to a control group. Alt (2018) evaluated the impact of the new Israeli science curriculum and its emphasis on meaningful learning by investigating teachers' use of formative and summative assessment tasks. Alt (2018) found that despite new curriculum expectations, the majority of teachers were using traditional teaching and assessment methods, but that teachers using cooperative methods used more formative tasks.

Johnson and Johnson (2014, p. 841) argue that cooperative learning is an "essential tool for training individuals how to meet [the] challenges…" facing the 21st century, such as growing global interdependence, which places an increasing need for effective interpersonal skills. The need to prepare future citizens to be able to make valuable contributions as citizens of the UAE in the 21st century led to the educational reform in the UAE and subsequently to cooperative learning practices being introduced within the ADEC curriculum. Considering that cooperative learning was occurring within the Abu Dhabi educational context where my study was conducted, investigating the influence of this strategy on students' motivation, self-regulation, and perceptions of their learning fills a research gap in the field.

This section began with a description of cooperative learning including a description of the two key elements—positive interdependence and individual accountability—that seminal researchers in the field have identified as essential to the effective implementation of cooperative learning (Section 2.4). The theoretical influences on cooperative learning were described in Section 2.4.1. Past research in cooperative learning was briefly reviewed in Section 2.4.2, including a review of studies investigating associations between cooperative learning and: motivation (Section 2.4.2.1); self-regulation (Section 2.4.2.2); and the learning environment (Section 2.4.2.3) This chapter concludes with a summary of the literature reviewed in this chapter relevant to the research objectives addressed in my study.

2.5 Chapter Summary

In this chapter, I have reviewed the literature pertaining to the objectives of my study: first, to examine the influence of the learning environment on students' motivation and self-regulation, and, second, to investigate whether there were differences in motivation, self-regulation and learning environment perceptions between classes with teachers identified as effectively implementing cooperative learning strategies and classes that did not have such teachers. The purpose of this review was to locate my study within the existing research relevant to the objectives of my study, to establish the warrant for pursuing my research objectives, and to identify the limitations within the research towards which my study makes a contribution.

I began this chapter with a review of literature relevant to the overarching objective driving my research; what motivates students to learn (Section 2.1). Motivation is widely recognised as an important aspect of effective learning (Ainley, 2004) and remains, despite the large amount of research devoted to this topic, an area of education that is not well understood (Hancock, 2004). I specifically focused within this review on the three motivation constructs used in my study: learning goal orientation (Section 2.1.1), task value (Section 2.1.2), and self-efficacy (Section 2.1.3). Students with a learning goal orientation believe that effort is a key aspect of success, seek challenge, and persevere with learning tasks. Task value refers to the extent a student expects and values success, which, in turn, determines their motivation towards performing achievement tasks. A student's self-efficacy determines the extent to which they believe themselves to be capable of achieving learning tasks. Because a motivation questionnaire was used in my study to assess students' motivation, I described and critiqued several questionnaires that had been developed to assess motivation in terms of their suitability for use, and justified the selection of the questionnaire used in my study in Section 2.1.4. The interrelationships between one or more of the motivation constructs used in my study (learning goal orientation, task value, and self-efficacy), were reviewed in Section 2.1.5. The review of literature indicated that the motivation constructs of self-efficacy and task value have the strongest interrelationship and that there is a lack of clarity regarding the interrelationship between self-efficacy and goal orientation. It is hoped that relevant findings within my study contribute towards clarifying understandings in this area of research.

In Section 2.2 I reviewed the literature concerning self-regulation, beginning with defining self-regulation and describing self-regulation models. I then reviewed past research in self-regulation and finished this section with a review studies that have explored the interrelationship between self-regulation and motivation, two of the three constructs investigated in my study. Self-regulation is an important component of social cognitive theory (Bandura, 1986) and concerns the thinking, feeling, and behavioural processes students engage in as they attempt to achieve a goal (Boekaerts & Cascallar, 2006). Choice and control, important aspects of self-regulated learning (Schunk & Ertmer, 2000), are increasingly recognised as necessary 21st century skills and, consequently, are being incorporated within the objectives of many education systems. The educational reform in Abu Dhabi was taking place because of the need to bring the education system online with 21st century educational objectives. Investigating students' self-regulation of effort within the context of an ongoing educational reform as is undertaken in my study will hopefully contribute towards a greater understanding of students' self-regulatory behaviour.

In Section 2.3, learning environment literature relevant to my study was reviewed. For the purposes of my study, the learning environment referred to the psychosocial aspects of the learning setting—psychological, social, emotional, and cultural influences that pervade the environment in which students learn. My study sought to investigate the impact of the learning environment on students' motivation and self-regulation in science learning in order to understand how better to foster a psychosocial learning environment that promotes adaptive motivation and self-regulation behaviour as well as subsequent educational achievement. I began this section by defining the concept of learning environment and provided a brief history of research developments in this field (Section 2.3.1). After this, a range of historically important and contemporary learning environment instruments were reviewed (Section 2.3.2). There are now a range of learning environment instruments that can assess students' perceptions of their learning environment, and this information can be used to design the most conducive learning environment for any particular group of students. I completed this section by reviewing the instrument that was used in my study to assess students' perceptions of the learning environment; the WIHIC.

Next, past research in the learning environment was reviewed in Section 2.3.3. Learning environment–outcome associations is one line of learning environment research that has been widely studied (Fraser, 2007, 2012). The influence of the learning environment on students' motivation and self-regulation, two important affective student outcomes, was investigated in my study. Therefore, in Section 2.3.3.1, I reviewed literature investigating learning environment–outcome associations, with a particular focus on motivation (Section 2.3.3.2). After that, I reviewed studies that have investigated the impact of a range of educational innovations by assessing students' perceptions of the learning environment, including the educational innovation of cooperative learning as I explored the mediating effect of cooperative learning on students' perceptions of their learning environment, motivation, and self-regulation in my study.

Understanding the relationship between self-regulatory processes and the learning environment was a focus of my research as the learning environments within the context of my study were in a process of evolution and change due to educational reform and, as such, may have affected students' self-regulation of effort. Section 2.3.3.4 reviewed literature that has investigated the relationship between students' perceptions of their learning environment and self-regulation.

One aspect of my study involved the investigation as to whether there were differences in self-reports of motivation and self-regulation, as well as learning environment perceptions, between students in classes with teachers identified as effectively implementing cooperative learning strategies and students not in such classes. In Section 2.4, therefore, I reviewed literature relevant to cooperative learning. I began by defining cooperative learning and describing its theoretical constructs. I then reviewed past studies investigating the relationship between cooperative learning and motivation, self-regulation, and perceptions of the learning environment, respectively. Cooperative learning is well established as an effective educational strategy, and there has been extensive research finding a positive impact between cooperative learning and a range of cognitive and affective student outcomes, including motivation. However, there is limited research assessing learning environment perceptions of cooperative learning environments and the resultant impact on motivation and self-regulation. My study contributes to the limited research in this area. Most importantly, it fills a gap in the research investigating this within a Middle Eastern context.

The first two chapters of this thesis have established the framework from which this research evolved, first by providing a background, context, and rationale for the study (Chapter 1) and second, by reviewing literature that informed the direction for my study in this chapter. The review of literature in this chapter situated my study within relevant literature and highlighted areas of limited or no research with regard to examining what relationships exist between students' motivation towards learning, self-regulation, and perceptions of the learning environment. In Chapter 3, the research methodology employed in my study is explained.

Chapter 3

RESEARCH METHODS

In the previous chapter, the literature pertinent to this study was reviewed. Informed by this review, the research and data collection methods used in the study are described in this chapter. The chapter is set out using the following headings:

- Research objectives (Section 3.1);
- Sample information (Section 3.2);
- Instruments (Section 3.3);
- Data collection (Section 3.4);
- Data analysis (Section 3.5);
- Ethical considerations (Section 3.6); and
- Chapter summary (Section 3.7).

3.1 Research Objectives

The aims of this study were two-fold: first, to examine what relationships exist between students' motivation, self-regulation, and perceptions of the learning environment; and second to investigate differences in motivation, self-regulation, and learning environment perceptions between students in classes with teachers identified as effectively implementing cooperative learning, and students not in such classes. After consideration of the context within which the study was situated, and based on theorising as well as a review of the literature, four research objectives were developed in the attempt to achieve these aims. These were introduced in Chapter 1 and are reiterated here.

Research Objective 1: To establish the validity and reliability of two questionnaires when modified and translated for use in the United Arab Emirates (UAE) to assess students' motivation towards learning, self-regulation, and perceptions of the learning environment.

Based on the hypotheses outlined in Chapter 1 (Section 1.3.1), the second and third research objectives were:

Research Objective 2: To examine the influence of the learning environment on students' motivation and self-regulation.

Research Objective 3: To examine the influence of motivation on students' self-regulation.

Research Objective 4: To investigate whether differences exist between students' motivation, self-regulation, and perceptions of the learning environment in classes with teachers identified as effectively implementing cooperative learning practices and classes that did not have such teachers.

3.2 Sample Information

In this section, I describe the sample and the selection process for my study that determined both the schools and classes (Section 3.2.1), and the student sample (Section 3.2.2).

3.2.1 Selection of Schools and Classes

The context of the UAE for this study was chosen for two reasons. First, I was living there and working as an education advisor[11] during the time that this study was conducted. This gave me a unique insight into the ways in which some aspects of the education reform were being implemented. My position, working in some of the same schools where the study was situated, enabled me to draw on contacts and relationships that were previously established. The students were familiar with education advisors being in their classrooms and working alongside their class teacher and were, therefore, less likely to be uncomfortable or unsure about my presence in their classroom. Second, students in science classes were selected because cooperative

[11] Education advisors were appointed by the Abu Dhabi Education Council (ADEC) as curriculum experts to support teachers in government schools to implement relevant aspects of the educational reform in their subject areas.

learning was theoretically being implemented in science classrooms at the time of this study as part of the education reform taking place in Abu Dhabi (see Chapter 1, Section 1.1.2 for a description of this reform). This provided an opportunity to examine whether motivation, self-regulation, and perceptions of the learning environment were influenced by cooperative learning practices compared with traditional teaching practices. Students were selected for this study from Cycle 2[12] science classes because science was the only subject within the Abu Dhabi Education Council (ADEC) curriculum at the time of this study where cooperative learning practices were a specific and expected component of the curriculum in grades 6 to 9.

The principal criterion that guided the selection process was the identification of teachers who were effectively implementing cooperative learning strategies within their science classes. Once these teachers were identified, this, in turn, determined the schools and the classes from which the sample was taken. The process of selecting teachers who were implementing cooperative learning effectively was supported by a rubric developed by the senior curriculum specialist for science at ADEC, responsible for the implementation of the science curriculum within Cycle 2 government schools in the emirate of Abu Dhabi. This progressive framework was known as the 'Snapshot in Pedagogy' (SNIP; see Appendix 3 for a copy of this document). The purpose of this rubric was to gather data with regard to the efficacy of teachers' implementation of pedagogical changes that were taking place as part of the school reform process. In the case of the science curriculum in Cycle 2 schools, this change involved moving from traditional, teacher-centred teaching to using cooperative learning strategies when teaching science. The SNIP consisted of a rubric with a set of progressive criteria based on the quality of delivery of the key elements within the cooperative learning strategies being implemented.

There were four key elements within the SNIP document, each of which could be graded from one to five, depending on the skill level of the teachers. The four elements were Students (empowerment), Inquiry (the learning process), Team Work (discuss, share, plan, ownership), and Skills (process skills/science skills). Each level of the rubric under these headings had five level descriptors progressing from

[12] Middle schools (grades 6 to 9) are called Cycle 2 in Abu Dhabi government schools.

'unsatisfactory' (level 1) to 'excellent' (level 5). At the time of my study, an initial expectation from ADEC was for teachers to achieve level 3 in each of the element criteria. An example of a level 1 criterion in the Students (empowerment) section was 'Teams: teacher selected, function on occasions. Student Voice: Rarely sought or listened to as part of teacher planning.' The criteria at level 3 in this section (the minimum required to be seen as implementing cooperative learning effectively) was 'Teams: teacher selected, roles usually used and function well. Student voice: feedback on teaching programmes is regularly sought.'

At the beginning of the school year, the senior curriculum specialist had asked the science education advisors to evaluate the teachers they worked with using the SNIP framework. The objective of this evaluation was to provide a baseline against which to measure progress in the delivery of cooperative learning practices over the year. These data were collated, and subsequent findings, together with discussions with science education advisors, informed the selection of suitable teachers for my study. Firstly, teachers achieving a score of three or more in each element within the SNIP were identified. Further discussions then followed with the education advisors working with these teachers. As the education advisors conducted regular observations of these teachers' implementation of cooperative learning strategies within their science classes, these discussions enabled more detailed information that further informed decision making with regard to teacher selection for my study. As a result of this process, five teachers across Abu Dhabi Cycle 2 government schools were identified as using cooperative learning effectively within their science classes. These teachers were working in several different schools in Abu Dhabi, within a range of classes from grades 6 to 9. A further six teachers were selected from the remaining pool of teachers who had been identified as not yet implementing cooperative learning strategies effectively within their science classrooms.

3.2.2 Selection of Participants

The five teachers identified as effectively implementing cooperative learning practices within their science classes provided a pool of nine classes of students, ranging from grades 6 to 9 (n=175). In order to have a representative sample, a further seven classes were selected that were taught by teachers identified as not yet implementing cooperative learning effectively in their science classes (n=163). This provided a total sample size for my study of 338 female students in 16 Cycle 2 science classes across six Abu Dhabi government schools. A small number of students (< 3%) within the sampled classes did not take part due to being absent on the day the survey was administered in their class. There were no students within the classes where the survey was being administered that did not want to complete the questionnaire. Table 3.1 provides a breakdown of schools, class grades, and number of students in each class. As there were only five teachers identified as being effective teachers of cooperative learning, this limited the sample pool that had been exposed to effective cooperative learning strategies and, therefore, the overall size of the total sample (N=338). The total number of classes surveyed was 16, with the majority of students (69%) in the sample enrolled in grades 8 and 9.

Table 3.1 Breakdown of schools, teachers, grades, and participants in the study

School	Teacher	Grade	No. of student participants	Effective cooperative learning implementation
School 1	Teacher 1	6	18	Yes
		7	14	Yes
	Teacher 2	8	15	Yes
	Teacher 3	9	18	Yes
School 2	Teacher 4	6	29	Yes
School 3	Teacher 5	9 (x 4 classes)	81	Yes
School 4	Teacher 6	8	25	No
	Teacher 7	9	28	No
School 5	Teacher 8	9 (x 2 classes)	43	No
	Teacher 9	8	25	No
	Teacher 10	6	22	No
School 6	Teacher 11	7	20	No

The selected students were not streamed for their science classes, and there were no specific criteria applied to the distribution of students to classes. Therefore, the academic abilities of students within the classrooms varied, resulting in a randomised selection of students, with a representative sample across both groups.

Section 3.2 provided information with regard to the study sample. The next section describes the instruments used in my study.

3.3 Instruments

Two instruments were used to collect the data for the study: the Students' Adaptive Learning Engagement Survey (SALES; used to assess students' motivation and self-regulation) and a modified version of the What Is Happening In this Class (WIHIC; used to assess students' perceptions of the learning environment). In this section, a description of each instrument is provided: the SALES is described in Section 3.3.1; and the WIHIC is described in Section 3.3.2. This is followed by a description of how the instruments were adapted and translated for the purposes of this study (Section 3.3.3).

3.3.1 Students' Adaptive Learning Engagement Survey (SALES)

The SALES questionnaire was developed by Velayutham, Aldridge, and Fraser in 2011, to provide "…a more concise and parsimonious instrument to address students' adaptive motivational beliefs in science learning" (p. 7). The SALES questionnaire was chosen as a suitable instrument to use in this study for several reasons. First, it provided an opportunity to validate the instrument when modified and translated for use in a non-Western country such as the UAE. Second, it was initially designed and used to assess students' motivation and self-regulation in science, the same subject as in this study. Third, it was specifically designed for the educational level of the student sample in my study. Last, it has been found to have "high content, face, convergent, discriminant, predictive and concurrent validity when used in lower secondary science classes" (Velayutham et al., 2011, p. 16). Therefore, the SALES questionnaire was considered to be suitable for the purposes of this study.

The SALES questionnaire assesses student responses to three scales considered important to student motivation—learning goal orientation, task value, and self-efficacy—and one scale relating to self-regulation of effort. Each of the four scales has eight positively phrased items that are designed to accurately assess each scale. Descriptions of the theoretical underpinnings of these constructs can be found in

Chapter 2, Sections 2.1.1, 2.1.2, and 2.1.3). Table 3.2 provides a summary description of each scale, including an item sample for each of the scales in the SALES questionnaire.

Table 3.2 Description and sample item for each SALES scale

Scale name	Scale description	Sample item
		In this science class…
Learning goal orientation	A student's desire to develop competence, focus on learning, understand and master tasks	it is important that I understand my work.
Task value	The value a student places on a learning task as important, interesting, and useful	what I learn is useful for me to know.
Self-efficacy	The belief a student holds about their own competencies	I can complete difficult work if I try.
Self-regulation	The degree to which a student metacognitively, motivationally, and behaviourally participates in the learning process	I keep working until I finish what I am supposed to do.

Source: Adapted from Velayutham, Aldridge, & Fraser (2011, 2012) with permission.

The first motivation construct within the questionnaire is learning goal orientation. This scale, with regard to motivation in science, refers to "the degree to which the student perceives him/herself to be participating in a science classroom for the purpose of learning, understanding, and mastering science concepts, as well as improving science skills" (Velayutham et al., 2011, p. 9). Task value, the next motivation construct within the questionnaire, refers to "the degree to which the student perceives the science learning tasks in terms of interest, importance, and utility" (Velayutham et al., 2011, p. 9). The final motivation scale in the questionnaire is self-efficacy, which, in this questionnaire, "assesses the degree of [the] student's confidence and beliefs in his/her own ability in successfully performing science tasks" (Velayutham et al., 2011, p. 9). The importance of management and control of effort when undertaking academic tasks has been identified by Pintrich and De Groot (1990). Self-regulation, therefore, is included as a scale within the SALES questionnaire and "involves the degree to which the student controls and regulates his/her effort in science learning tasks" (Velayutham et al., 2011, p. 9). Each item within the four scales of the instrument were responded to using a five-point response scale of 'strongly disagree,' 'disagree,' 'not sure,' 'agree,' and 'strongly agree' (please see Appendix 4 for a copy of the SALES questionnaire used in this study).

3.3.2 What Is Happening In this Class? (WIHIC)

The WIHIC was developed by Fraser, Fisher, and McRobbie (1996) to bring parsimony to the learning environment field and to include relevant educational concerns. The instrument was designed specifically for high school science contexts (Aldridge et al., 1999). The most salient scales from a range of questionnaires were combined with "contemporary and relevant dimensions" (Aldridge et al., 1999, p. 50), which included the assessment of constructivism and other characteristics of contemporary learning environments (Dorman, 2008). The instrument has been revised and refined several times, going from the original version of nine scales and 90 items to a final version consisting of seven scales and 56 items that was field tested in Australia and Taiwan (Aldridge et al., 1999).

The WIHIC was considered to be appropriate to use for this study because of the evidence supporting its validity and reliability in a range of contexts and countries across the world (Fraser, 2014) as well as its suitability for the education level and subject focus of the sample in this study (Aldridge et al., 1999; Dorman, 2003; Waldrip et al., 2009).

The seven scales of the WIHIC can be classified according to Moos' (1979) conceptual framework for human dimensions, (shown in Chapter 2, Table 2.1). Using Moos' framework, student cohesiveness, teacher support, and involvement can be classified as relationship dimensions. The three scales of investigation, task orientation, and cooperation can be classified as personal growth dimensions. Equity can be classified as a system maintenance and change dimension (Dorman, 2008). Table 3.3 gives a description of each scale in the WIHIC, sample items for each scale, and how each scale relates to Moos' (1979) dimensions. Each of the scales in the WIHIC has 8 items per scale and 56 items in total. The items consist of a range of positively worded statements designed to draw out information relevant to what is being assessed in each scale. It is scored using a frequency–response format of ‘almost never,’ ‘seldom,’ ‘sometimes,’ ‘often,’ and ‘almost always’ (Fraser, 2002). A description of each scale, together with a rationale as to what scales were included within the modified WIHIC used in my study, is provided in Section 3.3.2.

Consideration was given as to the relevance of items within each WIHIC scale in relation to the research objectives of my study. The educational reform taking place in Abu Dhabi resulted in a cooperative learning structure being implemented within Cycle 2 science classes, as described in Chapter 1, Section 1.1.3. As not all teachers were yet implementing cooperative learning strategies effectively, this resulted in some science classroom learning environments differing from others. In order to effectively assess the varying learning environments present within this study, the WIHIC scales were considered in terms of their relevance to cooperative learning.

The three WIHIC scales that were not included were investigation, task orientation, and equity. The investigation scale refers to “the extent to which skills and processes of inquiry and their use in problem solving and investigation are emphasised” (Dorman, 2008, p. 183). The task orientation scale involves the assessment of how important it is to students to stay on task and complete planned activities (Dorman, 2008). The final scale within the WIHIC that was not included was equity, which assesses the extent to which students perceive themselves as “being treated equally by the teacher” (Dorman, 2008, p. 183). After careful scrutiny and consideration of each item in these scales—investigation, task orientation, and equity—it was decided to omit these scales from my study. While important, these scales did not have items that would contribute directly to the research objectives of this study, particularly with regard to cooperative learning. This lack of applicability, therefore, resulted in their omission.

The four scales included in the modified WIHIC questionnaire were student cohesiveness, teacher support, involvement, and cooperation. The student cohesiveness scale was selected because “the extent to which students know, help, and are supportive of one another” (Dorman, 2008, p. 183) is a key aspect of successful cooperative learning, to which half of the sample in this study was theoretically exposed. Research indicates that students who feel connected to one another demonstrate fewer conduct problems and emotional difficulties, and increased pro-social behaviour (Oldfield, Humphrey, & Hebron, 2016). They also have greater respect for teachers while also enjoying the learning process (Blum, McNeely, & Rinehart, 2005).

Table 3.3 Scale description, sample item and Moos' classification for each WIHIC scale

Scale name	Scale description	Sample item	Moos' scheme
	The extent to which…		
Student cohesiveness	students know, help, and are supportive of one another.	I work well with other class members.	R
Teacher support	the teacher helps, befriends, trusts, and shows interest in students.	The teacher's questions help me to understand.	R
Involvement	students have attentive interest, participate in discussions, perform additional work, and enjoy the class.	Students discuss with me how to go about solving problems.	R
Task orientation	it is important to complete activities and to stay on the subject matter.	I know what I am trying to accomplish in this class.	P
Cooperation	students cooperate rather than compete with one another on learning tasks.	I cooperate with other students on class activities.	R
Investigation	emphasis (is given to) the skills and processes of inquiry and their use in problem solving and investigation.	I solve problems by using information obtained from my own investigations.	R
Equity	students are treated equally by the teacher.	I am treated the same as other students in this class.	S

Note: R = Relationship, P = Personal Development, S = System Maintenance; System Change
Response Alternatives: Almost Never, Seldom, Sometimes, Often, Almost Always.
Source: Adapted from Aldridge, Fraser, & Huang (1999) with permission.

An environment where students feel socially accepted and supported by their peers is important for students' learning, and, in such an environment, students are more likely to take risks in their learning without fear of ridicule (Aldridge et al., 2012). The items within this scale, such as ‘I work well with other class members’, were considered to be useful in assessing students’ perceptions of the cooperative learning environment.

The teacher support scale assesses students’ perceptions of the level of support the teacher provides in terms of how the teacher relates to students and the extent to which he or she trusts and helps students in their learning (Dorman, 2008). The relationship between the teacher and students is an extremely important aspect of effective teaching and learning (Aldridge et al., 2012). In addition, students within my study who were exposed to effective cooperative learning strategies were likely to have experienced a shift in responsibility from receiving information directly from the teacher, to seeking information collectively (Hijzen et al., 2006). One of the research objectives of this study was to examine differences towards motivation, self-regulation, and perceptions of the learning environment between classes with teachers identified as effectively implementing cooperative learning, and classes that did not have such teachers. Inclusion of this scale was predicted to provide information about students’ perception of the quality of support they received from the teacher with regard to the cooperative learning strategy being implemented.

The involvement scale concerns students’ level of interest and participation in learning as well as the extent to which they engage in discussions and perform additional work (Aldridge et al., 1999). This scale was selected because it is closely related to the student cohesiveness scale and to two of the constructs being investigated in this study; self-efficacy (a component of motivation), and self-regulation. It was predicted that the extent of peer-to-peer involvement would relate to the level of perceived student cohesion; students who feel connected are more likely to be involved in group discussions and collaborative work (McCallum et al., 2015). Inclusion of this scale was also predicted to provide information regarding students’ self-regulation; if a student responded positively to the involvement items, they may also be demonstrating self-regulated behaviour in the classroom. In addition, a statistically significant link has been found between involvement and students’ self-efficacy (Velayutham et al., 2013). The involvement scale of the WIHIC was therefore considered as an important scale to include for the purposes of this study.

The final WIHIC scale to be selected was the cooperation scale. In the WIHIC questionnaire, this scale involves "the extent to which students cooperate rather than compete with one another on learning tasks" (Dorman, 2008, p. 183). Johnson and Johnson (2014, p. 843) argue that "…valuing cooperation results in greater psychological health and higher self-esteem than does competing with peers or working independently." The strength of evidence suggesting that cooperative learning has a positive effect on a range of learning outcomes (Johnson et al., 2000), led to its inclusion as a learning environment scale in this study. Half of the sample was exposed to cooperative learning practices from teachers that had been identified as effective teachers of cooperative learning. It was predicted that the responses to the items in this scale would be useful in assessing students' perceptions of the quality of cooperative learning that they were exposed to. It was also expected that responses to this scale would show whether there were differences in the way students, in classes with teachers identified as effectively implementing cooperative learning, perceived cooperation in their learning environment compared to those who were not in such classes. A copy of the modified WIHIC questionnaire used in my study can be found in Appendix 5.

3.3.3 Adapting and Translating the Questionnaires

Prior to collecting data for this study, the SALES and WIHIC instruments were examined with regard to their suitability in relation to the research objectives as well as the context of the study. The SALES instrument was kept in its entirety as all the scales and items were considered to be relevant for the purpose of my study and appropriate to its context. The WIHIC instrument, however, was adapted for the purpose of this study to include only four of the seven scales, as described in Section 3.3.2.

Adapting previously validated instruments had several advantages for the purposes of this study. The first and most obvious advantage was that both instruments had been thoroughly revised, tested, and found to have high levels of validity in previous studies (Aldridge et al., 1999; Dorman, 2008). Second, both instruments were a good fit to address the research objectives of my study (found in Section 3.1). Third, both instruments are designed to gather information from a similar age group to this study, and, therefore, many of the checks that were carried out when the instruments were developed, such as the appropriateness of the language in the questionnaires for this age group, were appropriate for this study also. Last, Anderson (1998) warns that a good questionnaire is difficult to create, suggesting that poorly constructed questionnaires lead to ineffective research, and that good scales are grounded in theory, have been used over several years, and include validation with previous instruments that measure the same constructs. It was for the above reasons that the SALES and WIHIC were selected and adapted for this study.

