NUTURE INTRINSIC MOTIVATION,
INSPIRE STUDENTS IN LEARNING:
A STUDY ON MOTIVATING STUDENTS
TO LEARN IN THE CLASSROOM

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Nurture Intrinsic Motivation, 
Inspire Students in Learning: 
A Study on Motivating Students 
to Learn in the Classroom

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ABSTRACT

What are students motivated by when they are learning? What can teachers do to promote the love for learning? This mixed-methods research study has as its objectives the investigation of the motivational profiles of students and the examination of the effects of autonomy-supportive instructional behaviours characterised by provision of choice, provision of meaningful rationale and acknowledgement of perspective-taking on students’ perceived autonomy-support, psychological needs satisfaction, motivational regulation, motivational beliefs of self-efficacy and intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort in learning.

Quantitative findings revealed that as a collective group, the secondary school female students experienced slightly more autonomous than controlled motivational regulations and responded favourably to the autonomy-supportive instructional behaviours. Findings also revealed that there exist clusters of students with distinctive motivational profiles who responded differently to the autonomy-supportive instructional behaviours.

Qualitative findings from focused-group discussions with the students and an interview with the teacher provided more in-depth understanding into the reasons for the motivational regulations of the students and the students' experiences in learning in an autonomy-supportive classroom. Findings further suggested ways in which the intervention programme could be modified to be more beneficial for students.

The implication of the findings was discussed in the socio-cultural-political context of the Singapore society with the Self-Determination Theory embedded in an Ecological-System framework.
CHAPTER ONE
INTRODUCTION

“If you want to build a ship, don’t drum up the men to gather wood, divide the work and give orders. Instead, teach them to yearn for the vast and endless sea.”
-Antoine de Saint-Exupery in *The Wisdom of The Sands*

1.1 The Singapore Education System

1.1.1 Thinking School, Learning Nation

In 1997, the then Prime Minister of Singapore, Mr Goh Chok Tong announced the new vision statement of the Ministry of Education – Thinking School, Learning Nation. In his speech, he described a vision of a nation of thinking citizens, capable of meeting the challenges of the future and an education system that prepares the people for the challenges that are to come.

“Thinking schools will be learning organisations in every sense, constantly challenging assumptions and seeking better ways of doing things through participation, creativity and innovation. Thinking schools will be the cradle of thinking students as well as thinking adults and this spirit of learning should accompany our students even after they leave school.

A learning nation envisions a national culture and social environment that promotes lifelong learning in our people. The capacity of Singaporeans to continually learn, both for professional development and for personal enrichment, will determine our collective tolerance for change.”

(Ministry of Education, 2011a)
The vision statement as announced by the then Prime Minister of Singapore has implication at many levels. Of interest in this study is how it translates into educational practices for teachers and students.

With the policy change comes a redefinition of the role of teachers. Teachers no longer just teach and their students learn. Teaching itself becomes a learning profession where teachers are encouraged to constantly look out for new ideas and apply new educational theories and practices in the classrooms. They are encouraged to have a deep understanding of the learners in their classrooms, to experiment with new ways of teaching and new instructional behaviours and thereby translate education policies into practical and effective programmes to meet the learning needs of the students; knowing that their experimental efforts will be supported with resources.

For the students, the emphasis changes from spoon-feeding of content knowledge and rote-learning to one where independent learning, creativity, originality of thought and inventiveness in basic knowledge prevail. This requires a shift from teaching of content knowledge to imparting of learning skills – thinking skills and lifeskills so that the students can think for themselves, be creative and find their own solutions to manage whatever new challenges that come their way in the future.

In the above-mentioned speech delivered by the then Prime Minister of Singapore Mr Goh Chok Tong, he expressed his concern over the learning attitudes of many Singaporean young and suggested a way forward for teaching practitioners.

“What is critical however is that we fire in our students a passion for learning, instead of studying for the sake of getting good grades in their examinations. I must say this passion is generally lacking among our students, including many of our most able. Their knowledge will be fragile, no matter how many ‘A’s they get unless they have the desire and aptitude to continue discovering new knowledge well after they leave school” (Goh, 1997).
Hence, the topics of interest in this study – What are the students motivated by when learning? What can teachers do to instil in our students a passion for learning?