3.3.3.1 Translation of the SALES and Modified WIHIC

English was a second language for the participants of this study. While many of the students who were to respond to the survey had a good command of English, the questionnaire was translated into Arabic to ensure that a full understanding of the concepts was possible by all the participants, regardless of their competency in speaking and understanding English. The final survey was dual language in order to provide as much language support as possible, as some of the classes had also been taught in English. It was important that the translation was completed by someone who was an expert in both English and Arabic, and someone who was familiar with the educational concepts within the scales. This person would need to be able to draw on this understanding to ensure accurate translations of these concepts into Arabic. Every item in each of the scales was carefully examined and discussed with the translator to make sure that the concepts were clearly understood before being translated into Arabic.

As recommended by Ercikan (1998) and Warwick and Osherson (1973), the Arabic version was then back-translated into English by an independent expert in both languages who was not familiar with the original English version of the questionnaire. This enabled a comparison of the two English versions to be made to ensure that the key concepts within the scales were consistent in meaning after translation. It was found that in all but a few items the meaning was consistent. However, there was a tendency for the back-translated items to have more complex English wording. The items that were found to be inaccurate, inconsistent, and/or overly complex were then discussed and re-translated to match the simplicity of the original English version. An example of an inaccurate item that needed the Arabic wording to be changed was item number 13 in the task value scale in the SALES questionnaire: ‘What I learn is relevant to me.’ This item back-translated as ‘What I learn is not important to me.’ An example of an overly complex item that needed to be simplified was item 33 in the student cohesiveness scale in the WIHIC questionnaire. The original English version was ‘I make friendships among students in this class.’ This was back-translated originally as ‘I establish rapport with students in this class.’ This item was re-translated and back-translated again to ensure the simpler meaning of friendship rather than rapport was conveyed.

The final version of the survey, in which the SALES and modified WIHIC instruments were presented simultaneously, had instructions in both Arabic and English, and, in some places, were illustrated with visual symbols to further facilitate understanding. Each scale and accompanying items had the information printed in English, with Arabic alongside each item. The survey began with a set of instructions, including a text box highlighting the translated response items. The survey was divided into two sections; the first section consisted of the SALES questionnaire, and the second section contained the modified WIHIC questionnaire. Each section was colour coded to enable students to clearly see where each scale began and finished. The survey was printed in colour on A3 double sided and folded into a booklet, with each section clearly delineated. A copy of the SALES and WIHIC questionnaires can be found in Appendix 4 and 5 respectively.

This section has described the two instruments used in my study; the SALES and a modified version of the WIHIC. The modification and translation processes undertaken in order to satisfy the purposes of my study have been explained. The next section concerns the data collection processes undertaken in my study.

3.4 Data Collection

As explained in Chapter 1, Section 1.2, pragmatism allows for research questions to determine the methodology used. Because this study was of a confirmatory nature, the data collected were largely quantitative. Some qualitative data, however, were collected during the pilot phase of the study, which was conducted with two classes of 24 students each, and is described in Section 3.4.1. The pilot survey informed a number of adjustments that were made prior to beginning the main study; completed by 338 students across 16 classes, and described in Section 3.4.2.

3.4.1 Pilot Testing

Once the surveys were both translated, they were pilot tested in two classes prior to the main study. The pilot classes were selected after the sample population for the main study had been identified, and were from an entirely separate pool of students and teachers. A teacher accompanied me to the classrooms where the pilot surveys were being administered, in order to translate as necessary. This teacher had been selected specifically as she did not teach these students in any subject, thus reducing as much as possible any bias that may have been present if this teacher had been currently teaching these students. The teacher's role was to translate my instructions prior to, and during, the administration of the surveys, as well as to convey to me any misunderstandings and questions the students may have.

The primary purpose of the pilot study was to ensure that students were interpreting the items in the way that was intended and, if necessary, to refine items as appropriate for the main study, as recommended by Cohen, Manion and Morrison (2007). It was also important to ensure that the modified and translated versions were suitable for use with students of this age group, particularly with regard to readability, comprehensibility, and cultural appropriateness. Another purpose of the pilot survey was to confirm that the survey could be completed in the necessary timeframe of 45 minutes, the length of a class period.

In addition to piloting the administration of the survey itself, the way in which the study would be introduced to students was also piloted. Firstly, prior to students responding to the survey, considerable time was spent clarifying the importance of the students recording honest responses; what they *really* thought, not what they thought the teacher or researcher wanted to hear. I stressed the importance of responding honestly to the survey and conveyed to them that their responses would only be meaningful and helpful for my study if they were genuine; otherwise, the study would have no value. It was anticipated that having the researcher administer the survey personally would lend authenticity to this request.

Secondly, before the administration of the survey began, the students were questioned with regard to their conceptual understanding of the scales. A small number of students raised clarifying questions that were translated back and forth to ensure an accurate understanding was achieved. The scale that raised the most questions was the teacher support scale in the modified WIHIC questionnaire. This scale asks students to evaluate their teacher's behaviour in terms of how much support they provide. Some students were concerned that if their responses were seen as criticising the teacher, they could be punished for this by having marks removed from their end-of-year grade. The measures taken to ensure anonymity were carefully explained. The students were advised that that the teachers would not see any survey responses, and that even if they did see them, it would be impossible for them to recognise any individual student response as every questionnaire was coded, with no names or grade/class indications provided. While the students appeared to be reassured by the measures taken, their response highlighted potential trust issues that needed to be addressed, both in the subsequent pilot interviews and also before administering the survey. When the students indicated they had no further questions, the survey was administered and completed within the required timeframe.

After completion of the survey, eight students (four from each of the two classes) were invited to be interviewed. These students were representative of the pilot study population and consisted of three high achieving, two average, and three low achieving students. The interview process considered four aspects. First, the students were interviewed to ensure that the items were interpreted in ways intended. Second, the students were asked for feedback with regard to the response format, in order to check that they were using this in a meaningful way, and to address any inconsistencies in their responses. Third, students' understandings of more sophisticated aspects were examined and, if necessary, clarified. Last, an opportunity was provided for students to raise any further concerns with regard to the survey that had not been addressed.

The interview began with the translating teacher reading the items in each scale aloud. At the end of the items in each scale being read, students were asked how they had interpreted those items, and differences in interpretation were discussed. Any items that were not interpreted in the way intended, or were not understood, were noted, and subsequently addressed before the administration of the main survey. For the majority of the items, the responses of the students indicated that there were no areas of difficulty and that they had interpreted the questions in the way intended. There was one scale; teacher support, where two of the item responses were contradictory. Every student interviewed had recorded 'almost never' or 'seldom' for item 41, 'The teacher takes a personal interest in me,' and then 'often' or 'almost always' for item 42, 'The teacher goes out of her way to help me.' The interviews indicated that the Arabic meaning for this item placed an emphasis on the teacher being interested in them as a person outside of the school context or being a friend. To address this contradiction, changes were made to the translation before implementation of the main survey.

Next, feedback was sought with regard to the response format, an explanation of which was situated at the beginning of the survey. Both of the five-point response scales were discussed carefully, to ensure that the Arabic translation had conveyed an accurate meaning with regard to the graduating nature of the five-point response scales. This was particularly important because the response format differed between the two questionnaires; the SALES responses ranged from 'strongly agree' to 'strongly disagree', and the modified WIHIC responses ranged from 'almost never' to 'always'. The students' responses to these questions indicated that the meaning of both sets of five-point response formats were satisfactorily understood.

The next part of the interview concerned the extent to which the students understood the ideas embedded within the more conceptually sophisticated scales. Both the scale descriptions, and specific items within these scales, had been discussed in depth during the translation process, and it was considered necessary to accurately gauge students' understanding in this regard to ascertain whether any items required further clarification or adjustment. For example, students were asked what they thought learning goal orientation meant, and to share their understandings of the specific items as translated in Arabic. Students' responses indicated an accurate understanding of the ideas within that scale. When asked, the students expressed that they felt learning science was important. Their reasons for this included that science helped them to understand how things worked in the world, and that they believed learning science would help them to get an interesting job.

Self-efficacy was another scale that was discussed. Item 17 asked for a response to 'I can master the skills that are taught.' When asked for their views about what this meant to them, one student responded that she always mastered the skills that were taught but that she only scored 70% in last trimester's science assessments. When this was discussed further, the student was adamant that the check in the 'strongly agree' box was appropriate because she *believed* she could always master the skills. Another high achieving student was less sure that she could *always* master the skills and her response of 'not sure' mirrored this. This response confirmed findings in the literature with regard to positive associations being made between self-efficacy and achievement (Bandura, Barbaranelli, Caprara, & Pastorelli, 2001; Schunk & Pajares, 2009). This student perhaps had a clearer understanding of self-efficacy in that she was more aware of her strengths *and* weaknesses, which may have affected her self-regulation of effort and subsequent achievement.

Another scale that was discussed with the students was self-regulation, particularly item 25; 'Even when tasks are uninteresting I keep working' and item 27; 'I continue working even when there are better things to do' as these students had all answered 'strongly agree' in response to these items. When questioned further, the students stated that they always kept working. I reiterated the importance of taking time to consider this idea and reflecting on what they do in instances when they find a task boring. I shared that I found it difficult to keep working when I was not finding the topic interesting and that I would have to think about that question if I was completing the questionnaire. One of the students changed their score from 'agree' to 'not sure' as a result of this conversation. This finding reinforced the importance of clarifying this and other concepts prior to administration of the main survey.

In the last part of the interview, an opportunity was provided for students to raise any other concerns. As concern with regard to anonymity had been expressed by some students when implementing the pilot survey prior to this interview, I asked the students whether this concern had affected the way they had answered the questions. The students all responded that they had answered the questions honestly because, once I had explained the measures taken to ensure anonymity, they could see that there was no way for teachers to know which class had completed which set of questionnaires. I then asked the students to tell me how they felt about the measures taken to ensure anonymity using a scale of one to ten, with number one being that they were still worried that somehow their teachers would see their responses, and number ten that they were confident that it would not be possible for this to occur. Every student responded with a score of eight or more, indicating a high level of confidence. Despite this reassurance, I made sure this concern was discussed thoroughly in each class in the main study prior to beginning the survey. The students raised no further concerns with regard to any other aspect of the survey. The students did, however, express appreciation for the opportunity the survey provided for them to express their opinion about how they perceived learning in science.

The results of the interviews with the students from the pilot survey led to decisions being made prior to administration of the main survey. First, it was decided to make changes to the Arabic translation of item 41 in the teacher support scale, to ensure that the meaning of 'The teacher takes a personal interest in me' was clearly conveyed in Arabic. Second, it was decided both to reiterate to the students prior to the administration of the survey the importance of responding with their own opinion; there was no 'right' answer, and to include this message on the survey itself. Third, the meaning of the self-efficacy and self-regulation scales in the SALES section of the questionnaire would require clarification with each class prior to administration of the survey, to ensure more accurate data. These findings made clear the importance of thoroughly introducing the survey before students began completing it, as well as the format that this would take.

3.4.2 The Main Study

To ensure a high degree of standardisation regarding the instructions provided to students, I administered the questionnaires personally. In doing so, I was able to facilitate a discussion of the concepts involved to ensure that students understood them as well as to ensure the meanings of individual words were understood. In this way, I was able to anticipate potential confusion and to clarify any misunderstanding before the students responded to the surveys, thereby increasing the likelihood that the items in the scales were understood in the way intended.

Times were made to fit with teachers' plans and timetables, and administration of the questionnaire began. I tried whenever possible to administer the surveys during a time when teachers were absent to avoid taking up potential learning and revision time. This system worked very well and was appreciated by the teachers.

In each class, a student with more advanced English speaking skills was asked to translate concepts that had been identified as potentially problematic during the pilot survey. Using this method eliminated the need for the class teacher to be present, thereby further reducing the possibility of students feeling restricted in their responses. It also allowed a more relaxed atmosphere for the discussions. Because I personally administered the survey to students, I was able to follow a consistent process with regard to the introduction as well as the administration of the survey. Exactly the same instructions were given to every participating class, resulting in a high level of consistency during administration. This process is described below.

Firstly, the purpose of the survey was conveyed. It was clearly stated that for the purpose of the research, students' responses should reflect their own beliefs and that, conversely, providing answers that they felt were 'right', but did not reflect their true beliefs, would make the research invalid. Measures taken to ensure confidentiality and anonymity were explained. Students were reassured that it was important, and possible, for them to respond honestly and without fear of reprisal. After this, concepts that had presented challenges during the administration of the survey were explained, with opportunities provided for students to ask questions with regard to any further misunderstandings. Lastly, directions were given with regard to the meaning of the five-point response scales, and how to complete the survey.

Once the explanations had been given and time allowed to answer any questions, students began to complete the questionnaire. I remained at the front of the room so that students did not feel I was looking at their responses. However, from this position, I was able to monitor the students to make sure that they were not relying on the responses of others. No behaviours were observed that would suggest that the responses were not their own.

The time for administration of the questionnaires was usually 35-40 minutes, including the explanation at the beginning. This allowed for the survey to be completed in the 45 minute period allocated to each class. When the questionnaires were collected, care was taken to ensure that students had completed every section. Each questionnaire was number coded, which meant that no class, student, or teacher could be identified by any person. There was a class code that identified whether the questionnaire had been answered by students in a class with a teacher identified as effectively implementing cooperative learning strategies.

This section has described the data collection process involved in both the pilot testing and administration of the main study. The next section describes the data analyses processes undertaken.

3.5 Data Analysis

Prior to data analysis, it was important to ensure the data collected and entered into the database was complete, with no errors or inconsistencies, and therefore a data clean-up was undertaken as recommended (Alreck & Settle, 1995; Rahm & Do, 2000). As I had administered the surveys myself, I was able to check each survey as it was handed in to ensure that every item had been responded to. On the few occasions where a page had been missed out, I asked that student to complete the relevant items at that time. This resulted in no missing data on the questionnaires at the point of data entry. In order to ensure data entry was accurate, I double checked and re-checked 100% of the data entries line by line, identifying and correcting any errors (<5%). The data were then checked again by a colleague to further establish that each line of the data entry matched the items completed by the students.

The data for this study, collected from 338 students in 16 classes across six schools, were analysed in several ways to address the research objectives (outlined in Section 3.1). First, analyses were undertaken to address my first research objective; to establish the validity and reliability of the SALES and WIHIC instruments (reported in Section 3.5.1). Second, structural equation modelling (SEM) using AMOS version 22 (Arbuckle, 2007) was conducted to address research objectives two and three, to examine what relationships exist between students' motivation towards learning, self-regulation, and perceptions of the learning environment (reported in Section 3.5.2). Last, to address research objective four, MANOVA/ANOVA and effect sizes were used to investigate whether there were differences in these relationships among students exposed to cooperative learning during science lessons (reported in Section 3.5.3).

3.5.1 Research Objective 1: Validity and Reliability of the Instruments

In order to support research objectives two and three, it was important first to establish the validity and reliability of the SALES and WIHIC instruments for use with Cycle 2[13] students in the UAE. To do this, the factor structure, internal consistency reliability, discriminant validity, and concurrent validity were examined. The results of the data analyses in relation to my first research objective are reported in Chapter 4.

To examine the *a priori* factor structure of both the SALES and the WIHIC, the factor loadings for each item in the instruments were computed separately. After initial checks were completed to establish the multivariate normality and sampling adequacy of the data, exploratory factor analysis, involving principal axis factor analysis with oblique rotation, was conducted separately for the SALES and WIHIC instruments. Unlike orthogonal rotation, oblique rotation enables the factors to correlate whereas "using orthogonal rotation potentially results in a less useful solution where factors are correlated" (Osborne, 2015, p. 5). Oblique rotation was used because data involving humans are generally correlated (Field, 2009), and using oblique rotation enabled the extraction of a succinct set of relevant factors. Factor loadings were used to indicate how strongly each item was related to a particular factor, eigenvalues showed the relative importance of each factor, and the percentage of variance was used to check whether sufficient factors had been retained (Field, 2009). Kaiser (1960) recommends each factor to have an eigenvalue greater than one, and Field (2009) suggests that standardised factor loadings should be greater than .40. Therefore, the criteria for

[13] Middle schools (grades 6 to 9) are called Cycle 2 in Abu Dhabi government schools.

retaining an item was that it should load at .40 or more on its own scale and less than .40 on all other scales. Only those items with factor loadings that met these criteria were retained for further analysis.

The internal consistency reliability was used as an estimate to examine "the degree to which the items on a test jointly measure the same construct" (Henson, 2001, p. 177). The internal consistency reliability of each scale was calculated using Cronbach's alpha coefficient (Cronbach, 1951), arguably the "most widely used objective measure of reliability" (Tavakol & Dennick, 2011, p.1). Using this measure, the higher the score, the more reliable the scale is considered to be (Santos, 1999), with an alpha value of 1 being perfectly reliable. Conventionally, to be a scale, a lenient cut-off of .60 is acceptable in exploratory research. For this study, scales with a reliability of at least .70 were considered to be satisfactory, and scales with more than .80 reliability were considered to be 'good' scales (Cohen, 1977). Nunnally's (1978) widely accepted suggestion of .70 as an acceptable reliability coefficient was used as the cut-off for this study.

Discriminant validity measures how items in a scale "correlate with other measures that are theoretically unrelated" (Ruskin et al., 2014, p. 143); the degree to which constructs are empirically different (Afari et al., 2013). According to Brown (2006) and Field (2009), oblique rotation provides a realistic representation of the interrelatedness of the factors within an instrument. It has been argued that whilst there should be a moderately strong relationship between factors, factor correlations above 0.80 imply an overlap of concepts and poor discriminant validity (Brown, 2006; Field, 2009). The component correlation matrix obtained from oblique rotation was used to establish whether discriminant validity was met in this study.

Concurrent validity measures the extent to which scales are able to distinguish between different groups. It was important that the instruments used to measure students' motivation, self-regulation, and perceptions of their learning environment were able to differentiate between different classrooms. Research has established that students' motivation towards learning can be differentiated between classes (Ames, 1992; Meece, Glienke, & Burg, 2006; Ryan & Patrick, 2001; Tuan et al., 2005; Urdan & Schoenfelder, 2006; Wolters et al., 1996). Similarly, research has established that a unique feature of learning environment instruments is their ability to differentiate between classes (Fraser, 1998). That is, students in the same class should, theoretically, have similar perceptions of the learning environment but different to students in other classes. To ensure that both instruments were able to distinguish between classes in terms of motivation, self-regulation, and perceptions of the learning environment, a one-way analysis of variance (ANOVA), with class membership as the independent variable, was computed for each scale in the SALES and modified WIHIC instruments. The eta^2 statistic, based on the ratio of the between-group effect to the total amount of variance in the data (Field, 2009), provided information about the amount of variance attributed to class membership.

3.5.2 Research Objectives 2 and 3: Examining the Relationships between Motivation, Self-Regulation, and the Learning Environment

Three hypotheses were made with regard to examining what relationships exist between students' motivation towards learning, self-regulation, and perceptions of the learning environment. The first was that students' perceptions of their learning environment would influence motivation towards learning. The second was that the learning environment would also influence students' self-regulation of effort. The third was that the motivation constructs of learning goal orientation, task value, and self-efficacy would influence self-regulation. In order to assess these hypotheses, a research model was developed (shown in Figure 3.1) which was assessed using structural equation modelling (SEM). The results of the data analyses in relation to my second and third research objectives are reported in Chapter 5.

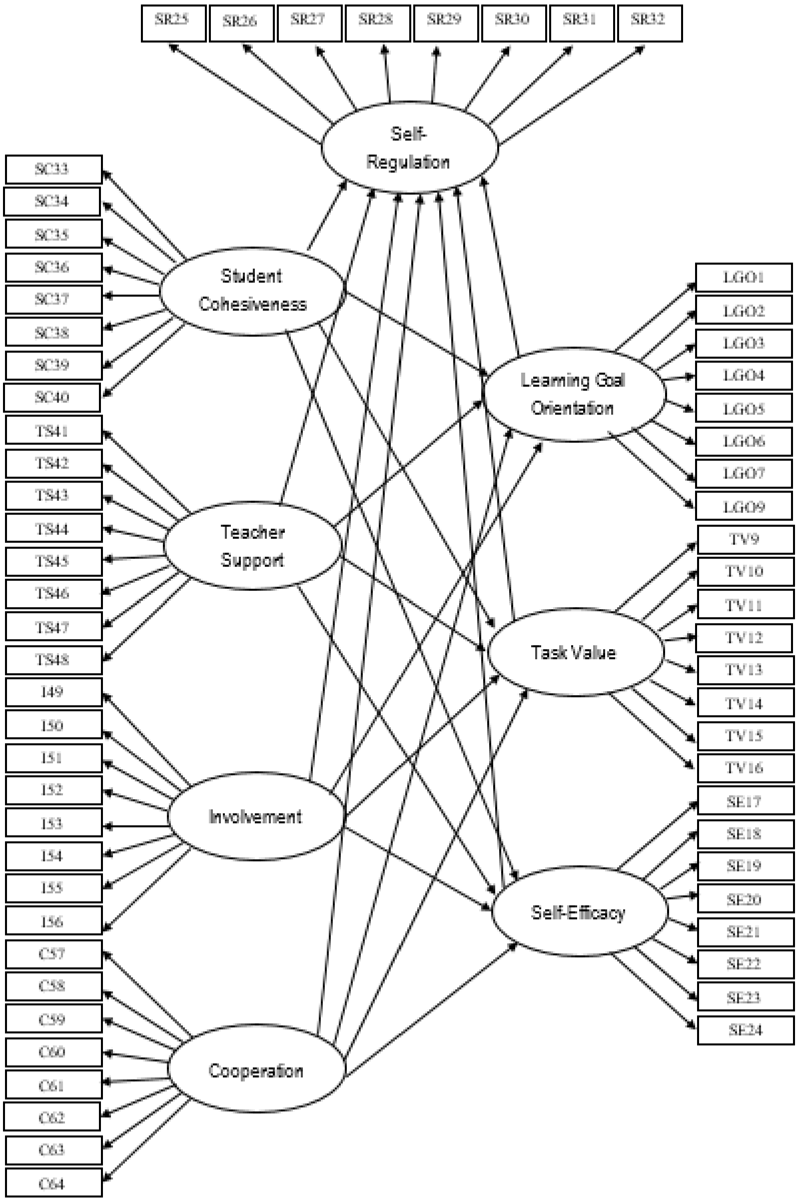


Figure 3.1. Research model[14]

The use of SEM involved three stages. First, descriptive statistics (described in Section 3.5.2.1) were generated in order to provide information about the distribution of the variables (George & Mallery, 2016). Second, confirmatory factor analysis (CFA) was used to assess the measurement properties of the combined SALES and WIHIC scales by examining convergent and discriminant validity (Section 3.5.2.2). Third, after assessment of the measurement model, the structural model was evaluated (Section

[14] Each box on the left and right hand sides in the model represent the items in each construct. The initials preceding the item numbers represent the respective scales.

3.5.2.3). The CFA process is described in this section, followed by a description of evaluation of the structural model.

3.5.2.1 Descriptive Statistics

Descriptive statistics of the combined dimensions of both instruments' scales (student cohesiveness, teacher support, involvement, cooperation, learning goal orientation, task value, self-efficacy, and self-regulation) were generated using SPSS 22. An important aspect of covariance-based SEM analyses is for the data to be multivariate normal (Byrne, 2010). Statistically, data can be assessed for univariate normality by obtaining the skewness and kurtosis (Hair, Black, Babin, & Anderson, 2010; Tabachnick & Fidell, 2013). Kim (2013, p. 4) states that "Skewness is a measure of the asymmetry of the distribution of a variable and kurtosis is a measure of 'peakedness' of a distribution." West, Finch, and Curran (1995) state that in order for the data to be univariate normal, it needs to have skewness of < 2 and kurtosis of < 7. Kline (2010) recommends that an acceptable level for skewness and kurtosis indices is $|3|$ and $|10|$, respectively. The data were assessed for skewness and kurtosis using Kline's recommendations as a guide.

3.5.2.2 Assessment of Measurement Properties

In SEM, the measurement model "specifies the relations between a construct and its observed indicators" (Henseler, Hubona, & Ray, 2016, p. 4). The measurement model was assessed in order to ascertain whether the research model fitted the data as well as to check for any violations. As a part of SEM, CFA is a means of assessing the measurement model by examining the internal consistency reliability, and convergent and discriminant validity.

The internal consistency reliability of each scale in the measurement model was calculated using Cronbach's alpha coefficient (Cronbach, 1951) with Nunnally's (1978) recommendation of .70 as an acceptable reliability coefficient, as explained in in Section 3.5.1. Convergent validity was evaluated using composite reliability and average variance extracted. When using structural equation modelling, true reliability is often estimated using composite reliability, which includes larger estimates of true reliability than when using coefficient alpha. In coefficient alpha, loadings or weights are required to be equal whereas when using SEM, construct loadings or weights are permitted to vary. This means that SEM is able to empirically evaluate and solve some of the limitations of coefficient alpha (Peterson, Kim, & Kozlowski, 2013). It is recommended that composite reliability should be at least .70 (Nunnally & Bernstein, 1994), and this measure was used as the cut-off for my study.

The last criterion needed to meet the expectations of convergent validity was to measure the average variance extracted (AVE). The AVE measures “the amount of variance that is captured by the construct in relation to the amount of variance due to measurement error” (Fornell & Larcker, 1981, p. 45). According to both Fornell and Larcker (1981) and Nunnally and Bernstein (1994), the AVE should be .50 or higher to satisfy convergent validity. Fornell and Larcker (1981) state that the AVE should be .50 or higher because if it is less than .50, the amount of variance due to measurement error is larger than the variance captured by the construct, which brings into doubt the validity of both the individual indicators and the construct.

Discriminant validity assesses the degree to which the constructs are empirically different. It is evaluated by examining the correlation between the constructs. Discriminant validity is regarded as essential because without it, it is not possible to check whether results that confirm hypothesised structural paths are true, rather than a result of statistical discrepancies (Farrell, 2010). Discriminant validity was evaluated by calculating the square root of the average variance extracted from a construct, with the inter-construct correlation. As suggested by Fornell and Larcker (1981), for the discriminant validity to be satisfactory, the square root of the AVE for each construct should be higher than the correlations shared among that construct and the other constructs in the model.

3.5.2.3 The Structural Model

Once assessment of the measurement model had been confirmed, the structural model was then evaluated. While the measurement model describes relationships between a construct and its observed indicators, the structural model “specifies the relationships between the constructs” (Henseler et al., 2016, p. 4) and “comprises the hypothesised relationship between latent constructs in the research model" (Santosa, Wei, & Chan, 2005, p 366). The structural model was evaluated, in the first instance, by examining its overall goodness of fit, followed by investigating whether the variance in the dependent variables could be explained as measured by using the squared multiple correlations (R^2), and finishing with establishing the statistical significance of the estimated path coefficients.

According to Henseler et al. (2016), establishing the overall goodness of fit of a model is essential because if the model does not fit the data, then the model is not conveying all of the information that the data contains, resulting in questionable conclusions being made. In order to examine the goodness of fit for the structural model, several indices were used, as recommended by Harrington (2009) and Kline (2010). While the model chi-square (χ^2) was the first fit index to be developed and is usually reported in CFA research, when evaluating model fit, other indices are often depended on (Brown, 2006). As advised by Brown (2006), fit indices were chosen from each of the three categories of indices they are generally grouped in: absolute fit, parsimonious, and comparative indices. This recommendation is made because indices in each of these categories provide different information. In addition to the model chi-square (χ^2), the standardised root means square residual (SRMR) was another absolute fit index that was included to measure how well the model reproduces the data (Teo, Ursavas, & Bahcekapili, 2012). The root mean square error of approximation (RMSEA) was selected from parsimonious indices because it takes the complexity of the model into account (Brown, 2006). Two comparative indices were selected to assess the structural model in relation to a more restrictive baseline model (Brown, 2006): the comparative fit index (CFI) and the Tucker-Lewis index (TLI).

Once good model fit was established, the next stage was to determine whether the research model had the ability to explain the variance in the dependent variables. In order to ensure the confirmatory power of the hypothesised relationships, the coefficient of determination (R^2) of the endogenous constructs was examined. According to Falk and Miller (1992), the R^2 value for each endogenous variable needs to be higher than 0.10 so as to ensure that the latent construct is deemed adequate. The higher the squared multiple correlation, the greater the joint explanatory power of the hypothesised antecedents (Diamantopoulos & Siguaw, 2000).

Finally, Analysis of Moment Structure (AMOS) was used to examine the hypothesised relationships in the research model. The strengths of the relationships between the independent variables (learning environment scales) and the dependent variables (motivation and self-regulation scales) are indicated by the estimation of the path coefficients. The path coefficients in the structural model represent standardised regression coefficients. To test the hypotheses, the *p*-value and the path coefficient were calculated. In AMOS, the critical ratio (or *t*-value) can be used to determine the significance of the estimated parameters. In order for relationships to be statistically significant, the critical value for each relationship needs to be greater than ± 1.96. To establish a significant causal link between variables, the path coefficient needs to be greater than 0.05 (Hair et al., 2010; Shipley, 2000).

This section described the data analyses involved in the second research objective of this study: examining what relationships exist between students' motivation towards learning, self-regulation, and perceptions of the learning environment. The next section describes the analyses used to address the fourth research objective of my study.

3.5.3 Research Objective 4: Investigating the Differences between Students in Classes with Teachers Identified as Effectively Implementing Cooperative Learning and Students Not in Such Classes

The last objective of this study was to investigate whether there was a difference in students' motivation towards learning, self-regulation, and perceptions of the learning environment between classes with teachers identified as effectively implementing cooperative learning practices and classes that did not have such teachers. In order for this objective to be addressed, it was essential that the selection of the sample was purposive (as described in Section 3.2). As far as possible, the only difference between the two groups in the sample was that one group was exposed to effective cooperative learning practices while the other group was not. In all other ways, both groups in the sample were similar in terms of ability, age, grade level, and background. The class selection process is explained in Section 3.2.1.

For the sample of 338 students, the statistical significance of the differences between the two groups (175 students in classes exposed to cooperative learning and 163 students in classes that were not) was explored using multivariate analysis of variance (MANOVA), involving multiple outcome variables (Huberty & Morris, 1989), as this allows several dependent variables to be analysed simultaneously. Because the multivariate test yielded significant results overall for the set of eight dependent variables using Wilks' lambda criterion, the univariate analysis of variance (ANOVA), involving a single outcome variable (Huberty & Morris, 1989), was interpreted separately for each of the eight scales. The ANOVA was used to "clarify the meaning of significant discriminators [and] to explain the results of the MANOVA" (Huberty & Morris, 1989, p. 302).

Whereas MANOVA was used to investigate the statistical significance of differences between two groups, effect size was used to describe the magnitude or educational importance of those differences, as recommended by Cohen (1992) and Sullivan and Feinn (2012). Sullivan and Fein (2012) suggest that the absolute effect size is "the difference between the average, or mean, outcomes in two different intervention groups" (p. 279). Researchers have argued that effect size is the key finding of a quantitative study because while a *p* value indicates that an effect exists, the effect size provides a more interpretable, quantitative description of the size of that effect (Fritz, Morris, & Richler, 2012; Sullivan & Feinn, 2012). Effect size has generally been considered small if the values are between 0.10 to 0.29, medium with values between 0.30 to 0.49, and large between 0.50 and 1 (Cohen, 1992; Hattie, 2015; Kline, 2010). However, in their empirical analysis of Cohen's (1992) guidelines, Gignac and Szodorai (2016) argue that effect sizes greater than 0.50 represent fewer than 3% of cases and that "normative guidelines should be closer to 0.10, 0.25, and 0.35, respectively" (p. 76). For the purposes of this study, the widely accepted Cohen's (1992) effect size guidelines were used.

3.6 Ethical Considerations

Prior to designing and implementing this study, consideration was given to several ethical issues that might potentially arise when using the questionnaire method in the context within which the study took place. There were also times during the data collection period when reflection on ethical considerations was needed in order to ensure that the ethical nature of the study was not compromised. This section outlines the protocols conducted to ensure that the practices involved in this study were ethical.

3.6.1 Permissions, Informed Consent, and Confidentiality

First, ethics approval was gained by the Human Research Ethics Committee of Curtin University. A copy of ethics approval from the university is provided in Appendix 6. Once this was received, permission was sought and given from the Abu Dhabi Education Council (ADEC) to conduct this research within selected government schools in the Abu Dhabi Emirate, a copy of which can be found in Appendix 7. This email correspondence was also sent to principals of all schools in the Abu Dhabi region, with the explanation that their school may be approached with a request to conduct research in their school.

Once these permissions were received, I contacted the science education advisors who were working in schools with the teachers who had been identified for the study (see Section 3.2.2). I asked the education advisors to organise an introductory meeting with the principals of these schools. The purpose of the research, together with administration instructions for the questionnaire, were explained at this meeting. A letter of introduction, translated into Arabic, was provided at every meeting, which explained the purpose and principles behind the study as well as how ethical integrity was to be maintained. All principals agreed for this study to be undertaken, and permission was given to meet with the teachers.

At the teacher meetings, the purpose and procedure of the study was again explained and opportunities provided for questions. The importance of non-bias to the validity of the research was emphasised, together with the need to receive authentic responses from students. To achieve this, permission was sought and received to administer the questionnaire personally in order to ensure consistency of message and administration.

Informed consent, according to Anderson (1998), is “the most fundamental principle for ethical acceptability” (p.18). Written permission was sought from all potential stakeholders prior to initiating this study. Part of the ethical standard of informed consent involves providing a statement that participation is voluntary, that participants should not feel obliged to participate in any way, and that they can withdraw from the study at any time (Anderson, 1998). The introductory letter provided to principals and teachers, as well as the consent form given to parents, reiterated the optional nature of the study. In addition, when the survey was conducted, students were again informed that participation was optional. A copy of the introductory letters provided to principals and teachers can be found in Appendices 7 and 8 respectively, and the parent consent form can be found in Appendix 9.

Confidentiality and security of the research data were maintained in the following ways. First, all survey responses were numerically coded with each grade, class, and teacher receiving a specific unidentifiable number. These codes were kept separate from the collected data, thus ensuring anonymity of all participating schools, teachers, and students. Second, access to the research data was restricted to myself and my PhD supervisor. Last, teachers were not present when the survey was implemented and, therefore, could not observe how their students were responding to the questionnaires. Following these steps allowed absolute confidentiality to be maintained throughout the data collection and entry processes.

3.6.2 Language Considerations

Conducting a study in a country where English is a second language demands consideration as to how to avoid the potential risk to students if either developmentally or culturally inappropriate language was used within the questionnaire. This was addressed by careful reading of the language used in both the SALES and the modified WIHIC instruments, and then, during the translation process, making sure that there was no language that may have been appropriate in English, but would not be appropriate when translated into Arabic. The use of back-translation was particularly helpful in this regard to ensure appropriateness of language. In-depth and honest consultation with the translators resulted in all language within the questionnaire being developmentally and culturally appropriate.

As this study was conducted in an Arabic speaking country, there were obvious language barriers to be overcome. All information involved in gaining informed consent was translated. A translated version of the questionnaire was included in the documentation that was hand delivered to all principals involved in the study so that they could be fully informed as to the nature of the questions that students would be asked. As explained in Section 3.3.3, the questionnaire itself was subjected to rigorous scrutiny during the translation and back-translation processes.

3.6.3 Cost/Benefits Ratio for the Study

A final ethical consideration involved an examination of the costs and benefits of this study. According to Cohen, Manion, and Morrison (2007), it is important to have a balance between a researcher's pursuit of the truth and potential threats to participants' rights and values as a result of subsequent research. In order to reduce potential costs to both the student participants and teachers affected by the study, considerable effort was made to ensure minimal disruption to teaching and learning time. For example, the school year was coming to a close at the time of data collection for this study, and teachers were under pressure to complete curriculum requirements prior to exams. This pressure was alleviated in two ways. First, the data collection period was postponed for two weeks to allow for increased teaching time, and second, wherever possible, classes were selected to complete the survey during periods when they were having a substitute teacher due to their subject teacher being absent. This involved some rearranging on my part, but it was important for the costs to the participants and others affected by the study to be reduced wherever possible.

Steps taken to ensure anonymity and confidentiality of the data protected the students from any potential negative consequences from responding honestly in the questionnaire. The potential cost to teachers was also eliminated as they could not be identified as a 'poor' teacher. Careful consideration of language and/or cultural propriety was intended to avoid causing students social or emotional harm as a result of participating in this study.

There were also two potential benefits of this study. First, students were receiving an opportunity to express their views, possibly for the first time, about the teaching and learning strategies they were experiencing in their science lessons. When students were asked how they felt about completing a survey such as the one in the study, they expressed their appreciation for the opportunity to give their opinion about how they learn and perceive their learning environment. Second, the findings of this study will be reported back to ADEC, which may result in positive changes being made in the science curriculum.

Overall, it was considered that the cost/benefits ratio regarding this study were acceptable. It was concluded that the benefits of this study outweighed the potential costs that may occur as a result of its implementation.

3.7 Chapter Summary

The purpose of my study was firstly to examine the influence of the learning environment on students' motivation and self-regulation, and secondly, to investigate differences in motivation, self-regulation and learning environment perceptions. This chapter has presented a detailed account of the research methods used to address the four research objectives of my study (Section 3.1), the hypotheses, and the research model (both found in Section 3.5.2). The sample for this study consisted of 338 female students in grades 6 to 9 and was derived from the identification of teachers' efficacy regarding the implementation of cooperative learning. Information with regard to the sample for my study is provided in Section 3.2.

The data were collected using two instruments. The Students' Adaptive Learning Engagement Survey (SALES) was used to assess students' motivation and self-regulation, and a modified version of What Is Happening In this Class (WIHIC) was used to assess students' perceptions of the learning environment (described in Sections 3.3.1 and 3.3.2, respectively). Both instruments were translated and back-translated (described in Section 3.3.3). The translated instruments were then pilot tested with two classes of students before the implementation of the main survey began (described in Sections 3.4.1 and 3.4.2, respectively).

To address the second and third research objectives of my study (outlined in Section 3.1), it was necessary to first ensure that the SALES and modified WIHIC instruments were sufficiently valid and reliable when translated for use in the UAE (research objective 1). These analyses involved the examination of the *a priori* factor structure of both instruments, followed by exploratory factor analysis. Principal axis factor analysis was used to establish the factor structure. To establish internal consistency reliability, Cronbach alpha was calculated for each scale in both instruments. Discriminant validity was established through the comparison of the square root of the average variance extracted with the inter construct correlation. Finally, in order to determine if the instruments were sufficiently able to distinguish between classes, a one-way analysis of variance (ANOVA) was used to establish concurrent validity.

To examine what relationships exist between students' motivation towards learning, self-regulation, and perceptions of the learning environment (research objectives 2 and 3), a research model was developed (Figure 3.1). This model was based on the hypotheses that a) students' perceptions of their learning environment would influence their motivation towards learning and self-regulation, and that b) the motivation constructs of learning goal orientation, task value, and self-efficacy would influence students' self-regulation of effort.

Data analysis involved the generation of descriptive statistics to establish univariate normality. This was achieved by confirming that the skewness and kurtosis measures fell within acceptable guidelines (Section 3.5.2.1). Following this, confirmatory factor analysis as a part of structural equation modelling was used to assess the measurement properties and research model by establishing internal consistency reliability, and convergent and discriminant validity (Section 3.5.2.2). Next, in Section 3.5.2.3, the structural model was evaluated through the examination of the overall goodness of fit including an explanation of the variance in the dependent variables using the squared multiple correlations (R^2). Finally, the hypothesised relationships in the research model were examined by calculating the *p*-value and estimation of the path coefficients.

The fourth research objective of my study sought to establish whether there would be differences in students' motivation, self-regulation, and perceptions of the learning environment between students in classes with teachers identified as effectively implementing cooperative learning practices and those not in such classes. To examine this hypothesis, Multivariate Analysis of Variance was used, followed by univariate Analysis of Variance.

Finally, Section 3.6 describes the ethical decisions and considerations that were made prior to, during, and after the implementation of the surveys. The next chapter presents the results and an analysis of the questionnaire data collected using the adapted SALES and WIHIC questionnaires.

Chapter 4

RESULTS – VALIDATION OF INSTRUMENTS

In this chapter, evidence is provided to support the validity and reliability of the two instruments used in this study to address my first research objective:

> To establish the validity and reliability of two surveys when modified and translated for use in the United Arab Emirates (UAE) to assess students' motivation towards learning, self-regulation, and perceptions of the learning environment.

Exploratory factor analysis was used to examine the factor structure, internal consistency reliability, discriminant validity, and concurrent validity for both instruments: the SALES and the modified WIHIC. The chapter is set out in the following way:

- Validity and reliability of the SALES questionnaire (Section 4.1);
- Validity and reliability of the modified WIHIC questionnaire (Section 4.2); and
- Chapter summary (Section 4.3).

4.1 Validity and Reliability of the SALES Questionnaire

To provide evidence to support the validity and reliability of the SALES questionnaire, the factor structure (reported in Section 4.1.1), internal consistency reliability (reported in Section 4.1.2), discriminant validity (reported in Section 4.1.3), and concurrent validity (reported in Section 4.1.4) were examined.

4.1.1 Factor Structure for the SALES

As explained in Chapter 3, Section 3.5.1, in order to examine the *a priori* factor structure for the SALES, the factor loadings for each item in the SALES were computed. First, the multivariate normality and sampling adequacy of the data were tested. Bartlett's test of sphericity indicated that χ^2 = 5918.798, and this value was statistically significant (p<.001). The Kaiser-Maiyer-Olkin measure of adequacy was high (.955), confirming that the data was appropriate for further analysis. Principal axis factor analysis with oblique rotation involving the 32 items extracted the four *a priori* sets of factors of learning goal orientation, task value, self-efficacy, and self-regulation. All items loaded .40 or higher for their own scale and below .40 on all other scales with one exception (item 24 for the self-efficacy scale, which was removed for all subsequent analyses). The results of the oblique rotation, detailing the factor loadings for individual items of the SALES as well as the eigenvalues and percentage of variance for each SALES scale, are reported in Table 4.1.

The eigenvalues, reported at the bottom of Table 4.1 (see p. 135), ranged from 1.20 to 13.01; all were greater than 1, as recommended by Kaiser (1960). The percentage of variance ranged from 3.88% to 41.99% for different SALES factors with a total percentage of variance of 57.88% (also reported at the bottom of Table 4.1 on p.135).

4.1.2 Internal Consistency Reliability for the SALES

The Cronbach alpha reliability coefficient was calculated for each SALES scale in order to provide an index of internal consistency reliability; to measure the extent to which each item in a scale assessed the same construct. The Cronbach alpha coefficients, reported in Table 4.2, ranged from .842 to .914. Given Cohen's (1977) cut-off of .80 for a 'good' scale, these coefficients were all considered to be 'good,' confirming the internal reliability for each SALES scale when used with this sample.

Table 4.1 Factor loading, eigenvalue and percentage of variance for the SALES

Item	Factor loading			
	Learning goal orientation	Task value	Self-efficacy	Self-regulation
1	0.753			
2	0.737			
3	0.721			
4	0.791			
5	0.776			
6	0.744			
7	0.803			
8	0.545			
9		0.655		
10		0.795		
11		0.691		
12		0.677		
13		0.577		
14		0.646		
15		0.752		
16		0.553		
17			0.699	
18			0.753	
19			0.792	
20			0.527	
21			0.468	
22			0.485	
23			0.553	
25				0.550
26				0.700
27				0.579
28				0.709
29				0.672
30				0.670
31				0.549
32				0.532
Eigenvalue	13.018	1.623	1.200	2.102
% Variance	41.992	5.236	3.872	6.782

N=338 students in 16 classes
Factor loadings smaller than 0.40 have been omitted

Table 4.2 Internal consistency reliability (Cronbach alpha) for the SALES scales

Scale	Number of items	Cronbach alpha
Learning goal orientation	8	0.914
Task value	8	0.898
Self-efficacy	7	0.875
Self-regulation	8	0.842

N= 338 students in 16 classes

4.1.3 Discriminant Validity for the SALES

To evaluate the extent to which each of the scales was empirically different, discriminant validity was assessed. As explained in Chapter 3, Section 3.5.1, oblique rotation was used in order to understand the interrelatedness of the factors within the SALES instrument. The component correlation matrix, obtained from oblique rotation, is reported in Table 4.3. These results show that all of the correlations were below .80, with the highest correlation being .546, therefore fulfilling the requirements of discriminant validity.

Table 4.3 Component correlation matrix for the SALES scales

Scale	Learning goal orientation	Task value	Self-efficacy	Self-regulation
Learning goal orientation	-			
Task value	.496	-		
Self-efficacy	.546	.457	-	
Self-regulation	.439	.524	.434	-

N=338 students in 16 classes

4.1.4 Concurrent Validity for the SALES

The theoretical claim that levels of student motivation among classes can be differentiated, has been supported by research evidence (Ames, 1992; Meece et al., 2006; Ryan & Patrick, 2001; Tuan et al., 2005; Urdan & Schoenfelder, 2006; Wolters et al., 1996). The concurrent validity of the constructs within the SALES was established by using one way analysis of variance (ANOVA) in order to investigate the ability of each scale to differentiate between different classes. The results, reported in Table 4.4, indicate that the eta^2 value ranged from .117 to .147 for individual scales and was statistically significant (p<0.001) for all four scales, supporting the concurrent validity of the SALES instrument.

Table 4.4 The ability to differentiate between classes (ANOVA results) for the SALES scales

Scale	ANOVA results (eta^2)
Learning goal orientation	0.117**
Task value	0.141**
Self-efficacy	0.147**
Self-regulation	0.137**

N=338 students in 16 classes
** p <0.01

4.2 Validity and Reliability for the Modified WIHIC Questionnaire

To provide evidence supporting the validity and reliability for the modified WIHIC questionnaire, the factor structure (reported in Section 4.2.1), internal consistency reliability (reported in Section 4.2.2), discriminant validity (reported in Section 4.2.3), and concurrent validity (reported in Section 4.2.4), were examined.

4.2.1 Factor Structure for the Modified WIHIC

To examine the *a priori* factor structure for the modified WIHIC, the factor loadings for each item were computed. As explained in Chapter 3, first the multivariate normality and sampling adequacy of the data were tested. Bartlett's test of sphericity indicated that $\chi^2 = 5834.419$ and that this value was statistically significant (p <.001). The Kaiser-Maiyer-Olkin measure of adequacy was high (.913), which confirmed that the appropriateness of the data was appropriate for further analysis. Once the factor structure was established, in order to provide evidence to support factorial validity of the modified WIHIC, exploratory factor analysis was carried out to extract salient factors. Principal axis factor analysis with oblique rotation involving the 32 items extracted four succinct sets of factors; student cohesiveness, teacher support, involvement, and cooperation. These results are reported in Table 4.5, which details the factor loadings, eigenvalues, and the percentage of variance. As recommended by Field (2009), each item had a factor loading of at least .40 on its own scale and less than .40 on any other scale. All items were therefore retained. The results showed that the eigenvalues for all of the scales range from 1.75 to 9.68. As each factor was greater than 1—as recommended by Kaiser (1960)—every scale was deemed satisfactory. The percentage of variance ranged from 5.475 to 30.275 for all four factors with a total percentage of variance of 56.67% (found at the bottom of Table 4.5).

Table 4.5 Factor loading, eigenvalue, and percentage of variance for the modified WIHIC

Item	Factor loading			
	Student cohesiveness	Teacher support	Involvement	Cooperation
1	0.851			
2	0.779			
3	0.828			
4	0.877			
5	0.787			
6	0.488			
7	0.761			
8	0.540			
9		0.717		
10		0.850		
11		0.790		
12		0.824		
13		0.809		
14		0.642		
15		0.729		
16		0.710		
17			0.461	
18			0.645	
19			0.413	
20			0.523	
21			0.695	
22			0.779	
23			0.638	
24			0.671	
25				0.608
26				0.572
27				0.763
28				0.819
29				0.728
30				0.717
31				0.604
32				0.483
Eigenvalue	4.695	1.999	1.752	9.688
% Variance	14.673	6.247	5.475	30.275

N=338 students in 16 classes
Factor loadings lower than 0.40 have been omitted

4.2.2 Internal Consistency Reliability for the Modified WIHIC

As with the SALES, to provide an index of internal consistency reliability, the Cronbach alpha reliability coefficient was calculated for each modified WIHIC scale to measure how well each item in a scale assessed the same construct. The Cronbach alpha reliability coefficient for each scale, reported in Table 4.6 ranged from .852 to .908, falling well within the 'good' reliability range of more than .80 as recommended by Cohen (1977) and attesting the internal consistency reliability of the four modified WIHIC constructs when used with this sample.

Table 4.6 Number of items per scale and internal consistency reliability (Cronbach alpha) for the modified WIHIC scales

Scale	Number of items	Cronbach alpha coefficient
Student cohesiveness	8	0.894
Teacher support	8	0.908
Involvement	8	0.852
Cooperation	8	0.862

N=338 students in 16 classes

***p<0.001*

4.2.3 Discriminant Validity for the Modified WIHIC

As with the SALES, discriminant validity was assessed to ensure that each of the scales in the modified WIHIC was empirically different from the others in the instrument. Table 4.7 reports the component correlation matrix, obtained by oblique rotation of the factors within the modified WIHIC. All of the correlations were below .80, with the highest correlation being .429. These results therefore met the requirements of discriminant validity.

Table 4.7 Component correlation matrix for the modified WIHIC scales

Scale	Student cohesiveness	Teacher support	Involvement	Cooperation
Student cohesiveness	-			
Teacher support	0.429	-		
Involvement	0.293	0.056	-	
Cooperation	0.391	0.257	0.390	-

N= 338 students in 16 classes

4.2.4 Concurrent Validity for the Modified WIHIC

In order to assess the extent to which each construct was able to distinguish between those groups that it was expected to distinguish (the different classes of students in the sample), concurrent validity was assessed using a one-way analysis of variance (ANOVA). The ANOVA results, reported in

Table 4.8, show that the eta^2 value was statistically significant (p<0.001) for three of the four WIHIC scales; the involvement scale being the exception. This suggests that the student cohesiveness, teacher support, and cooperation scales in the modified WIHIC differentiated significantly between classes, thus establishing that the concurrent validity of these three scales was supported.

Table 4.8 The ability to differentiate between classes (ANOVA results) for the modified WIHIC scales

Scale	ANOVA results (Eta^2)*
Student Cohesiveness	0.117***
Teacher Support	0.280***
Involvement	0.066
Cooperation	0.081**

N= 328 students in 15 classes

** $p<0.05$ *** *p*•0.001

The eta^2 statistic is the ratio of the between group effect to the total amount of variance

4.3 Chapter Summary

In this chapter, evidence has been provided to support the reliability and validity of the SALES and modified WIHIC instruments when used in the UAE context. As such, the chapter serves to address the first research objective: to establish the reliability and validity of the SALES and WIHIC instruments when modified and translated for use in the UAE to assess students' motivation towards learning, self-regulation, and perceptions of the learning environment. Separate data analyses for the SALES and modified WIHIC questionnaires were conducted in order to establish the factor structure, internal consistency reliability, and discriminant validity for both instruments.

Multivariate normality, using Bartlett's test of sphericity, and sampling adequacy, using the Kaiser-Maiyer-Olkin measure of adequacy, was established for the SALES instrument. The factor structure for the SALES was examined using principal axis factor analysis with oblique rotation. This analysis indicated that all of the items, with one exception, had factor loadings of at least .40 (item 24 for the self-efficacy scale was removed from all further analysis). All subsequent items loaded under their own factor but not on any other factor. The lowest eigenvalue for any scale in the SALES was 1.20. The total percentage of variance accounted for was 57.88%. The Cronbach alpha reliability for the different SALES scales ranged from .842 to .914, indicating a high level of internal consistency. The scales were found to have satisfactory discriminant validity, with all correlations being below the recommended level of .80 (Brown, 2006). Finally, the ANOVA results indicated that students' responses to each scale were statistically significant (p<0.001), thereby supporting the concurrent validity. The results of the above analyses provided support for the reliability and validity of the SALES when used with this sample.

As with the SALES, multivariate normality was established for the modified WIHIC. The results of the principal axis factor analysis with oblique rotation indicated that all of the items had factor loadings of at least .40 on their *a priori* scales and less than .40 on all others. The lowest eigenvalue for any of the scales in the modified WIHIC was 1.752. The total percentage of variance was 56.67%. The Cronbach alpha reliability for the WIHIC ranged from .852 to .908, indicating a high level of internal consistency. Satisfactory discriminant validity was established; there was a moderate relationship between the scales, as recommended by Field (2009). The correlations were all below the recommended level of .80 (Brown, 2006). Concurrent validity was established as each scale had eta^2 values that were statistically significant (p<0.001).

The results of the exploratory factor analysis, reported in this chapter, suggest that the SALES and modified WIHIC instruments were valid and reliable when used to measure the aspects of motivation, self-regulation, and perceptions of the learning environment being investigated in this study. The scales from both of these instruments were found to measure distinct characteristics of the influence of the learning environment on students' motivation and self-regulation.

The following chapter describes the results of the data analyses undertaken to investigate my second research objective: to examine what relationships exist between students' motivation, self-regulation, and perceptions of the learning environment, and my third research objective: whether differences exist between students' motivation towards learning, self-regulation, and perceptions of the learning environment in classes with teachers identified as effectively implementing cooperative learning practices and classes that did not have such teachers.

Chapter 5

RESULTS – STRUCTUAL EQUATION MODELLING AND MULTIVARIATE ANALYSIS OF VARIANCE

In this chapter, the results for the second, third, and fourth objectives of this study are reported. Firstly, analyses were conducted in order to examine whether support existed for the hypothesised model; that relationships exist between students' motivation towards learning, self-regulation and perceptions of the learning environment (research objectives 2 and 3). The analyses for the fourth research objective, involving multivariate analysis of variance (MANOVA), univariate analysis of variance (ANOVA), and effect size, were undertaken to investigate whether there were differences between students' motivation towards learning, self-regulation and perceptions of the learning environment in classes with teachers identified as effectively implementing cooperative learning strategies compared with classes that did not have such teachers. The chapter is organised under the following headings:

- Relationships between motivation, self-regulation, and learning environment perceptions (Section 5.1);
- Differences between classes: Students' motivation, self-regulation and learning environment perceptions (Section 5.2); and
- Chapter summary (Section 5.3).