1.1.2 Teach Less, Learn More

The Teach Less Learn More initiative was mooted in 2004. It builds on the foundation laid in place by Thinking School Learning Nation. It continues the Thinking School Learning Nation journey to improve the quality of interaction between teachers and learners. The focus of the Singapore education system thereby shifts from quantity to quality, taking into consideration the holistic development of the child. The emphasis thereafter, is on “quality” education. More “quality” in terms of classroom interaction, opportunity for self-expression and the learning of life-long skills through effective teaching approaches and less “quantity” in terms of rote-learning, repetitive tests and following prescribed answers (Ministry of Education, 2011b).

Teach Less Learn More aims to touch the hearts and engage the minds of the learners through richer interaction between teachers and learners. It calls on teaching practitioners to engage in rigorous debate and reflection on Why we teach, What we teach and How we teach (Ministry of Education, 2011b).

Why we teach? We teach to prepare our learners for the test of life and less for a life of tests. In order to prepare our learners for the challenges on the long journey called life, we must encourage our learners to learn because they are passionate about learning and less because they are afraid of failure, so that they can be creative and find their own solutions to whatever challenges that may come their way. Teachers could help promote passion in learning by addressing the learners’ needs, interests and aspirations, not simply to cover the syllabus (Ministry of Education, 2011b).
What we teach? We teach values, attitudes and mindsets that will be the guiding principles for the learners in their journey through life, not only how to score good grades in examinations. To do that, teachers could focus more on the process of learning, to build confidence and capacity in the learners, to encourage curiosity and critical thinking and to ask searching questions, less on following prescribed answers and replicating products. Thus, the focus is on nurturing the child holistically across different domains, less so on teaching the academic subject per se (Ministry of Education, 2011b).

How we teach? Teacher must first recognize that students differ in interest, readiness and modes of learning. The one-size-fits-all approach may not be beneficial for the different unique individuals in the classroom. Instead of teachers’ talks, teachers could do more guiding, facilitating and modelling to motivate students to be more proactive, to take ownership of their own learning and to pursue their passions in learning (Ministry of Education, 2011b).

The former Minister for Education, Mr Tharman Shanmugaratnam said,

“As a nation, we will only be able to say that we have succeeded in educating our young when we see a whole generation of students pursuing their dreams with passion, seized with a joy for life and a desire to shape a better society” (Shanmugaratnam, 2005).

With that, teachers are encouraged to re-visit and re-think Why we teach, What we teach and How we teach. To teach less so that students can learn more means that teachers need to engage their students in their own learning through effective instructional behaviours. Bearing in mind the overarching vision of Thinking School, Learning Nation which gives impetus to the pedagogical initiative of Teach Less Learn More; which together speak to life-long, life-sustaining and life-fulfilling learning, teachers must first adopt a mindset change and be prepared for a pedagogical shift from one on quantitative piling of content information to inculcating an innate quest for learning in the students. To inculcate an innate quest for
learning in the students, teachers must first tap into the students’ inner motivational resources and fire in them the passion for learning.

How do teachers tap into the students' inner motivational resources for learning?
What can teachers do to instil in the students a passion for learning?

1.2 Problem Identification

1.2.1 A Nation’s Concern

In a speech made at the 7th International Conference on Thinking held in Singapore in 1997, the then Prime Minister of Singapore Mr Goh Chok Tong made an observation that many of the Singaporean young, including our most able learners, lacked passion in learning. He pointed out that many young people in Singapore studied for the sake of tackling examinations. He felt that the knowledge acquired for the sake of scoring in examinations was very limiting and the preoccupation with passing examinations unhealthy. He opined that the younger generation could thrive better, not merely to survive, if they could have passion in learning – a thirst for new knowledge and hence, to always be curious, searching, exploring and discovering new knowledge for themselves, well after they have left school. He saw a serious need to instil passion in learning in our young.

The researcher of this study and many of her colleagues in the teaching fraternity share a similar sentiment. An observation of the classrooms revealed that many students lack a thirst in learning. Many students expend effort in their school work in a bid to possess the many external rewards that their teachers or family members dangle before them. Some students attend schools simply to go through the motion, visibly weary to having had to remember another piece of information to go through another examination.

These observations are however, very personal and therefore can be argued as subjective opinions. Such claims will be more convincing if supported by empirical evidence.
Are students in Singapore really lacking in passion in learning? What are they generally motivated by when learning? What can teachers do to instil passion in learning, that is, a zest for acquiring novel knowledge for its own sake rather than as a means to achieving some other external ends?