5.1 Examining the Relationships between Motivation, Self-Regulation and Learning Environment Perceptions

This section reports the data analyses undertaken to investigate whether the hypothesised relationships developed in the research model (as illustrated in Chapter 3, Section 3.5.2) were supported. Descriptive statistics, undertaken to establish univariate normality, are reported (Section 0). Next, confirmatory factor analysis undertaken to assess the measurement model is reported (Section 5.1.2). After this, data analyses to establish convergent validity is reported (Section 5.1.3), followed by discriminant validity (Section 5.1.4). This is followed by a report of the data analyses undertaken to evaluate the structural model (Section 5.1.5). Confirmation of the research model is then reported (Section 5.1.6), followed by the results of testing the hypotheses (Section 5.1.7), including the findings with regard to the influence of the learning environment on students motivation and self-regulation (Section 5.1.7.1) and the influence of motivation on students' self-regulation (Section 5.1.7.2).

5.1.1 Descriptive Statistics

Descriptive statistics, related to the dimensions within both of the surveys (student cohesiveness, teacher support, involvement, cooperation, learning goal orientation, task value, self-efficacy, and self-regulation), were generated using SPSS 22. These results, reported in Table 5.1, show that the means for each scale were higher than the mid-point of 3.00, as recommended by Kline (2010). The skewness indices for all of the scales ranged between -2.07 and -0.61, and the kurtosis indices ranged between -0.34 and 4.67. These results were considered to be acceptable as they were < 2 and < 7, respectively, as recommended by West, Finch, and Curran (1995). The standard deviations ranged between 0.77 and 1.06, demonstrating a narrow spread around the skewness and kurtosis. Given that all of the indices fell within acceptable levels for both skewness and kurtosis, the data was considered univariate normal, an important requirement of co-variance based statistics.

Table 5.1 Mean, standard deviation, skewness and kurtosis

Constructs	Items	Mean	SD	Skewness	Kurtosis
Student cohesiveness	8	4.34	0.79	-2.07	4.67
Teacher support	8	3.61	1.06	-0.68	-0.34
Involvement	8	3.70	0.82	-0.61	-0.08
Cooperation	8	4.01	0.82	-1.17	1.38
Learning goal orientation	8	4.20	0.81	-1.82	3.73
Task value	8	3.85	0.84	-1.00	0.78
Self-efficacy	8	3.80	0.79	-0.92	0.79
Self-regulation	8	3.93	0.77	-0.88	1.31

5.1.2 Assessing the Measurement Model

As a part of SEM, confirmatory factor analysis (CFA) can be used to assess the measurement model by investigating the relationships between items and scales (Harrington, 2009). As explained in Chapter 3, Section 3.5.2.2, CFA differs to exploratory factor analysis as it analyses all of the items from the instruments used in the research model within one regression model. This enables all of the items to be analysed simultaneously. In order to determine that the factor structure was valid and reliable for SEM purposes, construct validity was assessed by investigating the convergent and discriminant validity. Convergent validity was evaluated using internal consistency reliability, composite reliability and average variance extracted. These results are reported in Table 5.2.

5.1.3 Convergent validity for the measurement model

Convergent validity was evaluated using average variance extracted, and composite reliability. Average variance extracted values ranged from .51 to .57, higher than the value of >.50, as recommended (Fornell & Larcker, 1981; Hair et al., 2010; Nunnally & Bernstein, 1994). The composite reliability ranged from .89 to .91, indicating strong reliability as these exceeded the recommended criterion of greater than .60 as recommended (Bagozzi & Yi, 1990; Fornell & Larcker, 1981). The internal consistency reliability of the measurement model was calculated using Cronbach's alpha coefficient (Cronbach, 1951). Using Nunnally's (1978) recommendation for alpha scales having a reliability of at least .70, internal consistency reliability was achieved as the alpha value for the measurement properties ranged from .84 to .91.

Table 5.2 Results of the measurement model: Standardised factor loadings, average variance extracted, composite reliability and Cronbach's alpha

Latent variable	Item	Standardised factor loadings	Average variance extracted	Composite reliability	Cronbach's alpha
Learning goal			.57	.91	.91
orientation	LGO1	.71			
	LGO2	.70			
	LGO3	.77			
	LGO4	.76			
	LGO5	.85			
	LGO6	.77			
	LGO7	.80			
	LGO8	.68			
Task value			.52	.90	.90
	TV9	.60			
	TV10	.69			
	TV11	.80			
	TV12	.79			
	TV13	.77			
	TV14	.78			
	TV15	.67			
	TV16	.66			
Self-efficacy			.52	.89	.89
	SE17	.70			
	SE18	.68			
	SE19	.65			
	SE20	.71			
	SE21	.73			
	SE22	.80			
	SE23	.74			
	SE24	.72			
Self-regulation			.51	.89	.84
	SR25	.72			
	SR26	.68			
	SR27	.73			
	SR28	.75			
	SR29	.66			
	SR30	.76			
	SR31	.62			
	SR32	.80			
Student					
cohesiveness			.53	.90	.89
	SC33	.79			

Latent variable	Item	Standardised factor loadings	Average variance extracted	Composite reliability	Cronbach's alpha
	SC34	.71			
	SC35	.84			
	SC36	.85			
	SC37	.73			
	SC38	.54			
	SC39	.75			
	SC40	.53			
Involvement			.55	.91	.85
	I49	.82			
	I50	.86			
	I51	.70			
	I52	.79			
	I53	.71			
	I54	.70			
	I55	.70			
	I56	.64			
Teacher support			.54	.90	.91
	TS41	.66			
	TS42	.79			
	TS43	.77			
	TS44	.81			
	TS45	.80			
	TS46	.64			
	TS47	.65			
	TS48	.73			
Cooperation			.53	.90	.86
	C57	.81			
	C58	.73			
	C59	.77			
	C60	.71			
	C61	.72			
	C62	.73			
	C63	.66			
	C64	.69			

Note: * Indicates an acceptable level of reliability or validity

AVE: Average variance extracted = the sum of the squared standardised factor loadings divided by number of factors of the underlying constructs.

$$CR: Composite\ Reliability = \frac{(\sum_{i=1}^{n} \lambda_i)^2}{\left(\sum_{i=1}^{n} \lambda_i\right)^2 + \left(\sum_{i=1}^{n} \delta_i\right)}$$

Where $\lambda_i =$ the standardized factor loading for the indicators on the observed variable.

$\delta_i =$ the measurement error of each indicator.

5.1.4 Discriminant validity for the measurement model

Discriminant validity for the measurement model was evaluated by comparing the square root of the average variance extracted from a construct, with the inter construct correlation. Both of these figures are reported in Table 5.3, with the average variance extracted shown in brackets. This result established discriminant validity as these numbers were all higher than the correlations reported in brackets, in bold, on the diagonal. The results indicate that that the square root of the average variance extracted from a construct were all higher than the correlations shared among the constructs and other constructs in the model; the requirements of discriminant validity.

Table 5.3 Discriminant validity for the measurement model

Constructs	LGO	TV	SE	SR	SC	TS	I	C
LGO	**(.75)**							
TV	.68**	**(.72)**						
SE	.61**	.64**	**(.72)**					
SR	.60**	.61**	.70**	**(.71)**				
SC	.27**	.26**	.32**	.35**	**(.73)**			
TS	.21**	.32**	.35**	.42**	.08	**(.73)**		
I	.26**	.34**	.38**	.42**	.35**	.53**	**(.74)**	
C	.26**	.36**	.37**	.43**	.51**	.36**	.57**	**(.73)**

Note: ** $p < .01$
The bold elements in the main diagonal are the square roots of the AVE and the off-diagonal elements are the shared variance (factors' correlations).

5.1.5 The Structural Model

After the assessment of the measurement model, the structural model was evaluated in terms of the:

5. Overall goodness-of-fit;
6. The ability to explain the variance in the dependent variables, measured by using the squared multiple correlations (R^2); and
7. The statistical significance of the estimated path coefficients.

As explained in Chapter 3, Section 3.5.2.3, good model fit was evaluated using the following indices as recommended by Harrington (2009) and Kline (2010): Chi-square χ^2; Tucker-Lewis index (TLI); comparative fit index (CFI); Incremental Index of Fit (IFI); root mean square error of approximation (RMSEA); and standardized root mean square residual (SRMR). Table 5.4 illustrates the structural model goodness-of-fit. The chi-square test was non-significant. The other fit indices all indicated a good model fit according to the guidelines provided by Brown (2006). Based on these results, each scale in the structural model was deemed fit for SEM purposes.

Table 5.4 Structural model goodness-of-fit

Model fit indices	**Values**	**Recommended Guidelines**	**References**
χ^2	2862.44; $p < .001$	Non-significant	(Jöreskog & Sörbom, 1993; Kline, 2010; McDonald & Ho, 2002)
df	1866		
χ^2/df	1.53	< 3	(Hu & Bentler, 1999; Kline, 2010)
TLI	.91	$\geq .90$	(Hu & Bentler, 1999; Klem, 2000; McDonald & Ho, 2002)
CFI	.92	$\geq .90$	(Hair et al., 2010)
RMSEA	.04	$< .08$	(Hair et al., 2010)
SRMR	.05	$< .08$	(Hair et al., 2010)

5.1.6 Confirmation of the research model

The ability of the research model to explain the variance in the dependent variables was measured by using the squared multiple correlations R^2 of the four endogenous variables (learning goal orientation, self-efficacy, task value, and self-regulation). The results, reported in Table 5.5, shows that the (R^2) value for each endogenous variable was higher than the minimum requirement of 0.10 as recommended by Falk and Miller (1992), indicating that the latent constructs in this model were more than adequate. These results suggest that students' perceptions of their learning environment explained 31% of the variance in learning goal orientation, 42% of the variance in self-efficacy, 39% of the variance in task value, and 69% of the variance in self-regulation, with self-regulation demonstrating the most analogous relationship between the variables.

Table 5.5 Coefficient of determination (R^2) of the endogenous variables

Construct	Estimate
Learning goal orientation	.31
Self-efficacy	.42
Task value	.39
Self-regulation	.69

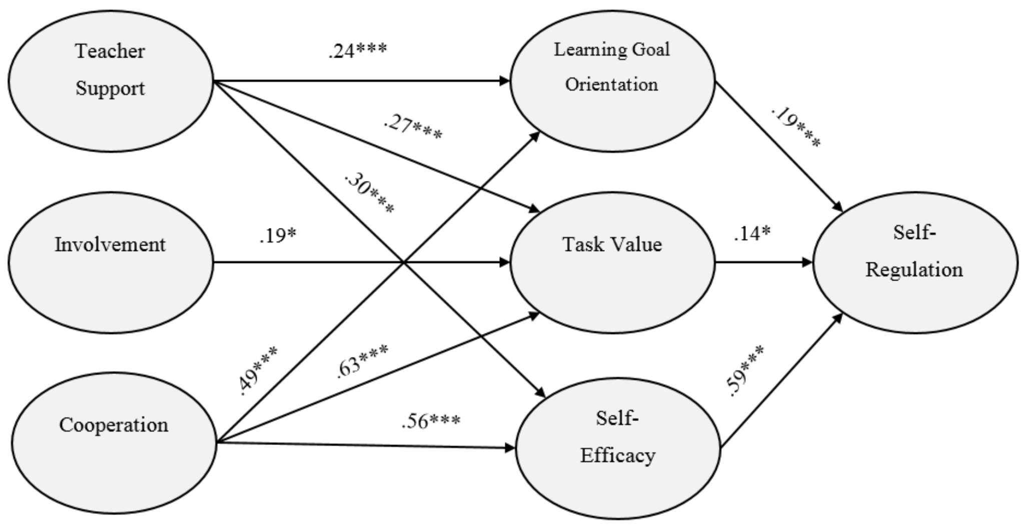
5.1.7 Testing the Hypotheses

SEM using analysis of moment structure (AMOS) was used to examine what relationships exist between students' motivation towards learning, self-regulation and perceptions of the learning environment. The strengths of the relationships between the dependent and independent variables are indicated by the estimation of the path coefficients. The path coefficients in the structural model represent standardised regression coefficients.

The research model (shown in Chapter 3, Section 3.5.2) illustrates the hypotheses that each of the learning environment constructs (student cohesiveness, teacher support, involvement, and cooperation), as independent variables, would influence students' motivation towards learning (Hypothesis 1) and self-regulation (Hypothesis 2). In addition, it was hypothesised that the three motivation constructs (learning goal orientation, task value, and self-efficacy) would also influence students' self-regulation of effort (Hypothesis 3).

Table 5.6 shows the direct relationships including standardized path coefficients, standard error, *p*-value, critical ratio, and hypotheses results. Overall, 10 of the 19 hypotheses were supported, resulting in 10 statistically significant relationships (as the critical value for these was greater than ± 1.96); the parameter coefficient value was statistically significant at the .05 level (Hair et al., 2010).

Figure 5.1 provides a graphic representation of the structural model results. In this diagram, only the path of each hypothesized relationship that was statistically significant is shown, including the standardized path coefficients. For this reason, the learning environment scale of student cohesiveness is missing from the diagram, as no statistically significant relationships were found with regard to the influence of this scale on students' motivation or self-regulation. The results of these relationships, examining the relationships between students' motivation towards learning, self-regulation and perceptions of the learning environment, are reported next.



Note: ****p* < .001; ** *p* < .01; * *p* < .05
Paths that were not significant are not shown.

Figure 5.1. Structural equation model showing the relationships between the independent learning environment variables with motivation, and the relationship between motivation and self-regulation.

Table 5.6 Standardized path coefficients, standard error, *p*-value, critical ratio and hypotheses result

Path	Standardized path coefficient	Standard error	p-value	Critical ratio	Results
H_1:SC→ LGO	.07	.07	.28	1.09 ns	Not supported
H_2:SC→ TV	.06	.05	.35	.93 ns	Not supported
H_3:SC→ SE	.01	.06	.88	.15 ns	Not supported
H_4:TS→ LGO	.24	.06	***	3.26***	Supported
H_5:TS→ TV	.27	.05	***	3.62***	Supported
H_6:TS→ SE	.30	.06	***	4.11***	Supported
H_7: I→ LGO	.17	.10	.07	1.80 ns	Not supported
H_8: I→ TV	.19	.08	.04	2.02*	Supported
H_9: I→ SE	.12	.10	.18	1.34 ns	Not supported
H_{10}:CO→ LGO	.49	.10	***	4.99***	Supported
H_{11}:CO→ TV	.63	.09	***	5.91***	Supported
H_{12}:CO→ SE	.56	.10	***	5.77***	Supported
H_{13}:SC→ SR	.01	.05	.96	.05 ns	Not supported
H_{14}: TS→ SR	.06	.05	.39	.86 ns	Not supported
H_{15}: I→ SR	.04	.08	.60	.52 ns	Not supported
H_{16}: LGO→ SR	.19	.05	***	3.55	Supported
H_{17}: TV→ SR	.14	.06	.02	2.41*	Supported
H_{18}: CO→ SR	.09	.09	.41	.83 ns	Not supported
H_{19}:SE→ SR	.59	.07	***	7.43***	Supported

Note: ***$p < .001$; ** $p < .01$; * $p < .05$; ns (non-significant)

5.1.7.1 The Influence of Learning Environment Perceptions on Motivation Outcomes and Self-Regulation

The second and third research objectives of my study sought to examine what relationships exist between students' motivation towards learning, self-regulation and perceptions of the learning environment. Three hypotheses were made in relation to these objectives; two in relation to the second research objective and one in relation to the third research objective. The first hypothesis predicted that students' perceptions of their learning environment would positively influence their motivation in terms of learning goal orientation, task value, and self-efficacy. With regard to this hypothesis, the results indicated that seven out of a possible twelve relationships had a direct, positive association. The influence of the four learning environment variables of student cohesiveness, teacher support, involvement and cooperation on the three motivation variables used in the study are described below.

The influence of student cohesiveness (the extent to which students know, help, and are supportive of one another), was positively associated with the student motivation variables of learning goal orientation, task value and self-efficacy, but this influence was not statistically significant, and was therefore not illustrated in the structural model (Figure 5.1). The influence of teacher support (the extent to which the student feels the teacher helps, befriends, trusts and is interested in them), was statistically significant and positive for all three motivation variables ($p<.001$). The influence of involvement (the extent of students' interest, participation, work ethic and enjoyment during lessons), had a positive and statistically significant relationship with only one motivation variable; task value ($p<.05$). Finally, the influence of cooperation (the extent to which students cooperate rather than compete during learning tasks), was positive and statistically significant for all three motivation variables ($p<.001$).

The second hypothesis was that students' perception of their learning environment would positively influence their self-regulation of effort. This hypothesis was not supported by the results. While the 4 possible relationships in the research model with regard to this hypothesis were positive in direction, none were statistically significant.

5.1.7.2 The Influence of Motivation Constructs on Self-Regulation

The third and final hypothesis, in relation to my third research objective, was that students' motivation would positively influence their self-regulation of effort. This hypothesis was supported by the results. All three motivational variables had a positive and statistically significant influence on students' self-regulation: learning goal orientation ($p<0.001$); task value ($p<0.05$); and self-efficacy ($p<0.001$). Self-efficacy had the greatest critical ratio of the three motivation variables at 7.43.

5.2 Differences between Classes: Students' Motivation, Self-Regulation and Learning Environment Perceptions

As described in Chapter 1, Section 1.1.3, cooperative learning practices had been implemented in Cycle 2 science classes as a part of the education reform taking place in Abu Dhabi government schools at the time of this study. This provided an opportunity to investigate whether there were differences in motivation, self-regulation and perceptions of the learning environment between classes with teachers identified as effectively implementing cooperative learning practices and classes that did not have such teachers. Consequently, this became the fourth research objective of my study.

The selection procedure of the students constituting the sample (N=338) is described in Chapter 3, Section 3.2, and reiterated briefly here. The sample was drawn from two groups of students: the first group (referred to as Group 1), consisted of students (n=175) in classes with teachers identified as effectively implementing cooperative learning strategies. The other group of students (n=163) was drawn from students not in such classes (referred to as Group 2).

MANOVA was used to explore whether there was any statistical difference in motivation, self-regulation, and learning environment perceptions, between the two groups. The four SALES scales (learning goal orientation, task value, self-efficacy, and self-regulation) and the four scales from the modified WIHIC (student cohesiveness, teacher support, involvement, and cooperation) constituted the dependent variables. Exposure to effectively implemented cooperative learning comprised the independent variable. The results of the data analysis, conducted with both groups of students using MANOVA, followed by ANOVA (with the student as the unit of analysis), as well as effect size, are reported in Table 5.7.

For all four SALES scales, the average item mean (the scale total divided by the items in that scale), was higher for students in Group 1 than for students in Group 2. Standard deviations (a measure of the spread of the scores) for all four scales were slightly higher in Group 2. The MANOVA, using Wilks' lambda criterion, produced statistically significant differences overall for the set of eight independent variables. Because of this, the ANOVA was interpreted separately for each of the eight scales. The ANOVA results, reported in Table 5.7, show that there were statistically significant differences for all four of the SALES scales: learning goal orientation; task value; and self-regulation (p<0.05); and self-efficacy (p<0.01). Students in Group 1 (classes with teachers identified as effectively implementing cooperative learning strategies) self-reported higher levels of motivation and self-regulation compared to Group 2 (students not in such classes). Furthermore, the effect size (the magnitude of the difference between these levels) was large for each scale, ranging from 0.829 standard deviations for task value to 0.919 standard deviations for self-regulation.

As with the SALES, the average item means score was higher for students in Group 1 (n=175) than for students in Group 2 (n=163) across all four scales of the modified WIHIC. The standard deviations were slightly higher in Group 2 than Group 1, indicating that there was a larger spread of responses for these students. For three out of four scales in the modified WIHIC (teacher support, involvement, and cooperation), the differences between the perceptions of students in Group 1 and Group 2 were statistically significant (p<0.05). However, there was no statistical difference with regard to the student cohesiveness scale between the two groups. The effect size was large for each of the other WIHIC scales (0.988 standard deviations for teacher support, 0.877 standard deviations for involvement; and 0.878 standard deviations for cooperation).

In sum, for all of the SALES scales, and all but one of the modified WIHIC scales, students in classes with teachers identified as effectively implementing cooperative learning strategies had more positive self-reports of motivation and self-regulation, and more positive perceptions of the learning environment, compared to students not in such classes.

Table 5.7 Average item mean, average item standard deviation and difference (effect size, MANOVA/ANOVA) between the scores for students in classes with cooperative learning and those that are not on each modified WIHIC and SALES scale

Scale	Average Item Mean		Average Item Standard Deviation		Difference	
	Group 1	Group 2	Group 1	Group 2	Effect Size	*F*
Motivation						
Learning goal orientation	4.312	4.079	0.061	0.063	0.883	7.142*
Task value	3.945	3.755	0.063	0.065	0.829	4.378*
Self-efficacy	3.925	3.667	0.059	0.061	0.907	9.148**
Self-regulation	4.061	3.786	0.058	0.060	0.919	10.935*
Learning Environment						
Student cohesiveness	4.382	4.294	0.060	0.074	0.547	1.052
Teacher support	3.985	3.199	0.060	0.061	0.988	54.075*
Involvement	3.806	3.578	0.061	0.064	0.877	6.626*
Cooperation	4.124	3.896	0.061	0.063	0.878	6.645*

N=175 students in classes with teachers identified as effectively implementing cooperative learning (Group 1) and 163 students not in such classes (Group 2).
*p<0.05, ** p<0.01

5.3 Chapter Summary

In this chapter, the results have been reported in relation to the second and third research objectives in my study; examining the relationship between students' perceptions of the learning environment, motivation towards learning, and self-regulation, as well as the results in relation to the fourth research objective; investigating the differences between these constructs among students in classes with teachers identified as effectively implementing cooperative learning and students not in such classes. In order to address the second and third research objectives, data collected from 338 students using the four-scale SALES instrument and a modified, four-scale WIHIC were analysed using structural equation modelling (SEM). Descriptive statistics of all eight scales were generated (reported in Section 0). Skewness and kurtosis indices were within an acceptable range and univariate normality in the data was supported. This was followed by assessment of the measurement model (Section 5.1.2). Convergent validity and discriminant validity for the measurement model were assessed using CFA.

Convergent validity for the measurement model was evaluated using composite reliability and average variance extracted (Section 5.1.3). The results indicated that the average variance extracted for the measurement model met the requirements of at least .50 (Nunnally, 1978), and composite reliability met the requirements, being higher than .85 (Schumacker & Lomax, 2004). Therefore, convergent validity was established. Discriminant validity (Section 5.1.4) was evaluated by examining the relationship between the constructs; the square root of the average variance extracted was higher than the correlations shared among the construct and the other constructs in the model, thus establishing discriminant validity.

Once the results from the analysis of the measurement model had been established as valid and reliable, the model fit was evaluated for the structural model (Section 5.1.5). The fit indices all indicated a good fit and the structural model was regarded as suitable for SEM purposes. Next, the explanatory power of the research model was assessed by calculating the squared multiple correlations R^2 of the four endogenous variables in order to explain the variance between constructs. After that, analysis of the path coefficient and p-value for the 19 hypothesised relationships in the research model resulted in 10 of these hypotheses being supported.

The results of the path analysis indicated that the learning environment variables of teacher support and cooperation had a positive and statistically significant influence on students' learning goal orientation, task value and self-efficacy ($p<.001$). The learning environment variable of involvement had a positive and statistically significant relationship with only one motivational variable; task value ($p<.05$). The learning environment variable of student cohesiveness had a positive, but not statistically significant influence on the motivation variables. Contrary to the hypothesis, there was no statistically significant relationships between any of the learning environment variables and students' self-regulation. All three motivation variables had positive and statistically significant relationships with students' self-regulation of effort.

In order to address the fourth research objective; investigating differences between classes with regard to motivation, self-regulation, and learning environment perceptions, data were analysed from the two groups of students[15] using MANOVA, followed by ANOVA, and effect size. There were statistically significant and positive differences for the students in Group 1, compared to students in Group 2, for all of the dependent variables in the SALES and modified WIHIC scales, except for one of the modified scales in the WIHIC; student cohesiveness. Once it was established that there were statistically significant differences between both groups, effect size was employed to examine the magnitude and educational importance of these differences. The effect size was large for all eight scales, ranging from 0.55 to 0.99 standard deviations.

In Chapter 6, the results presented in Chapter 5 are discussed, as are the significance of these results. Also included in Chapter 6 is a discussion of the study's limitations and educational implications. Suggestions for future research are made, and the significance of my study is presented.

[15] Group 1 consisting of students in classes with teachers identified as effectively incorporating cooperative learning strategies, and Group 2 consisting of students not in such classes.

Chapter 6

DISCUSSION, RECOMMENDATIONS, AND CONCLUSION

The aims of this study were two-fold; first, to examine what relationships exist between students' motivation, self-regulation, and perceptions of the learning environment; and second, to investigate differences in motivation, self-regulation, and learning environment perceptions between classes with teachers identified as effectively teaching cooperative learning strategies and classes that did not have such teachers. My study was situated within a pragmatist perspective, which, as described in Chapter 1, Section 1.2, involves the methodology being driven by the research objectives of the study. It was determined that a quantitative research design would most effectively address these research objectives.

Data were collected using two instruments, both of which were translated for use in the United Arab Emirates (UAE). First, the Students' Adaptive Learning Engagement Survey (SALES; Velayutham et al., 2011) was used to assess students' motivation and self-regulation. The SALES is a four-scale, 32-item questionnaire: three scales measure students' motivation and one scale measures students' self-regulation of effort. Second, a modified version of the What Is Happening In this Class (WIHIC) instrument (Fraser et al., 1996) was used to assess students' perceptions of the learning environment. The modified WIHIC consisted of four, eight-item scales, selected for their relevance to the objectives of my study; measuring student cohesiveness, involvement, teacher support, and cooperation.

Both surveys were administered to 338 female students in 16 Cycle 2[16] science classrooms across six Abu Dhabi government schools in the Abu Dhabi emirate of the UAE. Nine classes (*n*=175 students) had been learning science using a cooperative learning strategy called Cooperative Learning and Assessment (for a description of this approach, see Appendix 1). These classes had teachers who had been identified as effectively implementing the cooperative learning strategy in their science classes. Seven classes (*n*=163 students) had been learning science with teachers who were

[16] Government schools, consisting of students in grades 6 to 9 (middle school), were called Cycle 2 schools in the Emirate of Abu Dhabi.

identified as not yet able to use the cooperative learning strategy effectively and were still demonstrating a traditional, teacher-centred delivery of the science curriculum.

In this chapter, a discussion of the findings of my study, contributions to research, research limitations, and suggestions for possible future research are presented. The chapter is organised under the following headings:

- Discussion of the findings (Section 6.1);
- Educational implications (Section 6.2);
- Limitations of the study (Section 6.3);
- Recommendations for future research (Section 6.4);
- Summary of recommendations (Section 6.5);
- Significance of the research (Section 6.6); and
- Concluding remarks (Section 6.7).

6.1 Discussion of the Findings

In this section, the major findings pertaining to each research objective are summarised and discussed within the following three subheadings: validity and reliability of the SALES and modified WIHIC questionnaire when translated for use in the UAE (Section 6.1.2); relationships between students' motivation towards learning, self-regulation, and perceptions of the learning environment (Section 6.1.3); and differences in students' motivation, self-regulation, and perceptions of the learning environment between classes with teachers identified as effectively implementing cooperative learning strategies and classes that did not have such teachers (Section 6.1.4).

6.1.2 Research Objective 1: Establishing the Validity and Reliability of Instruments

In order to investigate the relationships between motivation, self-regulation, and perceptions of the learning environment, it was first necessary to validate two surveys (the SALES and modified WIHIC) that were used to collect the data informing my study. The first research objective of the study, therefore, was to establish the validity and reliability of two instruments when modified and translated for use in the UAE to assess students' motivation towards learning, self-regulation, and perceptions of the learning environment.

To provide support for the validity and reliability of these instruments when used with this sample, the factor structure, internal consistency reliability, and discriminant and concurrent validity were examined. The key findings of the results are summarised and discussed separately for the SALES (Section 6.1.2.1) and the modified WIHIC (Section 6.1.2.2).

6.1.2.1 Validity and Reliability of the SALES Instrument

To examine the validity and reliability of the SALES instrument, the data were analysed in a range of ways. Once the appropriateness of the data for further analysis had been confirmed by testing for multivariate normality and sampling adequacy, exploratory factor analysis, involving principal axis factor analysis with oblique rotation, was conducted to establish the factor structure for the SALES instrument. Next, an index of internal consistency reliability was established by calculating the Cronbach alpha coefficient. After that, the component correlation matrix obtained from oblique rotation was used to establish that the requirements for discriminant validity had been met. Lastly, a one way analysis of variance (ANOVA) was used to confirm concurrent validity (the ability of the SALES to distinguish between classes). The key findings for the validity and reliability of the SALES are summarised below.

- The 32-item, four-scale SALES was found to have good factorial validity; each item had a factor loading of .40 or more on its *a priori* scale and less than .40 on all other scales as recommended by Field (2009). The only exception was item 24 in the self-efficacy scale, which was removed. The eigenvalue for each scale was greater than one—as recommended by Kaiser (1960)—and the total proportion of variance accounted for was 57.88%.
- The internal consistency reliability coefficients, calculated using Cronbach's alpha, ranged from 0.84 to 0.91, and each scale had an alpha value that was more than satisfactory (Cohen, 1977; Nunnally, 1978).

- The results for discriminant validity confirmed the distinctiveness of all four scales because all correlations were below .80—as recommended by Brown (2006)—the highest correlation between the factors being 0.55.
- The results of the ANOVA used to establish concurrent validity indicated that all four scales of the SALES instrument were able to differentiate significantly between the 16 classes (p<0.001).

The SALES was developed relatively recently and consequently, there have been few studies that have utilised this instrument to date. However, the evidence in my study supports the validity and reliability of the SALES, and these findings compare favourably with other studies that have used the SALES to assess students' motivation and self-regulation (Alzubaidi et al., 2016; Chipangura & Aldridge, 2017; Velayutham et al., 2013; Velayutham & Aldridge, 2013; Velayutham et al., 2011, 2012). An important addition to the literature, with regard to the use of the SALES to assess motivation and self-regulation, is that for the first time, a translated and validated SALES instrument has been used with middle school students from an Arabic-speaking background. These findings suggest that the use of this instrument with Arabic-speaking students in a range of subjects is warranted to further establish its validity and reliability (*Recommendation 1*)[17].

6.1.2.2 Validity and Reliability of the Modified WIHIC Instrument

To examine the validity and reliability of the modified WIHIC, the same data analyses were conducted as for the SALES. After establishing that the data were suitable for further analyses, principal axis factor analysis using oblique rotation was used to establish factorial validity, followed by using Cronbach's alpha coefficient to measure the internal consistency reliability of the WIHIC. Next, discriminant validity was assessed using the component correlation matrix obtained from oblique rotation. Lastly, the ability of the instrument to distinguish between classes, thus confirming concurrent validity, was measured with a one-way ANOVA. The key findings with regard to the validity and reliability of the WIHIC instrument are summarised here.

[17] A summary of all the recommendations made in this chapter can be found in Section 6.5.

- The 32-item, modified WIHIC, using the four scales of student cohesiveness, involvement, teacher support, and cooperation, was found to have good factorial validity. Each item had a factor loading of greater than .40 on its *a priori* scale and less than .40 on all other scales. The eigenvalue for each scale was greater than one, and the total proportion of variance accounted for was 56.67%.
- The internal consistency reliability coefficients, calculated using Cronbach's alpha, ranged from 0.85 to 0.90.
- The results for discriminant validity confirmed the distinctiveness of all four scales, with the highest correlation between the factors being 0.43.
- The results of the ANOVA used to establish concurrent validity indicated that three out of four scales were able to differentiate significantly between the 16 classes ($p<0.001$): the student cohesiveness, teacher support, and cooperation scales; the exception being the involvement scale.

Overall, the results of the data analyses strongly supported the validity of the WIHIC for use my study. Further, these results support other studies that have found the WIHIC to be valid and reliable when translated into another language, such as: Korean (Kim et al., 2000); Bahasa Indonesian (Fraser, Aldridge, & Adolphe, 2010; Soebari & Aldridge, 2015; Wahyudi & Treagust, 2004); Mandarin (Aldridge & Fraser, 2000); Spanish (Adamski et al., 2013; Allen & Fraser, 2007; Robinson & Fraser, 2013; Soto-Rodriguez & Fraser, 2004); Greek (Giallousi et al., 2010); Sepedi (Aldridge et al., 2006); IsiZulu (Aldridge et al., 2009); and Arabic (Afari et al., 2013; Alzubaidi et al., 2016; MacLeod & Fraser, 2010).

Although it is unclear why the involvement scale in the modified WIHIC instrument was not able to differentiate between the perceptions of students in different classes, the results provide strong evidence to support the WIHIC when used in this setting. It is recommended, however, that researchers wishing to use the WIHIC in a similar setting examine the anomaly with the involvement scale more closely (*Recommendation 2*).

Overall, the findings in relation to this first research objective suggest that both the SALES and modified WIHIC questionnaires were valid and reliable instruments to use for this research, thus providing the assurance that the data could be used to address subsequent research objectives in the study. Furthermore, researchers and educators in Arabic-speaking countries now have two convenient instruments in their own language that can be used to assess the relationship between students' motivation towards learning, self-regulation, and perceptions of the learning environment in middle school classrooms.

6.1.3 Research Objectives 2 and 3: Examining the Relationships between Learning Environment, Motivation, and Self-Regulation

The next two research objectives of my study related to the examination of what relationships exist between students' motivation towards learning, self-regulation, and perceptions of the learning environment. In order to address these objectives, a research model for the study was developed (refer to Figure 3.1). This model demonstrates the underlying assumptions that resulted from theorising and a review of the literature, and which led to the development of the three hypotheses for my study, listed below.

H_1 That students' perception of the learning environment would influence their motivation towards learning;

H_2 That students' perception of the learning environment would influence their self-regulation; and

H_3 That students' motivation towards learning would influence their self-regulation.

Testing these hypotheses initially involved assessing the measurement properties through confirmatory factor analysis (CFA) to establish that the factor structure was suitable for Structural Equation Model (SEM) analysis. The results of the CFA indicated good reliability, convergent validity, and discriminant validity for the measurement model, indicating that the proposed research model was suitable for SEM. The results indicated that ten out of nineteen possible hypothesised relationships were statistically significant and positive in direction. Key findings are summarised below.

- The learning environment constructs of teacher support and cooperation positively influenced the motivation constructs of learning goal orientation, task value, and self-efficacy (p = <.001).
- The learning environment construct of involvement positively influenced task value (p = <.05).
- The motivation constructs of learning goal orientation, task value, and self-efficacy positively influenced self-regulation (p = <.001).
- The learning environment construct of student cohesiveness did not have a statistically significant relationship with any of the motivation constructs or self-regulation.
- The learning environment construct of involvement did not have a statistically significant influence on students' learning goal orientation, self-efficacy, or self-regulation.
- The learning environment construct of cooperation did not have a statistically significant influence on students' self-regulation.

The findings of my study imply that three aspects of the psychosocial learning environment—teacher support, involvement, and cooperation—influenced students' motivation, but that perceptions of the learning environment did not influence students' self-regulation of effort. The findings also suggest that students' motivation towards learning in terms of learning goal orientation, task value, and self-efficacy had a significant influence on their self-regulation of effort. The findings are presented in terms of the hypotheses made with regard to: the influence of the learning environment on students' motivation (Section 6.1.3.1); the influence of the learning environment on students' self-regulation (Section 6.1.3.2); and the influence of students' motivation on their self-regulation of effort (Section 6.1.3.3).

6.1.3.1 Hypothesis 1: The Influence of the Learning Environment on Students' Motivation

The hypothesis that students' perception of the learning environment would positively influence students' motivation supports previous research (Afari, 2013; Afari et al., 2013; Alzubaidi et al., 2016; Chipangura & Aldridge, 2017; Fraser, 2012; Jinks & Lorsbach, 2003; Opolot-Okurut, 2010; Tas, 2016; Velayutham et al., 2013; Velayutham & Aldridge, 2013; Velayutham et al., 2012). However, the results of my study found that different aspects of the learning environment affected motivation in different ways. In this section, the two learning environment constructs found to have a statistically significant and positive influence on the motivation constructs used in my study—teacher support and cooperation—are discussed. Second, the limited influence of involvement on only one motivational construct is discussed, as well as possible reasons why student cohesiveness did not significantly influence any motivation constructs.

Teacher Support and Motivation

The statistically significant, positive relationship that was found between the learning environment construct of teacher support, and all three motivation constructs in my study, suggests that the more that students felt the teacher was interested in them, trusted them, and supported their learning (teacher support), the more motivated and self-regulated they were. Higher levels of teacher support resulted in students self-reporting higher perceptions of value in what they were learning (task value). Greater levels of teacher support resulted in more students self-reporting a learning, rather than a performance orientation. In addition, the greater the level of teacher support, the higher the students' reported levels of self-efficacy. The influence of teacher support on the aspects of motivation assessed in my study are discussed below.

High quality teacher support is, according to Furrer, Skinner, and Pitzer (2014, p. 105), "intrinsically motivating." The influence of teacher support on students' motivation, found in my study, appears to support this statement, and corroborates a number of studies that have investigated learning environment–motivation associations, such as Kiefer, Alley, and Ellerbrock (2015, p. 14), who suggested that "teacher and peer support are critical elements of a responsive learning environment." Teacher support has been found to have a statistically significant and positive influence on middle and high school students' motivation in a range of learning contexts, such as: mathematics (Afari et al., 2013; Chionh & Fraser, 2009; Chipangura & Aldridge, 2017; Federici & Skaalvik, 2014; Gilbert et al., 2014; Kiemer et al., 2015; Opolot-Okurut, 2010; Patrick, Kaplan, & Ryan, 2011; Patrick et al., 2007; Rimm-Kaufman, Baroody, Larsen, Curby, & Abry, 2015; Sakiz, Pape, & Hoy, 2012; Skaalvik, Federici, & Klassen, 2015; Wentzel, Battle, Russell, & Looney, 2010; Wentzel, Muenks, McNeish, & Russell, 2017); science (Afari et al., 2013; Fauth, Decristan, Rieser, Klieme, & Büttner, 2014; Kiemer et al., 2015; Vedder-Weiss & Fortus, 2018; Velayutham et al., 2013; Velayutham & Aldridge, 2013; Wentzel et al., 2017); geography (Chionh & Fraser, 2009); English language learning (Oga-Baldwin, Nakata, Parker, & Ryan, 2017; Wentzel et al., 2017); and non-subject specific contexts (Cooper, 2013; Furrer et al., 2014; Katz, 2017; Monsen et al., 2014; Ruzek et al., 2016; Ryan & Patrick, 2001; Skinner, Furrer, Marchand, & Kindermann, 2008).

The motivational construct found in past studies to be most consistently and significantly influenced by teacher support appears to be learning goal orientation. The statistically significant and positive relationship between teacher support and students' learning goal orientation found in my study supports previous research, suggesting that a teacher's emphasis on the importance of understanding, engaging with, and mastering learning concepts leads to students with higher learning goal orientations (Stipek, Givvin, Salmon, & MacGyvers, 1998; Turner et al., 2002; Urdan, Midgley, & Anderman, 1998), and indicates the possibility that supportive teachers may influence classroom goal structures (Velayutham & Aldridge, 2013).

There is less research in the literature that describes the influence of teacher support on task value. The finding in my study, that teacher support had a statistically significant and positive influence on task value, corroborates the findings of a limited number of studies (Alzubaidi et al., 2016; Skaalvik et al., 2015; Velayutham & Aldridge, 2013). These findings give credence to the notion that teachers have an important role to play in supporting students to perceive the value of learning tasks. As there is limited research exploring this relationship, future research investigating teacher support/task value associations would be of value (*Recommendation 3*).

The strongest association between teacher support and motivation in my study related to the motivation construct of self-efficacy. This result differs from other studies that found no significant relationship between teacher support and self-efficacy (Chipangura & Aldridge, 2017; Gilbert et al., 2014; Ruzek et al., 2016; Velayutham & Aldridge, 2013). Gilbert et al. (2014) suggest that this finding may have been the case in their study because they were assessing other motivational constructs and not self-efficacy on its own. Ruzek et al. (2016), in response to the uncertain role that self-efficacy played in their study, suggest that self-efficacy beliefs may be more influenced by teachers' instructional support rather than the emotional interactions that their study measured. Given the somewhat "uncertain role of competence beliefs [self-efficacy]" (Ruzek et al., 2016, p. 101), and the differing results presented in my study, it is recommended that further research be dedicated to exploring the relationship between teacher support and self-efficacy (*Recommendation 4*).

While the construct of teacher support used in my study centred on teachers' emotional support, the way in which the teacher provides support may take different forms. Researchers have argued that teacher support should be viewed from a broad perspective, such as Wentzel et al. (2010), who promulgate the use of a multidimensional model of social support rather than focusing primarily on the emotional support that teachers provide. More recently, instructional, as well as emotional support, has been found to have a positive impact on students' motivation (Federici & Skaalvik, 2014; Rimm-Kaufman et al., 2015). The term 'instructional support' refers to support such as: clarifying learning objectives, promoting the engagement in higher order thinking, and providing constructive feedback (Patrick, Ryan, & Kaplan, 2007). In addition, other teacher behaviour has been found to impact students' motivation, such as the level of teacher-efficacy influencing students' self-efficacy (Chang, 2015), teachers with proactive behaviour management strategies (Rimm-Kaufman et al., 2015), teacher expectations (Gilbert et al., 2014), and teachers with high levels of inclusion (Monsen et al., 2014). It is recommended, therefore, that further studies investigate the ways in which a *range* of supportive teacher behaviours—as contributors to the psychosocial learning environment within the classroom—influence students' motivation (*Recommendation 5*).

While the majority of past studies found a positive correlation between teacher support and motivation constructs, some studies found that teacher support did not significantly influence students' motivation (Adamski et al., 2013; Ansong, Okumu, Bowen, Walker, & Eisensmith, 2017; Wentzel et al., 2017). For example, Adamski et al. (2013) assessed the impact of the learning environment scales in the WIHIC instrument on students' cultural attitudes, enjoyment of Spanish lessons, and achievement. The only positive and significant (<.05) relationship found in this study was between levels of teacher support and individual achievement. In another study, Ansong et al. (2017) found that peer support, rather than teacher support, was the strongest predictor of engagement in their study investigating the impact of scholarships on students' psychosocial and educational outcomes with middle school students in Ghana. Interestingly, Wentzel et al. (2017) found that individual students' perception of peer support positively influenced students' learning goal orientation, but class perceptions of teacher support influenced students' performance goal orientation. Given the substantial influence of peer support (Ansong et al., 2017; Ruzek et al., 2016; Wentzel et al., 2017), the less understood potential of positive peer relationships on motivation should be further investigated (*Recommendation 6*).

Cooperation and Motivation

Cooperation, as measured using the WIHIC, assesses students' perception of collaborative behaviours generally, not cooperative learning in particular. As such, this scale assesses students' perceptions of the ways in which they work productively and positively with others in the class such as, for example, sharing resources, cooperating in class activities, having a sense of teamwork, and learning from peers.

In my study, the learning environment scale of cooperation had the strongest influence on students' motivation, as measured using the scales of learning goal orientation, task value, and self-efficacy. This finding supports other studies that found a statistically significant and positive relationship between the learning environment construct of cooperation and students' motivation towards learning (Levy et al., 2004; Opolot-Okurut, 2010). Other researchers, such as Velayutham and Aldridge (2013), found that cooperation had no influence on students' motivation. Alzubaidi, Aldridge, and Khine (2016) found a statistically significant and positive relationship between cooperation and task value but not with regard to cooperation and self-efficacy. The positive influence of the learning environment construct of cooperation on students' motivation in my study was not surprising given the emphasis, at the time of my study, on cooperative learning strategies within the Cycle 2 science curriculum. Even in classes with teachers not yet identified as teaching cooperative learning effectively, there may well have been a greater awareness of cooperative behaviour due to this emphasis. This circumstance may be a reason why the cooperation/motivation relationships in my study differed from those of Velayutham and Aldridge (2013), and Alzubaidi, Aldridge, and Khine (2016).

Involvement and Motivation

Contrary to expectation, involvement had a statistically significant influence on only one motivational variable in my study—task value (p<.05). This finding infers that students' level of involvement influenced their motivation only in terms of seeing the learning tasks as valuable. It is possible that the items in this scale were interpreted differently to what was intended, despite efforts prior to the administration of the survey, designed to ensure that all students had a clear understanding of all items within each scale. The Arabic cohort constituting the sample for my study had predominantly been exposed to traditional teaching methods where students' involvement largely took the form of answering questions. This experience may have influenced students' conceptualisation of the items in the involvement scale, resulting in weaker than expected associations between students' perception of involvement and motivation towards learning.

Other studies have reported similar findings with regard to the limited influence of involvement on motivation. For example, in a study that involved the SALES instrument, Velayutham and Aldridge (2013) found that involvement had a statistically significant relationship with self-efficacy, but not with the other motivation constructs being investigated; learning goal orientation, and task value. Interestingly, Alzubaidi et al. (2016), also using the SALES, found that involvement had a statistically significant and negative influence on students' learning goal orientation and no significant influence on task value or self-efficacy. This finding suggests that the more involved the students felt, the lower their learning goal orientation. Afari et al. (2013)

found that involvement had no influence on students' academic efficacy or enjoyment of mathematics.

Despite the mixed results found in past studies, there are studies that have found a statistically significant relationship between the learning environment construct of involvement and motivation (Bi, 2015; Opolot-Okurut, 2010; Seng & Fraser, 2008) as well as attitude and/or enjoyment (Adamski et al., 2013; Allen & Fraser, 2007; Fraser, Aldridge, & Adolphe, 2010; Helding & Fraser, 2013; Ogbuehi & Fraser, 2007; Wolf & Fraser, 2008). Given the varied findings concerning the associations between students' perception of involvement in learning and motivation, it is recommended that future researchers examine this relationship more closely (*Recommendation 7*).

Student Cohesiveness and Motivation

The lack of relationship between the learning environment construct of student cohesiveness and the motivational variables found in my study was surprising. Given the focus on cooperative learning within at least half of the classes in my study, it was assumed that this focus would have facilitated student cohesion. The findings within other studies (Adamski et al., 2013; Alzubaidi et al., 2016; Chionh & Fraser, 2009; Fraser, Aldridge, & Adolphe, 2010; Martin-Dunlop & Fraser, 2008; Taylor & Fraser, 2013) as well as the cooperative learning emphasis theoretically being present in half of the classrooms in my study, suggest that student cohesiveness should have had a significant influence on students' motivation.

In considering why the relationship between student cohesiveness and motivation was not significant in my study, it is possible that the team selection process that was used as part of the Cooperative Learning and Assessment strategy may have influenced this result. An aspect of the cooperative learning strategies utilised within the classes in my study was self-selected teams (Lowe, 2004; see Section 1.1.3, and Appendix 1). The idea of student selected teams is a controversial one. While Kagan (1994) suggests there are several effective ways to select teams, including student selection, he also acknowledges that teacher assignment of teams has benefits. Other researchers suggest that problems with team selection are frequently caused by not enough coaching and strategies put in place to maintain effective teams (Hansen, 2006; Sashittal, Jassawalla,

& Markulis, 2011). Given the potential problems attributed to team selection, this may have had an influence on student cohesion within the classrooms that comprised the sample in this study.

Another consideration, with regard to there being no significant relationship between student cohesiveness and motivation in my study, is that students' peer orientation may have influenced their perceptions of student cohesion in classes with teachers identified as effectively implementing cooperative learning. Hancock (2004) found that students with a high peer orientation viewed working cooperatively much more favourably than students with a low peer orientation. The peer orientations of students was not investigated in my study, but it would be worth examining this relationship more closely in future research to further understand the relationship between cooperative learning and students' perception of social cohesion in the learning environment (*Recommendation 8*).

Students' perception of social cohesion within the learning environment may have also been influenced by their goal orientation. Levy et al. (2004) found that students identified as having a learning goal orientation, while expressing a preference for working collaboratively with good friends, were also prepared to cooperate with students who were not their friends in order to facilitate student cohesion. While it was found in my study that students' perception of student cohesiveness within their classroom did not influence their motivation, it is possible that students' goal orientation may have influenced their perception of social cohesiveness within the learning environment.

It is noted that, although the first hypothesis of my study was that the learning environment would influence motivation, there have been studies that have found a reciprocal relationship between motivation and perceptions of the learning environment (Bi, 2015; Oga-Baldwin et al., 2017), supporting the bi-directional elements of social cognitive theory (Bandura, 1977). For example, Oga-Baldwin et al. (2017, p. 140) found a "positive, dynamic relationship between motivation, perceptions of the learning environment, and engagement." In another study, Bi (2015) used an adapted form of the WIHIC to investigate associations between the learning environment and English language learners at a university in China. It was found that the learning environment and motivation mutually affected each other. Future research investigating motivation – learning environment associations would benefit from viewing the interaction of these relationships from a bi-directional rather than a uni-directional perspective (*Recommendation 9*).

6.1.3.2 Hypothesis 2: The influence of the Learning Environment on Self-Regulation

In my study, the learning environment did not have a statistically significant influence on students' self-regulation. This finding was not entirely unexpected as other studies have reported differing results with regard to the influence of learning environment constructs on students' self-regulation of effort (Chipangura & Aldridge, 2017; Velayutham et al., 2013; Velayutham & Aldridge, 2013). For example, in Chipangura and Aldridge's (2017) study, the only learning environment constructs that were found to have a statistically significant and positive influence on self-regulation were involvement and task orientation (only one of which—involvement—was a construct used in my study). Interestingly, in Chipangura and Aldridge's (2017) study, student cohesiveness was found to have a statistically significant ($p < 0.05$) and negative influence on students' self-regulation, suggesting that increased student cohesion resulted in decreased levels of self-regulation. In another study, Velayutham and Aldridge (2013) found only three learning environment constructs influenced self-regulation: student cohesiveness, investigation, and task orientation. Exceptions to these findings include Alzubaidi et al.'s (2016) study where a statistically significant and positive relationship was reported between self-regulation and all but one of the learning environment scales in the WIHIC, that of cooperation. Other researchers, such as Agina, Kommers and Steehouder (2011), suggest that context (learning environment) is a key factor in self-regulation. The mixed findings with regard to the impact of the learning environment on students' self-regulation found in the literature suggest that more research is needed in this area, particularly with regard to how students' self-regulation may influence their perceptions of the learning environment (*Recommendation 10*).

6.1.3.3 Hypothesis 3: The Influence of Motivation on Students' Self-Regulation

It was hypothesised that the motivation constructs used in my study—learning goal orientation, task value, and self-efficacy—would influence students' self-regulation of effort (see Figure 3.1). The statistically significant ($p < 0.001$), positive relationship between each of the motivation constructs and students' self-regulation of effort confirmed this hypothesis. This finding corroborates other studies in the literature that found motivation and self-regulation to be closely linked (Hijzen et al., 2007; Pintrich, 2003b; Schunk & Zimmerman, 2007; Wolters, 2010; Zimmerman, 2002).

In my study, the motivation construct of self-efficacy was found to have the strongest influence on self-regulation. This finding supports the findings of other researchers with regard to self-efficacy being a strong predictor of self-regulation of effort within classrooms (Bandura, 1991; Boekaerts & Cascallar, 2006; Dweck & Master, 2008; Pintrich & De Groot, 1990; Pokay & Blumenfeld, 1990; Schunk, 1996; Schunk & Ertmer, 2000; Zimmerman & Martinez-Pons, 1990; Zimmerman & Schunk, 2008).

The finding in my study that learning goal orientation had a statistically significant ($p<0.001$) and positive influence on students' self-regulation of effort, corroborates similar research findings with regard to the relationship between learning goal orientation and self-regulation (Alzubaidi et al., 2016; Chipangura & Aldridge, 2017; Schunk & Ertmer, 1999; Schunk & Zimmerman, 1996; Velayutham et al., 2013; Velayutham & Aldridge, 2013; Velayutham et al., 2011, 2012; Zimmerman & Kitsantas, 2014).

6.1.4 Research Objective 4: Differences in Motivation, Self-Regulation, and Learning Environment Perceptions

The final research objective of my study was to investigate whether differences exist in students' motivation towards learning, self-regulation, and perceptions of the learning environment for students in classes with teachers identified as effectively implementing cooperative learning practices and students not in such classes. As a result of the educational reform that the Abu Dhabi Education Council (ADEC) was undergoing at the time of my study, cooperative learning strategies were expected to be implemented within all Cycle 2 (middle school) science classrooms (as explained in Chapter 1, Section 1.1.3). This circumstance provided an opportunity to study the impact of cooperative learning on students' motivation, self-regulation, and perceptions of the learning environment.

Data were collected from two groups of students (N=338): one group (n=175) in classes with teachers identified as effectively implementing cooperative learning practices and another group that were not in such classes (n=163). The statistical significance of the differences between the two groups was measured using one-way multivariate analysis of variance (MANOVA) and ANOVA. In addition to establishing whether there was a difference between groups, effect size was used to establish the magnitude of these differences.

The findings indicated that there were statistically significant differences between the two groups. Students in classes with teachers identified as effectively implementing cooperative learning strategies reported higher levels of motivation towards learning, self-regulation, and more positive perceptions of the learning environment than students not in such classes. Key findings are summarised below.

- The average item means for the four SALES scales were all higher for students in classes with teachers identified as effectively implementing cooperative learning compared to students who were not in such classes.
- Statistically significant differences were found between the two groups with regard to the motivation scales utilised in this study: self-efficacy (p<0.01); task value (p<0.05); and learning goal orientation (p<0.05). Students in classes with teachers identified as effectively implementing cooperative learning strategies reported higher levels of motivation compared with those not in such classes.
- The effect sizes for the differences were large, and of educational significance, for all motivation constructs: learning goal orientation (effect size of 0.88 standard deviations); task value (effect size of 0.83 standard deviations); and self-efficacy (effect size of 0.91 standard deviations).
- Statistically significant differences were found between the two groups with regard to the self-regulation scale (p<0.01). Students in classes with

teachers identified as effectively implementing cooperative learning strategies reported higher levels of self-regulation compared to their counterparts.

- The effect size for the differences between the two groups with regard to self-regulation was large (effect size of 0.92 standard deviations).
- Statistically significant differences were found between the two groups with regard to the learning environment scales of teacher support, involvement, and cooperation ($p<0.05$), with students in classes with teachers identified as effectively implementing cooperative learning strategies perceiving the learning environment, as assessed by those scales, more positively than their counterparts.
- There was no statistically significant difference between the two groups with regard to students' perceptions of student cohesiveness.
- The effect sizes for the differences between the two groups were large for three learning environment constructs: teacher support (effect size = 0.99 standard deviations); and involvement and cooperation (effect sizes = 0.88 standard deviations). The effect size was moderate for the learning environment construct of student cohesiveness (effect size = 0.54 standard deviations).

The findings of my study corroborate other studies that investigated the impact of cooperative learning, finding that cooperative learning contexts resulted in increased levels of motivation (Can & Boz, 2016; Fernandez-Rio, Cecchini, et al., 2017; Fernández-Ballesteros, Díez-Nicolás, Caprara, Barbaranelli, & Bandura, 2002; Hancock, 2004; Hanze & Berger, 2007; Hijzen et al., 2007; Nadrah et al., 2017; Razak, 2016; Slavin, 1995, 1996; Umemoto & Yada, 2016); self-regulation (Arjanggi & Setiowati, 2014; Fernandez-Rio, Cecchini, et al., 2017; Fernandez-Rio, Sanz, et al., 2017; Grau & Whitebread, 2012; Mentz & Van Zyl, 2016), as well as more positive perceptions of the learning environment (Fernandez-Rio, Sanz, et al., 2017; Hanze & Berger, 2007; Hijzen et al., 2007; Premo, Cavagnetto, Davis, & Brickman, 2018).

The magnitude of the difference between the two groups, with regard to the three motivation constructs used in my study, corroborates similar findings in past research investigating the impact of cooperative learning on motivation. As with my study, cooperative learning was found to increase: self-efficacy (Hanze & Berger, 2007; Nichols, 1996; Umemoto & Yada, 2016); learning goal orientation (Can & Boz, 2016; Hijzen et al., 2006; Kim et al., 2015; Kim et al., 2012; Law, 2011; Nichols, 1996; Nichols & Miller, 1994; Ning & Hornby, 2014); and task value (Nichols, 1996; Umemoto & Yada, 2016).

One reason for the increased levels of motivation and self-regulation in classes with teachers identified as effectively implementing cooperative learning practices may have been due to the presence of two elements of successful cooperative learning, deemed by leading cooperative learning theorists as essential (Johnson & Johnson, 2009; Kagan, 1989; Sharan, 2010; Slavin, 1996). These two elements are positive interdependence (the success of the individual is reliant on the success of the whole) and individual accountability (being accountable for one's own actions and achievement as well as that of the group as a whole). Both of these elements have been found to increase motivation and self-regulation (Johnson et al., 2014). While cooperative learning implementation was an emirate-wide expectation within government school Cycle 2 science classrooms in Abu Dhabi, it was not yet being consistently or effectively implemented. This resulted in many classroom environments continuing to reflect traditional teaching practices. It is, therefore, possible that the magnitude of the difference in motivation and self-regulation in classes with effectively implemented cooperative learning strategies, was as a result of positive interdependence and individual accountability being present.

While students in classes with teachers identified as effectively implementing cooperative learning strategies had statistically significant and positive reports of self-efficacy in my study ($p=<.05$), the dynamics of academic efficacy within cooperative learning groups appear to be complex, and it is not clear from the results in my study as to what specific efficacy dynamics were in play. For example, a problem in poorly managed cooperative groups is that students with high levels of self-efficacy can dominate group discussions (Salonen, Vauras, & Efklides, 2005), resulting in the reduction of other group members' self-efficacy and self-regulation. This problem may have occurred in classes where cooperative learning was not being implemented effectively, which may have subsequently impacted on students' self-efficacy within those classes.

Further, there appears to be a strong relationship between self-efficacy and collective efficacy (Fernández-Ballesteros et al., 2002; Wang & Lin, 2007). That is, high levels of self-efficacy among students within a group are likely to result in a higher sense of collective efficacy. It is possible, therefore, that the higher levels of self-efficacy reported in classes with teachers identified as effectively implementing cooperative learning strategies, was as a result of individual-collective efficacy associations, and not because of the cooperative learning strategies themselves. This possibility has implications with regard to group selection. For example, Wang et al. (2007) recommend that teachers wanting high levels of efficacy among collective groups should ensure that there is at least one member in each group with high self-efficacy. As described in Chapter 1, Section 1.1.3, group selection, within the context of my study, was expected to be student driven. The way the groups were organised may have impacted the individual and collective efficacy dynamics within cooperative learning groups. It is recommended, therefore, that further investigation into the dynamics of self- and collective efficacy be an area of future research (*Recommendation 11*).

In my study, students in classes with teachers identified as implementing effective cooperative learning practices reported higher levels of self-regulation compared to their counterparts, who were not in such classes. This finding was not entirely surprising, as it is necessary in cooperative learning situations for students to “self, co, and share-regulate their learning” (Fernandez-Rio, Cecchini, et al., 2017, p. 2). Working cooperatively within a team, rather than relying on the teacher, may more readily foster self-regulatory behaviours, such as: organising information; assigning value to an activity; initiating learning activities; motivating themselves to get started; engaging in goal-directed tasks; and sustaining effort until the task is completed (Boekaerts & Cascallar, 2006; Fernandez-Rio, Cecchini, et al., 2017).

Students in classes with teachers identified as effectively implementing cooperative learning strategies reported more positive perceptions of their learning environment than those in classes that did not have such teachers. For example, students in these classes perceived higher levels of teacher support than their counterparts. This finding is interesting, considering that in these classes, students are likely to have spent more time working and learning together and less time listening to the teacher, compared to students not in such classes. The higher levels of perceived teacher support reported from these students could be due to the high levels of teacher support required to implement effective cooperative learning strategies. Teachers in these classes would likely have been required to provide high levels of support to ensure that cooperative learning was working effectively, particularly as it was a new instructional approach. This support may have included questioning to ensure conceptual understanding was occurring (particularly as the teacher was no longer the sole provider of content information), providing positive feedback with regard to working as a team, and generally providing high levels of encouragement.

Students in classes with teachers identified as effectively implementing cooperative learning strategies reported more positive perceptions of involvement and cooperation than their counterparts. It is possible that students in these classes felt more confident about raising questions, discussing ideas, and generally being involved in the learning dynamics within the classroom, due to increased levels of collective efficacy being present in their cooperative learning groups. Increased perceptions of cooperation among students in classes with teachers identified as effectively implementing cooperative learning strategies, compared to students not in such classes, is logical considering the focus on cooperative strategies and behaviour likely to have been present in those classes. The items within the cooperation scale in the WIHIC instrument directly refer to behaviours that would have been necessary when working in effective cooperative learning groups, such as working with and learning from others, sharing resources, and working to achieve goals.

Similar to the findings with regard to the learning environment construct of social cohesiveness having no significant influence on students' motivation or self-regulation, there was no statistically significant difference between the two groups with regard to perceptions of social cohesion within the respective classes. This finding was unexpected, as the demands of working cooperatively were expected to have required greater levels of social cohesion. However, as discussed previously, the way in which the groups were selected may have had a bearing on students' perceptions of social cohesion. If students in classes with teachers identified as effectively implementing cooperative learning strategies were not able to self-select groups as recommended, they may have resented working collaboratively with students with whom they were not friends and, correspondingly, replied negatively on items in this scale. This finding, contradictory to other studies (Alzubaidi et al., 2016; Chipangura & Aldridge, 2017; Velayutham et al., 2013; Velayutham & Aldridge, 2013), remains a puzzling one and would require further investigation to clarify its cause.

Overall, the results with regard to the examination of differences between students' motivation towards learning, self-regulation, and perceptions of the learning environment, indicate that students in classes with teachers identified as effectively implementing cooperative learning had higher levels of motivation, self-regulation, and more positive perceptions of their learning environment than did students who were not in such classes.

In the above section, the results pertaining to the four research objectives of my study were discussed and compared with research. The educational implications of these findings are discussed in Section 6.2.

6.2 Educational Implications of the Study

The findings of my study have educational implications for a range of stakeholders, particularly the Abu Dhabi Education Council (ADEC). A primary goal of the ADEC reform was to improve students' achievement (Abu Dhabi Education Council, 2009; 2012). It is has been well established in the literature that motivation and self-regulation influence achievement (Bereby-Meyer & Kaplan, 2005; Dignath et al., 2008; Hacieminoglu et al., 2009; Kitsantas et al., 2009; Lauriola et al., 2015; Roeser et al., 1996; Schmitt et al., 2015; Zimmerman, 2008), and that perceptions of the learning environment have a significant impact on student outcomes (Fraser, 2012). The finding in my study that there was a positive association between learning environment perceptions, motivation, and students' self-regulation suggests that the more positive students' perceptions of their learning environment becomes, the more motivated they are likely to be, which could, in turn, increase their levels of self-regulation; subsequently improving student outcomes, including achievement. Therefore, a consideration of students' motivation, self-regulation and learning environment perceptions beyond the scope of this study could improve student outcomes overall.

The statistically significant and positive influence of teacher support on all three of the motivational constructs used in my study supports substantial research that has found a positive association between teacher support and a range of student outcomes. This has implications for ADEC principals and teachers, who could reflect on and assess students' perceptions of teacher support in the classroom and, subsequently, make appropriate changes in teaching practice and behaviour to foster a positive learning environment, resulting in improved motivation.

My study supports previous research findings that students' perception of their learning environment influences their motivation towards learning. An implication for teachers and educational leaders is that an investigation of students' perceptions of their learning environment, using valid and economic measures such as those used in my study, could provide a wealth of useful information that could be used to improve many student outcomes, including motivation and self-regulation of effort (*Recommendation 12*).

The results of my study suggest that effectively implemented cooperative learning practices are likely to result in significant and positive improvements in students' motivation and self-regulation of effort. Given the positive association between motivation and self-regulation found in my study, as well as in past research, further resources, training, and professional development invested into cooperative learning practices may result in improved achievement outcomes in Abu Dhabi government school science classrooms (*Recommendation 13*).

Those responsible for policy development and curriculum reform within ADEC could use the outcomes of my study to inform decision-making with regard to the place of cooperative learning practices within other subjects in the ADEC curriculum. Further, my study could have educational implications with regard to educational policy and curriculum reform for other emirates in the UAE. The study could potentially influence the extent to which cooperative learning practices become incorporated within the curriculums of other emirates in the UAE.

An important implication of my study is that students in classes with teachers identified as effectively implementing cooperative learning had higher levels of motivation towards learning, self-regulation, and more positive perceptions of their learning environment than those students not in such classes. This finding would suggest that ADEC teachers with a desire to improve students' motivation, self-regulation, and learning environment perceptions, would do well to incorporate cooperative learning structures in their classroom programmes (*Recommendation 14*).

6.3 Limitations of the Study

My study, like any other, had limitations that need to be acknowledged when considering the significance of the findings and possible generalisation of the results. These limitations, largely with regard to the nature of the sample used in the study, are discussed and recommendations made for future research when applicable.

One limitation of my study was that the methodology was quantitative in nature and, as a result, causal explanations were not possible. As both quantitative and qualitative methods have limitations and strengths, it would be beneficial for future research to combine the strengths of both approaches in order to provide a deeper understanding of the relationships between the factors in the study (Creswell, 2014). For example, utilising observations would enable the examination of relationships between the perceived and the observed environment (Knight et al., 2014). Although time constraints for my study did not permit the collection of qualitative information, it is recommended that future studies adopt a mixed method approach to ensure sufficient breadth and depth of information (*Recommendation 15*).

Given the quantitative nature of my study, it was not possible to evaluate the extent to which teachers identified as effectively implementing cooperative learning in their classes had incorporated positive interdependence and individual accountability—essential pre-requisites of cooperative learning according to cooperative learning theorists (Johnson & Johnson, 1999; Sharan, 1980; Slavin, 1996). As such, the use of observations in future research would provide more informed conclusions to be drawn as to the efficacy of the cooperative learning practices present in the classrooms of these teachers (*Recommendation 16*).

There were three limitations with regard to the sample used in my study: the inclusion of only female participants; the sample size; and the grade levels included. These factors, which had a confounding effect on one another and were largely out of my control, are discussed below.

The first limitation regards the participants being female only. The reason that the study did not include male participants was logistical and resulted from the fourth research objective in my study: investigating whether there was a difference in students' motivation towards learning, self-regulation, and perceptions of the learning environment between classes with teachers identified as effectively implementing cooperative learning practices and classes that did not have such teachers. The teachers who had been identified as effectively teaching cooperative learning strategies were all female and hence, the students they taught were female[18]. To provide a more comparable sample, students in the remaining half of the sample were required to be female. Given that gender differences have been found with regard to students' perception of learning environment factors, such as teacher support (Katz, 2017), as well as finding that males and females may have different motivational beliefs (Herndon & Bembenutty, 2017), generalising the results to male students should be undertaken with caution. It is suggested that future studies of this nature would benefit from gathering data from both male and female populations (*Recommendation 17*).

The second limitation relates to the sample size. The limited number of teachers identified as effectively implementing cooperative learning in their classes, in turn limited the total sample size. The total sample size from the classes with teachers identified as implementing effective cooperative learning practices was 175 students. Due to both the need to have a representative sample, and the variance in individual class populations, the resulting sample size for classes that did not have such teachers was 163 students. The sample size placed limitations on the study in terms of data analyses, as it was not possible to use both exploratory and confirmatory factor analysis as the sample was too small to allow the data to be split for separate analyses. It is recommended, therefore, that future studies involve a larger sample size, if

[18] Once beyond kindergarten, all students in Abu Dhabi Government schools are taught by members of the same sex.

possible, to enable the use of both confirmatory and exploratory factor analysis (*Recommendation 18*).

The third limitation regarding the sample was the selection of students from different grade levels. In order to provide a representative sample, the study involved students from a range of grade levels. If the sample had been larger, it would have been possible to carry out data analyses to investigate whether changes in perceptions of the learning environment could have been attributed to grade level. Given that differences in motivation towards learning and learning environment perceptions have been found to vary over grade levels (Wentzel et al., 2010), it is recommended that future studies investigate grade level differences in motivation, self-regulation, and learning environment perceptions (*Recommendation 19*).

6.4 Recommendations for Future Research

It is an inevitable and valuable by-product of engaging in research that the current study becomes a springboard from which other research pathways could be launched. As a result of embarking on this research, consideration has been given to other research that could extend the findings of my study in the future. Possible directions for future research are discussed in this section.

There have been a small number of studies investigating learning environment–student outcome associations in Middle Eastern cultures, such as: investigating students' perceptions of science and mathematics learning environments in Qatar (Knight et al., 2014); examining the actual and preferred learning environments of student teachers in the UAE (MacLeod & Fraser, 2010); motivation, self-regulation, and learning environment perceptions of university English language learners in Jordan (Alzubaidi et al., 2016); and university students' perceptions of a mathematics learning environment and attitudes in the UAE (Afari, 2013; Afari et al., 2013). Cetin-Dindar (2016), in her study of motivation and perceptions of the learning environment amongst elementary students in Turkey, found that motivation actually decreased in a constructivist learning environment. Cetin-Dindar suggests this may have been because Turkish schools were not used to active learning as found within constructive environments. Rich research opportunities remain to further investigate cultural influences on learning environment–outcome associations as well as the influence of culture on learning environment perceptions, particularly within elementary, middle, and high-school contexts in the Middle East (*Recommendation 20*).

There is important new research investigating the responses and attitudes of Arab teachers in the UAE to educational reform and the resulting professional development as a consequence of this reform (McChesney, 2017; Von Oppell & Aldridge, 2015). It was my experience, and has been the experience of other researchers (Knight et al., 2014; McChesney, 2017; Von Oppell & Aldridge, 2015), that many Arab teachers and educational leaders within Gulf nations, such as the UAE and Qatar, have struggled with implementing educational innovations, such as cooperative learning, that are part of educational reform. Although an investigation of teachers' perceptions of the cooperative learning environment was beyond the scope of my study, future research, examining Arab science teachers' perceptions of the cooperative learning environment in Abu Dhabi government schools, would help to understand the impact of this educational innovation (*Recommendation 21*).

Cooperative learning has been widely established as having a generally positive influence on a range of learning outcomes (Johnson & Johnson, 2009), but most studies (reviewed in Chapter 2) have been situated within a Western context. There is much work to be done with regard to investigating the impact of cooperative learning in Arabic cultures. In government schools in the UAE, a social strata exists that may influence not only cooperative learning dynamics but also students' motivation, self-regulation, and perceptions of the learning environment. A particularly interesting aspect to consider would be the influence of cultural status on cooperative learning dynamics within the UAE and, possibly, other Middle Eastern classrooms.

The SALES instrument was designed with inclusivity and economy in mind (Velayutham et al., 2011). In order to better accommodate for the cooperative learning setting, future studies could deconstruct self-efficacy, goal orientation, and self-regulation to include: collective efficacy (Fernández-Ballesteros et al., 2002; Wang & Lin, 2007); more complex goal orientations, such as self-determination goals and social goals (Dowson & McInerney, 2001; Hijzen et al., 2006); and co-, shared, and socially constructed self-regulation (Grau & Whitebread, 2012; Järvelä & Järvenoja, 2011), respectively. Future research could provide further insight into the more complex nuances within these motivational constructs, although addressing the manageability of such measures could be a challenge.

Slavin (2015), a seminal researcher with regard to cooperative learning, has suggested that "further research [is] needed to advance cooperative learning scholarship" (p. 5), and this has been echoed by Casey and Goodyear (2015). One such research area could be to investigate the influence of peer orientation on motivation and achievement in cooperative learning contexts. Researchers have found that students with high peer orientations were significantly more motivated to learn and had higher levels of achievement than students with low peer orientation, although the difference was not significant (Hancock, 2004). Hijzen et al. (2006) found that students with high peer orientation rated the quality of cooperative learning practices more highly than students with low peer orientations. The relationship between cooperative learning, peer orientation, and motivation would benefit from further research.

6.5 Summary of Recommendations

Recommendation 1: The SALES instrument was translated and validated for use for the first time in the UAE and the first time with middle school students with Arabic as their first language. It is recommended that future research utilises this instrument to investigate Arabic-speaking students' motivation and self-regulation in a range of subjects and educational levels (see Section 6.1.2.1).

Recommendation 2: It is recommended that the anomaly in my study, concerning the inability of the involvement scale in the modified WIHIC instrument to differentiate between classes, is more closely examined in future research (see Section 6.1.2.2).

Recommendation 3: It is recommended that future research investigating teacher support/task value associations be undertaken as there is a scarcity of research examining this learning environment–motivation relationship (see Section 6.1.3.1).

Recommendation 4: The surprisingly inconsistent findings concerning the relationship between teacher support and self-efficacy associations as found in the literature suggest that more research should be conducted exploring these relationships (see Section 6.1.3.1).

Recommendation 5: Teacher behaviour is an important element of the psychosocial learning environment, and it is recommended that further research be conducted to investigate the range of teacher behaviours, beyond that of teacher support (see Section 6.1.3.1).

Recommendation 6: It is recommended that students' perception of peer relationships and the subsequent impact on motivation and self-regulation be further investigated (see Section 6.1.3.1).

Recommendation 7: It is recommended that further research be undertaken to investigate the associations between students' perception of involvement in the classroom and their subsequent motivation (see Section 6.1.3.1).

Recommendation 8: It is recommended that further research be conducted with regard to students' peer orientation and its impact on student cohesion in the cooperative learning classroom (see Section 6.1.3.1).

Recommendation 9: It is recommended that future research investigating learning environment–outcome associations do so from a bi-directional, rather than uni-directional perspective (see Section 6.1.3.1).

Recommendation 10: It is recommended that further research be undertaken with regard to the interplay between the learning environment and students' self-regulation, particularly with regard to how students' self-regulation influences their perceptions of the learning environment (see Section 6.1.3.2).

Recommendation 11: It is recommended that further research be conducted with regard to the impact of self- and collective efficacy dynamics on group dynamics, motivation, self-regulation, and perceptions of the learning environment (see Section 6.1.4).

Recommendation 12: It is recommended that teachers and educational leaders make use of valid and economical learning environment instruments, such as the one used in my study, to assess students' perceptions of the learning environment because this assessment is likely to yield valuable information that could support the improvement of a range of student outcomes, including motivation and self-regulation (see Section 6.2).

Recommendation 13: It is recommended that the Abu Dhabi Education Council (ADEC) invest further resources, training, and appropriate professional development to ensure that more teachers have the support they need to effectively implement cooperative learning practices as a means of improving students' motivation and self-regulation (see Section 6.2).

Recommendation 14: It is recommended that ADEC principals and teachers wanting to improve students' motivation and self-regulation consider incorporating cooperative learning strategies within the classroom (see Section 6.2).

Recommendation 15: It is recommended that qualitative methods be combined with the quantitative methodology of my study as a combination of the strengths of both approaches would provide a deeper understanding of the relationships between the factors in the study (see Section 6.3).

Recommendation 16: It is recommended that future research investigating students' motivation, self-regulation, and perceptions of the learning environment in cooperative learning contexts use observations and other appropriate measures to establish whether the elements of positive interdependence and individual accountability are present during cooperative learning (see Section 6.3).

Recommendation 17: It is recommended that future research investigating motivation, self-regulation, and perceptions of the learning environment in the UAE should, if possible, gather data from both male and female sample populations to both ensure greater generalisability, and compare differences (see Section 6.3).

Recommendation 18: It is recommended that future studies ensure that the sample size is sufficient to allow confirmatory factor analysis to be conducted to with regard to further substantiating the validity of the WIHIC and SALES questionnaires (see Section 6.3).

Recommendation 19: It is recommended that future studies investigate grade level differences in motivation, self-regulation, and perceptions of the learning environment (see Section 6.3).

Recommendation 20: It is recommended that future research exploring learning environment–outcome associations in Middle Eastern contexts investigate cultural influences on these associations, as well as the impact of these influences on students' motivation, self-regulation, and perceptions of the learning environment (see Section 6.4).

Recommendation 21: It is recommended that future research examine Arabic teachers' perceptions of the cooperative learning environment as well as other educational innovations being implemented as a result of educational reform (see Section 6.4).

6.6 Significance of the Research

It is hoped that my study will have value for a range of educational stakeholders. However, it makes a particular contribution to the educational reform taking place within Abu Dhabi. The significance of the findings within my study is discussed from three perspectives in terms of: the contribution made to teachers working in Abu Dhabi government schools (Section 6.6.2); the broader contribution of my study towards the ADEC educational reform (Section 6.6.3); and the theoretical and methodological contributions of my study (Section 6.6.4).

6.6.2 Contribution to Teachers Working in Abu Dhabi Government Schools

The results of my study have significance for science teachers working in Abu Dhabi government schools in several ways. While the findings of my study are directly applicable to science teachers, it is possible that they may also be of use for teachers of other subjects. First, teachers will have access to two bi-lingual and economical questionnaires in Arabic and English that have been utilised in the same educational context and culture: The SALES questionnaire (to assess students' motivation towards learning science and their self-regulation of effort) and the WIHIC questionnaire (to assess students' perceptions of their learning environment). These instruments can provide teachers with a snapshot of how students perceive their learning environment as well as subsequent influences that these perceptions may have on motivation. The ability to gather data on students' viewpoints has significance for teachers in Abu Dhabi government schools who have not previously had access to such measures. Second, the positive impact that effective cooperative learning had on students' motivation, self-regulation, and perceptions of the learning environment in my study, has significance for teachers wanting to improve students' motivation and self-regulation in their science classrooms; motivated, self-regulated students are likely to have improved achievement outcomes (Harackiewicz et al., 2000).

The findings of my study have further practical significance for teachers. The learning environment constructs of teacher support and cooperation, found in my study to have a positive influence on motivation, are specific and tangible aspects of the psychosocial learning environment that are within a teacher's ability to control. The findings in my study, that the level of teacher support given to students influenced their motivation, supports other similar studies, such as Furrer et al., (2014). Therefore, it is possible that adjustments and adaptations made to the levels of teacher support provided within the classroom may subsequently improve students' motivation. Similarly, as students' perceptions of the levels of cooperation within the learning environment influenced their motivation in my study, teachers could reflect on the level of cooperation within their classroom environment and make changes as necessary.

In addition, the finding that students in classes with teachers identified as effectively implementing cooperative learning strategies had higher levels of motivation, self-regulation, and more positive perceptions of their learning environment than students not in such classes, is of significance to teachers wanting to improve student outcomes. The strong association between the affective outcomes of motivation, self-regulation, and achievement found in the literature (Cox & Whaley, 2004; Denissen et al., 2007; Kitsantas et al., 2009) suggests that not only will affective outcomes such as motivation increase through cooperative learning but possibly achievement outcomes as well.

6.6.3 Contribution to the ADEC Education Reform

International results indicate that the achievement levels of students in Abu Dhabi in science, mathematics, and literacy are below expectations (Mullis, Martin, Foy, & Arora, 2012; Mullis, Martin, Foy, & Drucker, 2012). The finding in my study, that students' perception of the learning environment influenced students' motivation in science classes, implies that attention should be paid at a policy and curriculum level to learning environment culture within Abu Dhabi government schools. Subsequently, changes could be made to the psychosocial environment in order to promote students' motivation towards learning in all subjects.

The results of my study can inform the Abu Dhabi Education Council as to the impact of cooperative learning, one of the educational innovations being implemented in Abu Dhabi government schools Cycle 2 (middle school) science classes at the time of my study. Given the poor educational outcomes that contributed towards the introduction of the education reform in the UAE (Martin et al., 2012; Mullis, Martin, Foy, & Arora, 2012; Mullis, Martin, Foy, & Drucker, 2012), research that can evaluate the impact of any aspect of this reform on students' learning outcomes has significance. Students in classes with teachers that had been identified as implementing cooperative learning effectively had greater motivation, self-regulation, and more positive perceptions of their learning environment than students not in such classes. The educational importance of these findings, as established through the magnitude of effect sizes found in the results of my study, has significance for ADEC policy-makers and curriculum designers charged with improving achievement outcomes for Abu Dhabi students. This provides valuable information to ADEC with regard to the impact of cooperative learning on students' affective learning outcomes in science and suggests that cooperative learning strategies—if implemented effectively—are likely to improve students' motivation in other curriculum areas in addition to science.

While my study was situated within Abu Dhabi government schools, the findings therein are likely to be relevant for both other emirates in the UAE, as well as other Middle Eastern countries wanting to improve students' motivation and self-regulation in science and other subjects. Educational reform is taking place in the emirate of Dubai (Farah & Ridge, 2009) and other Gulf nations, such as Qatar (Knight et al., 2014; Qureshi et al., 2016). The findings from my study could be of use to these countries' education policy-makers when considering current or potential influences on students' motivation and self-regulation. In addition, the practical contribution my study makes to teachers within Abu Dhabi science classrooms could possibly be extended to other teachers, both in other emirates in the UAE, as well as in the wider region.

6.6.4 Theoretical and Methodological Contributions

While my study is situated within the educational context of Abu Dhabi, the findings nevertheless make a contribution to the fields of both learning environment and motivation. This research contributes to the literature as it extends previously limited research examining the relationship between motivation, self-regulation, and perceptions of the learning environment within science classrooms. Further, it fills a gap in the research as it investigates the associations between students' motivation, self-regulation, and learning environment perceptions within a cooperative learning environment.

My study has made a methodological contribution in three ways. First, it provides a reliable and validated Arabic version of the SALES instrument, suited to the UAE context, which can be used by researchers and educators to evaluate students' motivation and self-regulation in Middle Eastern middle school classrooms in a range of subjects. Second, it is the first study to explore learning environment, motivation, and self-regulation associations within the one study in the UAE, using structural equation modelling. Third, it uses effect size to establish the magnitude of differences in motivation, self-regulation, and perceptions of the learning environment between classes with teachers identified as effectively implementing a cooperative learning strategy and classes that did not have such teachers. Using effect size is "a powerful tool for evaluating the practical importance of study findings" (Cook, Cook, & Therrien, 2018, p.1). Effect sizes evaluate the practical importance of research findings in a way that *p* values cannot because they do more than establish that an effect does exist and can explain the size of that effect (Cook et al., 2018; Fritz et al., 2012; Sullivan & Feinn, 2012).

In the above section, the impact of my study for a range of stakeholders has been discussed. First, the impact of my study was discussed in terms of its significance for teachers wanting to improve their students' motivation, self-regulation, and perceptions of the learning environment (Section 6.6.2). Second, the significance for Abu Dhabi Education Council policy-makers and curriculum designers in terms of both evaluating the impact of the cooperative learning innovation as well as informing future decision making was discussed (Section 6.6.3.). Finally, the theoretical and methodological contributions that my study makes were discussed in Section 6.6.4.

6.7 Concluding Remarks

The United Arab Emirates (UAE) has undergone a radical transformation in only 50 years; from an undeveloped nation to one of the richest countries in the world. Guided by the vision of its founder, Sheikh Zayed Bin Sultan Al Nahyan, education in the Abu Dhabi Emirate of the UAE has been subjected to an extensive and ambitious education reform, which continues to this day. The modernisation of the education system in the UAE has been built on a platform of Western educational theories, pedagogies, and practices, resulting in the introduction of many educational innovations unfamiliar to both students and Arab teachers within government schools. Within this context, my study provides exigent information with regard to how some of these educational changes are perceived by students within Abu Dhabi government schools and within science classes in particular.

Motivation to learn and the ability to self-regulate one's effort towards learning are crucial ingredients in any modern education system, regardless of where in the world that system may be. As the modernisation of Abu Dhabi's education system continues, information as to the impact of this modernisation on students' motivation and self-regulation, as well as information regarding how students perceive their changing classroom learning environment, such as found in my study, has merit.

The results of my study suggest that the way in which students perceive their learning environment influences their motivation. The findings imply that the more students feel supported by their teacher, the more cooperation they experience, and the more involved they feel in the learning dynamics of the classroom, the more motivated towards learning they will be. This information suggests that the modernisation of teaching and learning occurring in Abu Dhabi, incorporating constructivist pedagogy, is having a positive effect on students' motivation. Motivation, in turn, was found in my study to influence students' self-regulation of effort. It follows, therefore, that students in UAE classrooms exposed to a positive learning environment are more likely to be motivated and to engage in adaptive self-regulatory behaviour, which could, in turn, result in improved knowledge and skills.

Cooperative learning is an educational innovation that was being implemented within Cycle 2 (middle school) science classrooms at the time of my study. The teachers identified as implementing this strategy effectively within their science classrooms were a minority, despite the curriculum expectation that cooperative learning was to be the platform for engaging in science learning in grades 6 to 9. The finding that students in a cooperative learning environment had higher levels of motivation, self-regulation, and perceptions of their learning environment, suggests that this innovation, if effectively implemented, will result in positive educational outcomes for students learning science.

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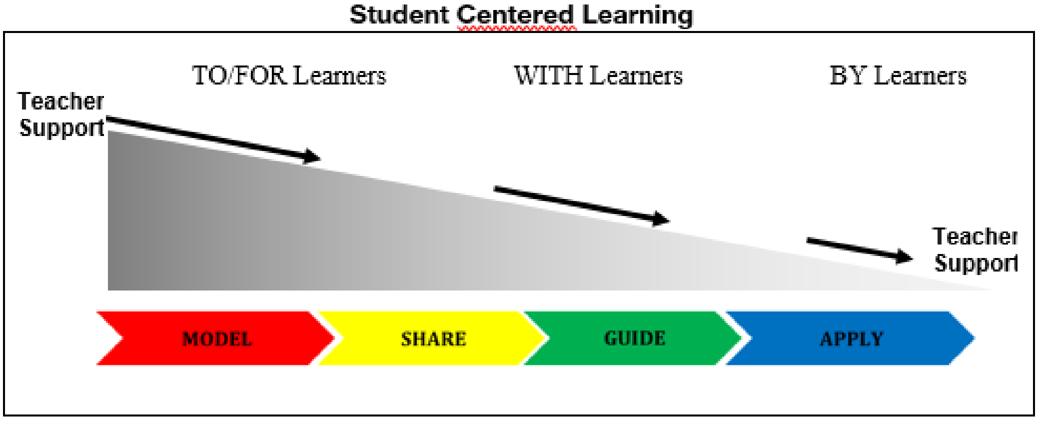
APPENDIX 1

Cooperative Learning and Assessment Strategy[19]

COLA
(Cooperative Learning and Assessment)

A Teaching Strategy:

Student Centered Learning



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Introduction

Background

COLA will be used extensively in cycle 2 and 3 Science subjects. The following material gives some background on protocols for team establishment, along with some strategies to help the team make good progress. We will refer to the 'groups' as 'teams' during this work.

Outline

The COLA approach is designed to improve student attitudes and learning outcomes. It is easy to implement in the secondary school classroom and has no impact on teacher workload or curriculum content. It has been extensively trialled over many years and the data collected with appropriate academic rigor shows a very positive effect on student attitudes.

Aims and Objectives

The following guidelines are a number of suggestions, which have been found to help the group enjoy working together more effectively, and gain more rewards both individually and as a learning team:

Protocol for Group Establishment and Organisation

Teachers will use the following guidelines in the setting up and operation of the groups within their classrooms. There will be plenty of opportunity to use any of the cooperative learning ideas from researchers such as the Johnsons and Kagan that have been used in this school. It is most important to ensure that these are kept simple and a have minimal impact on the individual teacher's workload.

Following the guidelines are a number of suggestions, which have been found to help the group enjoy working together more effectively, and gain more rewards both individually and as a learning team.

It is envisaged that the students will do the majority of their assessments in their groups but the end of year examination will be taken as individuals. Some written tests will be done as individuals, which can be diagnostic to track student progress.

Protocols for Group Establishment and Organisation

Student Instructions

1 Students are able to select their own group of preferably three but no more. The students usually select students of similar ability to work with which helps with task differentiation. Some teachers have selected the groups on ability as a first step. Teacher selected groups of one top student with two weaker ones does not work! Cycle 3 students can cope with four in a team.

2 They are to do all practical, fieldwork, assignments and tests working in these groups.

3 Each member of the group receives the same mark for tests, assignments, fieldwork and for any other assessment.

4 All work and assessment is essentially cooperative, students are encouraged to share the workload and enjoy working together, whether it is an assessed activity or a simple practical exercise.

5 Students will be instructed in suitable ways of ensuring that all group members participate and have a sense of ownership of the results. For example, tasks such as collecting and using equipment are always rotated to make sure that everyone has a turn. These 'roles' are defined as: Manager: Technician: Recorder/reporter, descriptions follow.

7 Students are instructed to ensure that each group member is given a specific task and that they are responsible for completing that task on time. The group then collates all of the contributions from each group member (this is often one member's task). The master assignment is marked and each member receives the same mark along with a copy of the final assignment

8 For written tests, students are arranged in their groups at the desks to allow them to work together with a minimum of contact with other groups. Eye contact should be possible among group members. Talk within the group is permissible but talk between groups is not. Answers are to be handed in and marked. All group members receive the same grade.

Teacher Instructions

1 There is essentially no change to the Curriculum content of the students' course of study.

2 It may be possible to include a few more strategies that are more suited to the cooperative group work approach such as investigations (both written and practical) and problem solving activities linked to the current topic.

3 Some groups would need more help in establishing good working relationships than others and teachers would need to try and ensure that all groups operate well. This is made easier by the fact that the whole group gets the tangible reward of grades in any assessment that they do together. Some group restructuring may be necessary if problems appear insurmountable, although such restructuring should be rare and a last resort

4 During written tests opportunity exists to help all groups with their approach to problems encountered during tests. This is not possible with a full class of students sitting tests as individuals. It is a good idea to treat the early tests, in particular, as a formative process and not just summative. One of the main thrusts is to improve student attitudes towards science and helping them with problem solving activities under test conditions is a good vehicle to help achieve this.

5 During written assignments and practical work students may need help in assigning tasks to each group member. It is important that these tasks are rotated throughout the group where possible to ensure a fair sharing of workload and a sense of worth among the group members.

Group Work Role Descriptions:

All Students will:
- Be active in achieving the group goal.
- Participate in group work
- Play a different role in each project based on teacher instructions
- Communicate appropriately with group members, other groups, and the teacher
- Be responsible for the team, for checking-up on each other, and helping each other out.

Roles: Manager: Technician: Recorder/reporter if there are only two students then the role of manager can be combined with Recorder/reporter

Manager:
- Diplomatically works with the group to break responsibilities with and amongst team-mates.
- Ensure that tasks are finished in appropriate time and guide team-mates to meet deadlines**
- Check all work over, prior to submission, with team-mates
- Generate a consensus within the group
- Ensure that all team members are actively participating

Technician:
- Lead the organization of the problem solving process and log this process
- Perform major parts of the experiment and lead data collection
- Share insights and new discoveries regarding course content and will reflect on the problem solving process.

Recorder:
- Keeps records of instructions, takes notes in collaboration with the team, what the team has completed.
- Prepares the final written report and documentation in consultation of the group.

Reporter:
- Represents the group
- Shares the groups ideas once the group has come to an agreement
- Represents the group in presentations and discussions
- Will fully understand the group's vision, methods, etc such that she can represent for the group without relying on the group in formal presentations or discussions (based on teacher instruction).

Time Manager: (Maybe taken by manager)
- Ensured tasks are completed in a timely fashion and guides team members on meeting deadlines
- Ensures Active participation of all team members during the lesson.

Group Responsibilities
Students are expected to take responsibility for their own learning and day to day organisation

Team Book

The team book is often a simple clear file or folder. It is kept at school and collected each day by a team member. It should contain:

1. A good team name on the front page of the team book and perhaps team photograph and a short biography of the team members.
2. A hard copy of the task
3. Complete daily contract sheet outlining "Learning Intentions" for their team that day this includes individual roles and attendance records.
4. Planning sheets (often A3 folded in half for the team book)
5. Useful reference material, newspaper cuttings etc.
6. Assessments and reports from the teacher or other teams in the case of peer assessment.
7. Reflections by students at the end of units are also to be encouraged.
8. Teachers can check the team books on a regular basis.

Team sign on

Once teams are established a daily sign on at the white board helps them take responsibility, use a permanent marker or a laminated card for use with a white board marker.

am	Date r team	
1	✓ ✓ ✓	
2	✓ ✓ la	
3	✓ ✓ ✓	
4	✓ ✓ ✓	

- Team sign in on white board ie 10 slots for team members to record each member present as a tick and write the names of anyone who is absent
- The duty team can have extra responsibility such as handing out equipment, running a quiz etc.
- A running points tally for short quizzes, exemplary work, helping others etc. can be for entire unit.

Skills are the Key!

<u>Skills Each Group Will Be Assessed on.</u>

Inquiring and Experimenting

Evaluating and Reflecting

Understanding and Analysing

Creating

Handling and

Participating

Remembering

Implementation Strategies

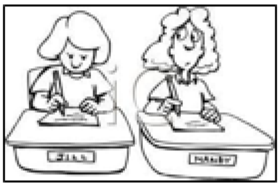
League Tables and Group Names

- The students certainly enjoy naming their group or learning team and come up with some imaginative titles.
- A natural extension of this is the introduction of 'league tables' where each groups place is listed on a chart in rank order.
- The groups are given a mark according to their place in each event (any task that is marked) such as 10 for first and 1 for last.
- The teacher can set up tasks such as a practical activity and the first group with the correct response(s) provided to the teacher receives the top mark and so on.
- If there is a range of tasks, every group will have an opportunity for their moment of glory. Students enjoy this aspect of their group work and even the lower ranked students enjoy the chances they get.
- They are working together to achieve more but not on their own. An example of a league table is available at the end of this section.

Review Testing

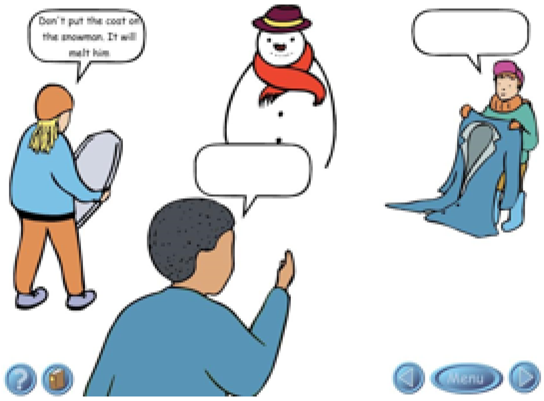
- After students have completed a test, going over of the answers is often seen as a waste of time by students yet teachers know that reviewing where you have gone wrong in a test is very important as we learn from our mistakes.
- One of the strategies introduced to help this and build the teamwork is the review test.
- Groups are returned their test scripts with their marks including those questions to which they have incorrect responses.
- They can then be given class time to do the questions that were wrong (open book perhaps or home work).
- These are resubmitted and remarked. The group then is given an average of the first and second marks.
- This strategy has been very successful and students enjoy having the opportunity to increase their group mark.
- The increased cooperation and opportunity to learn more as they try for more marks has proved to be worthwhile.
- The teacher does have to re-mark the tests but it is reduced the second time and since there are only 9 or 10 scripts in a class this is still less onerous than tests taken by individuals.

Unit Review and Student Test Design



- Teaching students how to revise for tests is an aspect of teaching often not given the priority it deserves and working on this in teams enables the students to talk among themselves and establish what in fact the key points are in a particular unit.
- They can use resources such as their notes, texts, prescribed SLO's, and of course the teacher.
- A unit summary can be presented for the group to use using mind mapping techniques.
- Student designed tests are also an effective way to help understanding of important parts of a unit.
- One way of doing this is to give each group part of a topic on which to make up a question (the time and mark value needs to be prescribed by the teacher).
- The questions from each group are then collated and the test taken in groups. The natural extension of this is for each group to mark the scripts from the rest of the class for their question and then collate the final result.

Concept Cartoons



- The use of argumentation in science through concept cartoons has proved to a valuable tool for use in cooperative group work and has been a regular part of science programmes for some time.
- Some excellent discussions among group members have led to a better understanding of concepts which students often find more difficult.
- Students and make their own concept cartoons in their teams after completing a unit. It is often fun to use their own photographs and 'PowerPoint' or 'Comic Life' software to add in their own speech bubbles. Can lead to student-designed experiments. http://www.angelsolutions.co.nz/products/concept-cartoons.htm

Who wants to be a millionaire?

- This is a very popular and fun format for teams to review units of work, rotate around the groups with 10 points for a correct answer, if they do not answer correctly open it to all teams, first team to volunteer gets 5 points for correct -5 for wrong response.
- If teams make up the questions they are not eligible to answer.

Debates

- These are very effective and encourage several teams to work together and a lot of fun.
- Can be done at the end of and inquiry.
- It is most effective if the formal debating protocols are followed, perhaps involve the English teachers.

General Guidelines: Implementing COLA

- Complete the getting to know you student profile sheet. Gives great info on student background and interests.
- Share (appropriate) some of your life history with students. They love it.
- Make sure that there are enough activities to keep every team member busy.
- Activities should have an appropriate level of scaffolding so that students of all levels can work independently.
- Do an **activity every period** right from the start that you can reinforce COLA expectations with (not always a practical)
- Wait 2-3 weeks before setting up permanent groups. Use 10 different coloured cards (3 of each) and randomly select groups for the first 3 weeks so students get a chance to work with others
- Your activities **must not always be academic focus ones** (otherwise certain groups or individuals will dominate)

- Have your wall chart that records points up early
- Make some activities **completion ones** rather that first finished so all groups can obtain maximum points
- Some starter activities

  - Show them 20 pieces of lab equipment, one minute to observe them and then each group writes down as many as they can (can discuss afterwards how working together might mean you can remember more)

  - Take the unit objectives or key questions and give them one minute to view them. Then each group writes down as many as they can (can discuss afterwards how working together might mean you can remember more)

  - Using balances to find the mass of selected objects

  - Listing observations of for example, magnesium burning

  - Building a tower that supports a marble using 25 straws and 1 metre of cellotape.

- Awarding points can vary in method and activity from class to class. More able students thrive on competition so 10 **quick** questions at the start of every period works well (as long as you don't discuss answers and take too much time). Award 5 points to the group(s) who got 9-10 right, 4 points for 7-8 right etc) For less able students, give instant rewards for the group who pack up first for example

- Marking only one of the group's workbook and using that mark for all 3 students works quite well and student's tend to "correct" their members if the book is not up to speed. Means that you only have to mark 10 books as well.
- When you mark classwork, don't write in the correct answers – indicate where the mistake is and get groups to correct their own work at the beginning of the next lesson.
- When you mark classwork, give written comments and praise and guidance rather than a numerical mark – this prevents confusion / argument when CA marks are decided.

- Make some assessments open book and some presentations as per Pluto style

- Get into IT based inquiry ASAP. Many "challenging students become totally different with a new approach)

- If it doesn't seem to be working, give it a rest for a time as it is a strategy, not the strategy for effective teaching

- If a student is reluctant to contribute, then isolate the student to work on their own and remove the privilege of doing the next practical or interesting activity. They soon want to be part of it all again.

- Number each "table" of three students for ease of instructions and to allow for multiple activities ie 3 groups on computers, 3 on written exercise and 3 on activity (the one I usually have to be with) and then we rotate.

- Try and get at least one other teacher to be doing what you are doing as you can plan together and share successes and failures

Appendix

An Example of a League Table (Wall Chart)

Number	Learning Team Name	ASSESSMENT EVENT and POINTS (10 for 1st Place, 1 for 10th)						
		Test1 Chem.	Prac 1 Sherlock	Test 2 Phys.	Issue Invest.	Test 3 Bio.	Total	Place
1	FALCONS	10	2	8	5	6	31	4th
6	SARACENS	9	7	9	7	7	39	1st =
7	CAMELS	8	9	10	4	8	39	1st =
8	LAND CRUISER	7	1	5	3	10	26	5th
9	The MALL	6	4	7	10	9	36	3rd
10	HURRICANES	5	3	6	9	2	25	6th
2	DESERT DWELLERS	4	10	4	1	1	20	8th
3	SPACE TRAVELERS	3	5	1	8	5	22	7th =
4	SCIENTISTS	2	8	3	2	4	19	9th
5	FISHERMEN	1	6	2	6	3	18	10th =

APPENDIX 2

Studies using the WIHIC to investigate learning environment – outcome associations

Studies since 2000 that have used the WIHIC to investigate the relationship between the learning environment and a range of student outcomes

Reference	Country	Language	Sample	Factorial validity and reliability reported	Outcome variable investigated	Unique contributions
Aldridge, Fraser, & Huang (1999); Aldridge & Fraser (2000)	Australia, Taiwan	English Mandarin	1,081 (Australia) & 1,879 (Taiwan) junior high science students in 50 classes	Yes	Enjoyment	Mandarin translation Combined qualitative & quantitative methods
Kim, Fisher, & Fraser (2000)	Korea	Korean	543 Grade 8 Science students in 12 schools	Yes	Attitude	Korean translation Gender differences in WIHIC scores
Zandvliet & Fraser (2004)	Australia, Canada	English	1,404 students in 81 networked classes	Yes	Satisfaction	Involved both physical and psychosocial learning environment
Allen & Fraser (2007)	US	English Spanish	120 parents and 520 Grade 4 & 5 students	Yes	Attitude Achievement	Involved parents and students Actual-preferred differences were larger for parents than students
Ogbuehi & Fraser (2007)	US	English	661 middle school Mathematics students	Yes	Attitude Achievement	Used 3 WIHIC and 3 CLES scales Innovative teaching strategies developed task orientation
Seng & Fraser (2008)	Singapore	English	250 working adults attending computer education courses	Yes	Satisfaction	Adult population Males perceived more trainer support and involvement but less equity
Martin-Dunlop & Fraser (2008)	California, US	English	525 female university Science students in 27 classes	Yes	Attitude	Very large increases in learning environment scores for an innovative course

Reference	Country	Language	Sample	Factorial validity and reliability reported	Outcome variable investigated	Unique contributions
Wolf & Fraser (2008)	New York, US	English	1,434 middle school Science students in 71 classes	Yes	Attitude Achievement	Inquiry-based laboratory activities facilitated cohesiveness and were differentially effective for males and females
Chionh & Fraser (2009)	Singapore	English	2,310 Grade 10 Geography & Mathematics students	Yes	Achievement Attitudes Self-Esteem	Differences between the Geography and Mathematics learning environment were smaller than between actual and preferred environments
Fraser, Aldridge, & Adolphe (2010)	Australia, Indonesia	English Bahasa	567 students (Australia) and 594 students (Indonesia) in 18 secondary Science classes	Yes	Several attitude scales	Differences were found between the countries and sexes
Opolot-Okurut (2010)	Uganda	English	81 students in two schools	Yes	Motivation	Findings suggest teachers wanting to improve motivation levels of students should investigate perceptions of the learning environment using WIHIC—small sample used, which possibly limits generalisability
Adamski, Fraser, & Peiro (2013)	US	English Spanish	223 Hispanic students in Grades 4–6	Yes	Attitude Achievement	Spanish translation Home environment was more influential on student attitudes, but the school learning environment was more influential on student achievement
Afari, Aldridge, Fraser, & Khine (2013)	UAE	Arabic	352 college students in 33 classes	Yes	Enjoyment Academic Efficacy	Arabic translation Use of games promoted a positive learning environment
Helding & Fraser (2013)	US	English	924 students in 38 Grade 8 & 10 Science classes	Yes	Attitude Achievement	Spanish translation Students of NBC teachers had more favourable learning environment perceptions

Reference	Country	Language	Sample	Factorial validity and reliability reported	Outcome variable investigated	Unique contributions
Robinson & Fraser (2013)	US	English Spanish	78 parents and 172 kindergarten Science students	Yes	Attitude Achievement	Kindergarten level Involved parents Spanish translation Relative to students, parents perceived a more favourable, but preferred a less favourable, learning environment
Taylor & Fraser (2013)	California, US		745 high school Grade 9–12 students in 34 Mathematics classes	Yes	Attitude	Investigated Mathematics anxiety from a learning environment perspective Females more anxious than males regarding Math concepts Males more anxious regarding learning Mathematics
Velayutham & Aldridge (2013)	Australia	English	1,360 students in Grades 8–10 Science classes	Yes	Motivation Self-Regulation	Identified aspects of the learning environment that influence motivation and self-regulation. Used a newly developed questionnaire to assess students' motivation.
Bi (2015)	China	English	Approximately 1.000 English major university students	Yes	Motivation	Investigated perceptions of the learning environment for students studying English, not a Science focus.
Peer & Fraser (2015)	Singapore	English	1,081 students in 55 classes	Yes	Attitude	First study of the learning environment in Science classrooms in Singapore schools.
Soebari & Aldridge (2015)	Indonesia	Bahasa Indonesia	2,417 students across 66 classrooms in 32 lower secondary schools	Yes	Attitude	Used WIHIC to evaluate impact of a teacher professional development programme on students' perceptions of the learning environment in Indonesia.
Aluzbaidi, Aldridge, & Khine (2016)	Jordan	Arabic	994 ESL university students from 13 schools within one university	Yes	Motivation Self-Regulation	Investigated relationship between perceptions of the learning environment, motivation, and self-regulation.

274

Reference	Country	Language	Sample	Factorial validity and reliability reported	Outcome variable investigated	Unique contributions
Zaragoza & Fraser (2017)	US	English	765 Grade 5 students from 17 schools	Yes	Attitude	Investigated difference in the learning environment and attitudes between field-study and traditional classrooms; found that field-study classrooms more effective than traditional classrooms for ESL students.
Chipangura & Aldridge (2017)	Western Australia	English	365 Year 6–12 Mathematics students in one school	Yes	Engagement	Investigated students' perceptions of learning environment and engagement based on exposure to multi-media.

275

Source: Adapted from Fraser (2012) with permission

APPENDIX 3

Snapshot on pedagogy[20]

SNAPSHOT ON PEDAGOGY (Cycle 2 & 3)

The purpose of this document is to enable us to collect data on the implementation of the major changes pedagogy in Cycle 2 and Cycle 3 schools over the 2011/2012 academic year. It is intended to be simple and easy to use. We expect few teachers will have moved much beyond level 3 at this time. This represents a big shift since its introduction and aligns well with ADEC's gradual release policy shifting the learning from: "the teacher>>>the student". Please complete the following spreadsheet and e mail/post in the science EA portal folder named 'snapshot in pedagogy'. Teachers are numbered only; all of the data are drop down menus except scoring.

School Data				Teacher data		Snapshot in Pedagogy			
Region	School	Cycle	Gender	Teacher	m/f	Students	Inquiry	Team Work	Skills

Students (Empowerment)	▯	**Inquiry** (The learning process)	▯	**Team Work** (Discuss, share, plan, ownership)	▯	**Skills** (Process skills/Science skills)	▯
Teams: Teacher selected, function on occasions Student Voice: Rarely sought or listened to as part of teacher planning.	1	The class has done one period or less through inquiry. May be used for assessment only.	1	The team works together for some activities.	1	Teachers and students only understand one or two of the skills during a few specific activities. They are not considered part of the learning process.	1
Teams: Teacher selected, they sometimes function and roles are used at times. Student Voice: Feedback on teaching programmes sometimes sought.	2	The class has done a few periods of inquiry. 1-4 periods of a unit is possible. Inquiry is often viewed as an assessment process.	2	The team works together for most activities.	2	Teachers and students understand a few of the skills during a few specific activities. Only a few are considered part of the learning process.	2
Teams: Teacher selected, roles usually used and generally function well. Student Voice: Feedback on teaching programmes is regularly sought.	3	The class has done the major part of a unit through inquiry. Inquiry is primarily viewed as a learning process.	3	All members of the team are involved for most activities.	3	Teachers and students are aware of the skills being learnt for some activities. Often considered part of the learning process.	3
Teams: Student/teacher selection, roles used, function well at all times. Student Voice: Feedback regularly guide programme development	4	The class has done at least one unit through inquiry and a number of 1-4 period sections of units. Inquiry is primarily viewed as a learning process.	4	All members of the team contribute positively to group activities and decision-making.	4	Teachers and students are fully aware of the skills being learnt during most activities and generally form and integral part of the learning process.	4
Teams: Student managed, including, selection, roles, planning of learning processes, highly functional. Student voice: Teachers and students co-construct some activities and assessments.	5	Most of the class coursework is done through units, which are inquiry based. Only a few teacher centered activities when intervention may be needed. Inquiry is considered a learning process.	5	All members of the team contribute positively to group activities and decision-making and encourage each other to participate fully.	5	Teachers and students are fully aware of the skills being learnt and they always form an integral part of the learning process.	5

276

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APPENDIX 4

Students' Adaptive Learning Engagement Survey (SALES)

لاطلاب استبياذ

Curtin University of Technology **Student Questionnaire**

INSTRUCTIONS: تعليمات

- Use a blue/black pen or 2B pencil
- Do not use red pen or felt tip pen
- Do not fold or bend

BLUE OR BLACK PEN

2B PENCIL

هتا تـراها لاندلاطرقة بـنفسـ ظللا:

Please MARK LIKE THIS ONLY:

Information: Please DO NOT put your name – just the code displayed

Almost Never	Seldom	Sometimes	Often	Almost Always
1	2	3	4	5

Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
1	2	3	4	5

Directions: ارشادات

Section 1:
Check one of the following criteria, depending on what <u>**YOU**</u> think.
Strongly Disagree : لا أوافق بشدّة
Disagree لا أوافق
Not sure لست متأكدا
Agree أوافق
Strongly Agree أوافق بشدّة

Section 2:
Check one of the following criteria, depending on what <u>**YOU**</u> think.
Almost never مطلقا
Seldom نادرا
Sometimes أحيانا
Often غالبا
Always دائما

Be sure to give an answer for all statements. There are no 'right' or 'wrong' answers. Your opinion is what is wanted.
Your responses will be kept confidential

الرجاء التأكد من الإجابة على جميع الحالات، لا توجد إجابات صحيحة أو خاطئة، فقط رأيك هو المطلوب . إجاباتك ستُعامل بسرية تامّة.

277

Section 1

Learning Goal Orientation التوجيه للهدف التعليمي *In this science class…هذه العلوم حصّة في*	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
1. One of my goals is to learn as much as I can. أحد أهدافي هو أن أتعلّم بأكثر قدر ممكن	1	2	3	4	5
2. One of my goals is to learn new science content. أحد أهدافي هو أن أتعلّم محتوى مادّة العلوم الجديد	1	2	3	4	5
3. One of my goals is to master new science skills. أحد أهدافي هو التمكّن من مهارات مادّة العلوم الجديدة	1	2	3	4	5
4. It is important that I understand my work. من المهم أن افهم عملي	1	2	3	4	5
5. It is important for me to learn the science content that is taught.من المهم أن أفهم محتوى مادّة العلوم التي تدرّس	1	2	3	4	5
6. It is important to me that I improve my science skills. من المهم أن أطوّر مهاراتي	1	2	3	4	5
7. It is important to me that I understand what is being taught to me.من المهم أن أفهم ما يدرّس	1	2	3	4	5
8. Understanding science ideas is important to me. فهم أفكار مادّة العلوم مهم بالنسبة لي	1	2	3	4	5
Task Value قيمة المهمّة *In this science class…العلوم حصة في*	**Strongly Disagree**	**Disagree**	**Not sure**	**Agree**	**Strongly Agree**
9. What I learn can be used in my daily life. ما أتعلّمه يمكن إستخدامه في حياتي اليوميّة	1	2	3	4	5
10. What I learn is interesting. ما أتعلّمه يثير إهتمامي	1	2	3	4	5
11. What I learn is useful for me to know. ما أتعلّمه يفيدني في المعرفة	1	2	3	4	5
12. What I learn is helpful to me. ما أتعلّمه يساعدني على التعلّم	1	2	3	4	5
13. What I learn is relevant to me. ما أتعلّمه يهمني	1	2	3	4	5
14. What I learn is of practical value. ما أتعلّمه له قيمة عمليّة	1	2	3	4	5
15. What I learn satisfies my curiosity. ما أتعلّمه يثير حب الاطّلاع لدي	1	2	3	4	5
16. What I learn encourages me to think. ما أتعلّمه يشجعني على التفكير	1	2	3	4	5
Self-Efficacy النجاعة الذاتية *In this science class…هذه العلوم حصّة في*	**Strongly Disagree**	**Disagree**	**Not sure**	**Agree**	**Strongly Agree**
17. I can master the skills that are taught. أستطيع إتقان المهارات التي تدرّس	1	2	3	4	5
18. I can figure out how to do difficult work. أستطيع تحديد كيفية القيام بالمهام الصّعبة	1	2	3	4	5
19. Even if the science work is hard, I can learn it. أستطيع تعلّم مادّة العلوم حتّى لو كانت مهمّاتها صعبة	1	2	3	4	5
20. I can complete difficult work if I try. أستطيع اتمام المهامات الصعبة إذا حاولت	1	2	3	4	5
21. I will receive good grades. سأحصل على علامات عالية	1	2	3	4	5
22. I can learn the work we do. أستطيع تعلّم العمل الذي نقوم به	1	2	3	4	5
23. I can understand the content taught. أستطيع فهم المحتوى الذي يدرس	1	2	3	4	5
24. I am good at this subject. أنا جيد في المادّة	1	2	3	4	5

278

Self-regulation التسيير الذاتي *In this science class...* الحصّة هذه في	**Strongly Disagree**	**Disagree**	**Not sure**	**Agree**	**Strongly Agree**
25. Even when tasks are uninteresting, I keep working. حتّى لو كانت المهمّات غير لا تثيرني سأستمرّ في العمل	1	2	3	4	5
26. I work hard even if I do not like what I am doing. أعمل بجدّ حتّى لو كنت لا أحبّ ما أقوم به	1	2	3	4	5
27. I continue working even if there are better things to doأستمرّ في العمل حتىّ لو كانت هناك أشياء أحسن يمكن القيام بها	1	2	3	4	5
28. I concentrate so that I will not miss important points. أركّز حتى لا أضيّع النقاط المهمّة	1	2	3	4	5
29. I finish my work and assignments on time. أتمّم عملي و مهامّي في الوقت	1	2	3	4	5
30. I do not give up even when the work is difficult. لا أريد أن أتخلّى حتّى عندما يكون العمل ضعبا	1	2	3	4	5
31. I concentrate in class. أركّز في الصف	1	2	3	4	5
32. I keep working until I finish what I am supposed to do. أتابع العمل حتى أتم ما يجب علي فعله	1	2	3	4	5

279

APPENDIX 5

What Is Happening In this Class (WIHIC)

Section 2					
Student Cohesiveness: إندماج الطّالب	**Almost Never**	**Seldom**	**Sometimes**	**Often**	**Almost Always**
33. I make friendships among students in this class. لي علاقات صداقة مع الطلاب في هذا الصف	1	2	3	4	5
34. I know other students in this class. أعرف طلاب آخرين في هذا الصّف	1	2	3	4	5
35. I am friendly to members of this class. أنا صديق لأعضاء صفّي	1	2	3	4	5
36. Members of this class are my friends. أعضاء هذا الصّف هم أصدقائي	1	2	3	4	5
37. I work well with other class members. أعمل بصفة جيّدة مع أقراني بالصّف	1	2	3	4	5
38. I help other class members who are having trouble with their work. أساعد أعضاء آخرين في الصّف من يجد صعوبة في العمل	1	2	3	4	5
39. Students in this class like me. طلبة هذا الصّف يحبّونني	1	2	3	4	5
40. In this class, I get help from other students. أحصل على المساعدة من طلاب آخرين في هذا الصّف	1	2	3	4	5
Teacher Support المساعدة من قبل المعلّم	**Almost Never**	**Seldom**	**Sometimes**	**Often**	**Almost Always**
41. The teacher takes a personal interest in me. المعلمة تهتم بي بشكل شخصي	1	2	3	4	5
42. The teacher goes out of her way to help me. تبذل المعلمة جهدا لتساعدنى	1	2	3	4	5
43. The teacher considers my feelings. تهتم المعلمة بمشاعري	1	2	3	4	5
44. The teacher helps me when I have trouble with the work. تساعدنى المعلمة عندما أجد صعوبة	1	2	3	4	5
45. The teacher talks with me. المعلمة تتحدّث معي ok	1	2	3	4	5
46. The teacher is interested in my problems. تهتمّ المعلّمة بمشاكلي	1	2	3	4	5
47. The teacher moves about the class to talk with me. تأتي المعلّمة لتتحدّث معي	1	2	3	4	5
48. The teacher's questions help me to understand. تساعدني أسئلة المعلمة على الفهم	1	2	3	4	5

280

Involvement: المشاركة في التعلّم	Almost Never	Seldom	Sometimes	Often	Almost Always
49. I discuss ideas in class. أناقش الأفكار في الصّف	1	2	3	4	5
50. I give my opinions during class discussions. أعطي رأيي خلال النقاش في الصّف	1	2	3	4	5
51. The teacher asks me questions. توجه لي المعلّمة أسئلة	1	2	3	4	5
52. My ideas and suggestions are used during classroom discussions. تستخدم أفكاري و اقتراحاتي خلال المناقشات الصّفّيّة	1	2	3	4	5
53. I ask the teacher questions. أوجّه أسئلة للمعلّمة	1	2	3	4	5
54. I explain my ideas to other students. أشرح أفكاري لطلبة آخرين	1	2	3	4	5
55. Students discuss with me how to go about solving problems. يناقش الطلبة معي كيفية حل المشكلات	1	2	3	4	5
56. I am asked to explain how I solve problems. يطلب مني شرح كيف نحل المشكلات	1	2	3	4	5

Cooperation التعاون	Almost Never	Seldom	Sometimes	Often	Almost Always
57. I discuss ideas in class. أناقش الأفكار في الصّف	1	2	3	4	5
58. I share my books and resources with other students when doing assignments. أشارك الطلاب الآخرين كتبا و مراجع عندما نقوم بالتكليفات	1	2	3	4	5
59. When I work in groups in this class, there is teamwork. عندما أعمل في مجموعات في هذا الصف هناك عمل فريق	1	2	3	4	5
60. I work with other students on assignments in this class. أشرك مع طلاب آخرين في المهمات في هذا الصف	1	2	3	4	5
61. I learn from other students in this class. أتعلّم من طلاب آخرين في هذا الصّف	1	2	3	4	5
62. I work with other students in this class. أعمل مع طلاب آخرين في هذا الصّف	1	2	3	4	5
63. I cooperate with other students on class activities. أتعاون مع الطلاب الآخرين حول أنشطة صفيّة	1	2	3	4	5
64. Students work with me to achieve class goals. الطلاب يعملون معي لانجاز أهداف الصّف ا	1	2	3	4	5

281

Thank you for your assistance in completing this questionnaire.

شكراً لمساعدتكم في إنجاز هذا لاستبيان.

APPENDIX 6

Ethics approval from Curtin University

RE: Ethics completion form

OH

ORD Ethics HUM <ORD-ethicshum@curtin.edu.au>

Thu 21/06/2018, 7:15 a.m.

Emma Rowntree

Reply all

From: ORD Ethics HUM <ORD-ethicshum@curtin.edu.au>
Sent: Thursday, 21 June 2018 6:44 AM
To: Emma Rowntree
Subject: RE: Ethics completion form

Hi Emma,

Thanks for providing an approval number.

We were able to search under that number in a list of old projects that didn't come across from schools as they were already complete, that's why it didn't show up in any of our systems from the last five or so years.

I am able to confirm you had ethics approval for your project, the details are below;
Year of approval: 2012
Approval number: SMEC-51-12
Student: Emma Rowntree
Email: katerowntree1@gmail.com
Supervisor: Jill Aldridge
School: SMEC
Title: Investigating the influence of cooperative learning practices on students' perceptions of their learning environment and motivation in UAE Girls' Grades 6-10 science classrooms
Description: This project is designed to assess the impact of a cooperative learning practice that is taking place in Cycle 2 and 3 (grades 6 to 10) science classrooms in the Abu Dhabi emirate of the UAE. Several classes of students will complete a questionnaire that consists of two instruments designed to measure perceptions of the learning environment and levels of motivation. The questionnaires will be confidential, with no names given, and will take no more than 45 minutes to complete. The questionnaires will then be collected and analysed to see if cooperative learning is influencing perceptions of the learning environment and levels of motivation.
Project Type: Masters by Research
Participants: Female students from 12 grade 6-10 science classes
No. of Participants: Approx 300
Data Type: Directly from individuals
Data Source: Questionnaires
Approval Date: 10th December 2012
Expiry Date: 9th December 2013
Completion Report: Completed May 2013

282

Don’t hesitate to get in touch if there’s anything else you need.

Kind Regards

Stephanie Holmquest
Ethics Support Officer | Research Integrity

Curtin University
Tel | +61 8 9266 3162 (Humanities)
Tel | +61 8 9266 3288 (Science & Engineering)

Email | stephanie.holmquest@curtin.edu.au
Web | http://research.curtin.edu.au/ethics-integrity/human/

283

APPENDIX 7

Granting of permission to conduct research from the Abu Dhabi Education Council (ADEC)

Sent: Sunday, March 24, 2013 9:51 AM
To: Emma Katherine Rowntree :ADEC-HQ
Cc: Masood Badri :ADEC-HQ; Mohammed Almazrouei :ADEC- HQ
Subject: FW: تسهيل مهمة باحثه : Emma Katherina

Dear Emma,
Please find below the approval meassage sent to all public schools, as you see from the date the approval ready only today.
If you have any further infromation please don't hesitate to contact us.
Best regards.

Research Office

____

From: School Operation
Sent: Sunday, March 24, 2013 9:35 AM
To: Abu Dhabi Education Zone Principals
Cc: ADEC Research
Subject: تسهيل مهمة باحثه : Emma Katherina

السادة / مدراء ومديرات المدارس الحكومية الأفاضل

يطيب لنا أن نهديكم أطيب التحيات,
في إطار دعم مجلس أبو ظبي للتعليم للبحث والباحثين، فإنه يسعدنا إعلامكم بموافقة المجلس على موضوع
الدراسة التي ستقوم بها الباحثة / Emma Katherina، طالبة ماجستير القيادة التربوية، university of
curtin australia، بعنوان:

"Investigating the influence of cooperative learning practices on students perceptions of their learning environment and motivation in UAE Girls's grades 6-10 scinece classrooms"
لذا، يرجى التكرم بتسهيل مهمة الطالبة ومساعدتها في الحصول على المعلومات المطلوبة للدراسة المشار إليها.

Executive Director's Office
School Operation Sector
Abu Dhabi Education Council
Email: school.ops@adec.ac.ae<mailto:school.ops@adec.ac.ae>

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284

APPENDIX 8

Introductory letter to Principals (English)

Curtin University

Dear Principal,

My name is Kate Rowntree and I am an Education Advisor, working on my Masters research degree. I have been granted permission by the ADEC Research Department to conduct a research study titled:

Investigating the Influence of Cooperative Learning (CL) Practices on Students' Perceptions of their Learning Environment and Motivation in UAE Girls' Grades 6-10 Science Classrooms

Cooperative learning is a strategy that has been found to benefit students' achievement and motivation towards learning in many countries, but research in this area to my knowledge has not been conducted with students in the UAE. As you know, the ADEC Science Curriculum has Cooperative Learning practices embedded within it, but the effectiveness of the practice has not yet been researched. This study could contribute to important findings regarding improving teacher practice and student learning in the following ways:

- From the findings we could assess students' perceptions of current CL practices and provide information about whether CL improves students' motivation towards learning science. If this is found, it may encourage teachers to improve their CL practice, and thereby increase student motivation in science.
- The questionnaire being used could be found to be a reliable instrument, suited to the UAE context that can be used by more teachers to gain feedback about how CL practice in the UAE is viewed by students.
- The research findings will hopefully provide reliable information to Curriculum Specialists in the Abu Dhabi Education Council about the impact that current CL practice is having on students' motivation and perceptions of the learning environment.
- The research findings may provide information that may support current policies and lead to more established CL practices in other subjects across the curriculum or, alternatively, show that CL practices in this context are not viewed positively by students and are not found to be positively impacting motivation and engagement in science.
- The research may suggest implications with respect to educational policy within the other six emirates of the UAE, potentially influencing the extent to which CL practices become incorporated within the national curriculums of the other emirates.

Your school has been identified as one that could provide the necessary information for the purposes of my study. My study consists of administering a questionnaire to the students in the following grades at your school (list teachers / classes here). Selection of the students is based on the extent to which the teacher is using CL practices in their science classes. The survey will be administered to an equal number of classes; those that are using CL and those that are not. I hope to be able to identify whether the CL practice is affecting students' motivation levels and influencing how they feel about the learning environment in their science class.

Completing the survey is expected to take no more than 1 period. I may have to return for the maximum of 1 further period if students are unable to complete the survey in the timeframe, but I do not expect this to be the case.

The requirements of implementing the survey are as follows:

- I would administer the survey to the students of the class during one class period, explaining the process using a translator.
- The survey is completely anonymous, with no students or teachers being identified.
- The survey is translated into Arabic.

- The students will be encouraged to answer honestly, and their teachers will not see their responses.
- I will be in the room throughout the completion of the questionnaire and will collect the questionnaires afterwards, into a sealed envelope.
- The results will be only be collated and analysed by myself, and my research supervisor at Curtin University.
- The findings will be shared with you and your teachers, with no teachers or students identified at any point.

Please check each statement if you have read and understood the following from the information sheet:

I have been informed of and understand the purposes of this study.	
I have been given an opportunity and a contact if I want to ask any questions.	
Any information that might identify any student, teacher or school will not be used in any published material.	
I have been informed that any information about my school, staff and students remains entirely confidential and will not be revealed at any time.	
I have been given a contact should I wish to make a complaint on ethical grounds.	

Please indicate below whether you will give permission for the student named above to take part in this valuable research study. Please return this form to their science teacher.

I will be the person responsible for this research. If you have any questions you are welcome to contact me on:

056 733 8219, or at katerowntree1@gmail.com, or emma.rowntree@adec.ac.ae

Should you wish to make a complaint on ethical grounds you may contact:

Thank you for your consideration.

Yours sincerely,

Kate Rowntree

Yes, permission is GRANTED to participate. No, permission is DENIED to participate

Principal's Signature Date Principal's Signature Date

286

APPENDIX 9

Introductory letter to Principals (Arabic)

ورقة بيانات البحث

عنوان البحث:

يتناول البحث تأثير إستخدام التعلّم التّعاوني على إدراك الطلاّب لبيئة التّعلّم و على الدافعيّة عند طلاّب الصفوف من السادس إلى العاشر في حصص العلوم فيمدارس الإمارات العربية المتحدة الحكوميّة .

اهداف البحث :

1. تقييم رؤية الطلاب لحصّة مادّة العلوم
2. تقييم مدى تحفّز الطلاّب لتعلّم مادّة العلوم
3. تقييم مدى فاعليّة استراتيجية التعلّم التعاوني المستخدمة في حصص العلوم - في الصفوف من 6 الى 9 في مدارس مجلس أبو ظبي للتعليم الحكومية - لغاية التعلّم أو للتقييم
4. تحديد ما إذا كانت استراتيجية التعلّم التعاوني المستخدمة تؤثر سلبا أو إيجابا على رؤية الطلاّب لبيئة التعلم.
5. تحديد ما إذا كانت لاستراتيجيّة التعلّم التعاوني تأثيرا سلبيا أو إيجابيّا على مستوى تحفيز الطلاّب لتعلّم مادّة العلوم.

المطلوب من المشاركين

6. ملئ استبانة لمدّة تطلّب 15 دقيقة خلال حصة واحدة من مادّة العلوم.
7. ان يعطي الطلاب آرائهم الخاصّة بصدق و أنّه ليس هناك أجوبة صحيحة أو خاطئة.
8. أن الباحثة و المشرف على البحث هما الوحيدان اللذان سيطّلعان على ما دوّنه الطلاّب في الاستبانة .
9. سيتم إعلام الطّلاّب بأن آرائهم قيّمة و مهمّة.
10. يمكن للطلاّب أو اولياء الأمور أن ينسحبو من المشاركة في البحث متى أرادوا ذلك دون حكم مسبّق.

سريّة و سلامة للعلومات

11. ستكون الاستبانة بدون إسم و لن تدوّن أسماء الطّلبة.
12. الباحثة ستقوم بتوزيع الاستبانات و ستقوم بجمعها.

287

13. ستكون نتائج البحث بدون أسماء و لن يذكر أي طالب في نتائج الاستبانات .

14. ستكون نتائج الاستبانات متوفّرة لأولياء الأمور و للطلاّب و لأعضاء الهيئة التدريسيّة و لمجلس ابو ظبي للتعليم

اسئلة او معلومات اخرى

15. إذا إحتاج المشاركون أو اولياء الأمور إلى معلومات إضافيّة يمكنهم الإتصال بالباحثة على الرّقم : 0567338219 أو على البريد الالكتروني katerowntree@gmail.com أو, على البريد الالكتروني للدكتور المشرف j.aldridge@curtin.adu.au ،Dr Jill Aldridge

16. إذا احتاج المشاركون أو أولياء الأمور اإلى رفع شكوى حول أمور أخلاقيّة يمكنهم الإتّصال بلجنة أخلاقيات البحث البشري على البريد الالكتروني : hrec@curtin.edu.au أو أن يكاتبوه على العنوان التّالي :, Curtin University of Technology, GOP Box U1987, Perth WA 6845. c/-office of Research and

17. تمت الموافقة على مشروع البحث هذا من طرف جامعة كيرتن ، لجنة أخلاقيات البحث البشري و رقم الموافقة ....

18. سنشجّع الطلاّب على الإجابة بصدق و لن ترى المعلّمة الاجابات

19. ساكون في الصفّ عند ملئ الإستبانات و ساجمعها و اضعها في ظرف مغلق.

20. ساجمّع النتائج و ساحلّلها بمفردي.

21. ساعطي المدرسة و المعلّمات النتائج التي توصلّت إليها من خلال البحث .

الرجاء ضع غشارة صح إذا قمت بقراءة و فهم المطلوب من النقاط التالية:

288

وقع إعلامي و أفهم أهداف هذه الدّراسة .	
أتيحت لي الفرصة للإتصال إذا أردت طرح سؤال ما .	
لن تنشر أيّة بينات تعرّف اي طالب أو معلّم أو مدرسة .	

وقع إعلامي أنه أية معلومات عن المدرسة أو عن الادارة أو عن الطلاّب ستبقى سريّة و لن تكشف في أي وقت .	
وقع الإتصال بي لإعلامي إذا كنت أريد أن أبلّغ شكوى أخلاقيّة.	

28. الرجاء الإشارة أدناه إذا كنت ستسمح / ستسمحين بأن يشارك الطالب المذكور إسمه اعلاه ليشارك في هذه الدراسة القيّمة .الرجاء إعادة هذه الاستمارة إلى مدرّسة العلوم.

29. ساكون المسؤولة عن هذا البحث . إذا كان لديكم اي سؤال فتفضلوا على الرقم التالي :

0567338219 أو katerowntree1@gmail.com أو emmarowntree@adec.ac.ae

شكرا جريلا على تعاونكم

Kate Rowntree

الرجاء كتابة للوافقة من عدمها و التوقيع في كلا الحالتين :

نعم أوفق على المشاركة (.......)

لا ، لا أوفق على المشاركة (.......)

المدرسة :...

الإمارة : .... المكتب التعليمي...

الإسم : ....التوقيع : ....

289

APPENDIX 10

Letter to parents requesting permission for their child to participate in the survey for this study

Dear Parent/Guardian,

عزيزي ولي الأمر

Permission is requested for ________________________________ to take part in a research study titled: **Investigating the Influence of Cooperative Learning Practices on Students' Perceptions of their Learning Environment and Motivation in UAE Girls' Grades 6-10 Science Classrooms**

نرجو التكرم بالموافقة على إشتراك ________________ في الدراسة البحثية تحت عنوان : أثر تطبيق استراتجيات التعلم التعاوني على دافعية وتصورات الطالبات لبيئتهم التعليمية في مدارس البنات من الصف السادس إلى العاشر خلال حصص العلوم في دولة الإمارات العربية المتحدة.

Please check each statement if you have read and understood the following from the information sheet:

الرجاء الإشارة أمام العبارات التي تعكس ما قرأته وفهمته بعد الإطلاع على ورقة المعلومات:

I have been informed of and understand the purposes of this study. لقد تم إبلاغي بأهداف هذه الدراسة وأفهمها جيدا.	
I have been given an opportunity and a contact if I want to ask any questions. لقد أتيحت لي الفرصة لطرح أي استفسارات وكذلك تم توفير جهة للتواصل في حال رغبت في المزيد من الأسئلة	
I understand I can withdraw my child's participation at any time without prejudice. أتفهم إمكانية انسحاب ابنتي من المشاركة في أي وقت دون أي تأثير عليها.	
Any information that might identify my child will not be used in published material. أي بيانات من شأنها ان تفصح عن هوية ابنتي لن تستخدم في أي مواد للنشر.	
I have been information that my child's information remains entirely confidential and will not be revealed at any time. لقد تم إخطاري أن كل المعلومات التي تخص ابنتي ستعامل بسرية تامة ولن يتم الإفصاح عنها في أي وقت.	
I have been given a contact should I wish to make a complaint on ethical grounds. تم تزويدي ببيانات جهة التواصل في حال رغبت في تقديم شكوى تتعلق بأمور أخلاقية.	

Please indicate below whether you will give permission for the student named above to take part in this valuable research study. Please return this form to their science teacher.

الرجاء الإشارة أدناه بالموافقة أو عدم الموافقة للطالبة المذكورة بالاشتراك في هذا البحث القيم. ويرجى إعادة الطلب إلى معلمة العلوم.
المسؤولة عن هذا البحث هي كايت رونتري، الموجهة التربوية في مجلس أبوظبي للتعليم؛ للإستفسار عن الدراسة بإمكانكم التواصل مع الباحثة عبر:
هاتف متحرك 056 733 8219
أو بريد إلكتروني: katerowntree1@gmail.com

Kate Rowntree, Education Advisor for ADEC, will be the person responsible for this research. If you have any questions you are welcome to contact her on:
056 733 8219, or at katerowntree1@gmail.com.
Thank you for your consideration.

شاكرين لكم حسن تعاونكم

مع تحيات
كايت رونتري

Yours sincerely,
Kate Rowntree

Yes, permission is GRANTED to participate. لابحث فـي ابنتي مشاركة على أوافق (نعم)	No, permission is DENIED to participate لابحث فـي ابنتي مشاركة على أوافق ،لا
______________________	______________________
Parent's Signature Date لتاريخ لأمر ولد توقيع	Parent's Signature Date لتاريخ لأمر ولد توقيع
__________ __________	__________ __________

290