1.2.2 The Singapore Psyche

There is a paucity of local literature concerning students’ motivation in learning, especially from a multi-dimensional construct perspective of motivation. The very few studies that surfaced from literature search did provide very meaningful insight into the psyche of young people in Singapore.

In one study, Lim (2010) investigated junior college students’ attitudes towards Mathematics, as a multi-dimensional construct with motivation as a key dimension, and then investigated the relationships between attitudes towards Mathematics and achievement in Mathematics. In this study conducted on 1044 students from a junior college in Singapore, Lim (2010) found that students were more extrinsically motivated than intrinsically motivated towards the learning of Mathematics. Using a modified version of the Academic Motivation Scale (AMS) (Vallerand, Pelletier, Blais, Briere, Senecal, & Vallieres, 1992,1993) to assess amotivation, extrinsic motivation (external regulation, introjection and identification) and intrinsic motivation, the study revealed that the participants were more motivated by rewards and punishments – external regulation, and could identify with the reasons for studying Mathematics – identification, than to want to know, to accomplish and to stimulate in the learning of Mathematics - intrinsically motivated. Also, the students scored lowest on amotivation which was expected as the participants were from a top junior college in Singapore and amotivation had been shown to correlate negatively with achievement (Karsenti & Thibert, 1995). The study further established that achievement, measured using a
three-hour paper that was equivalent to the GCE ‘A’ level 9740 H2 mathematics examination in terms of content and difficulty level, correlated negatively with external regulation. There was positive correlation between achievement and intrinsic motivation.

The findings from this top junior college in Singapore provide empirical evidence which lends support to the claim made by the then Prime Minister of Singapore Mr Goh Chok Tong in his speech in 1997. The findings suggest that students in Singapore are perhaps more extrinsically motivated than intrinsically motivated in their learning of academic subjects; they study to achieve an external goal, less so for the passion in learning. The findings further suggest that perhaps, ironically, to spur students towards greater height in achievement, teachers should work on motivating the students intrinsically. As the students acquire the passion in learning – to be curious, to search, explore and discover, the by-product of learning will be one of higher quality.

Liu, Wang, Tan, Koh, and Ee (2009) presented another way of understanding motivational profile. In their study, 767 secondary two students from Singapore responded to questionnaires measuring the degree to which they were extrinsically motivated (external regulation, introjected regulation, identified regulation), intrinsically motivated and amotivated with regard to project work. The researchers then cluster-analysed the responses to reveal four distinct clusters of students – (i) “High self-determined / high controlled” group characterised by high intrinsic motivation, identified and external regulations, and extremely high introjected regulation, (ii) “low self-determined / high controlled” group characterised by extremely high amotivation, low intrinsic motivation and low identified regulation, (iii) “high self-determined / low controlled” group characterised by extremely high intrinsic motivation and identified regulation, and extremely low external regulation and amotivation (iv) “low self-determined / low controlled” group characterised by extremely low introjected and external regulation.
A large majority of the students clustered in the “high self-determined / high controlled” group and the smallest number of students was found in “high self-determined / low controlled” group. Interestingly, when the responses of all the students were analysed together, they reported highest score in identified regulation, followed by intrinsic motivation, external regulation, introjected regulation and amotivation. The findings also revealed that the “high self-determined / low controlled” group was the most adaptive cluster. By adaptive, it means that the students reported the most positive experiences and perceived greatest learning in project work.

The findings in Liu et al. (2009) give us a glimpse into the complexity of human motivation. It suggests that at any one point in time, a student may be motivated by different reasons when participating in a learning activity. The student can be intrinsically motivated and extrinsically motivated to varying degree at the same time. Collectively, the responses suggest that secondary school students had more autonomous motivation towards learning, as evident from the higher scores in intrinsic motivation and identified regulation which is a more autonomous form of extrinsic motivation. Informatively, students reaped the greatest benefit (most positive learning experience and perceived greatest learning) when they approached their learning with higher intrinsic motivation and lower degree of extrinsic motivation.

The findings reaffirm the then Prime Minister of Singapore, Mr Goh Chok Tong’s suggestion that to help students benefit maximally from education, teachers could instil in their students a passion for learning. As suggested by the findings in Liu et al. (2009), the way forward could perhaps be in nurturing intrinsic motivation in learning.

Local studies on motivational orientation of students are scarce. The two studies reviewed above may not be sufficient to advise a trend. However, they did give us a glimpse
into the motivational orientation of students in Singapore, particularly, from a multi-dimensional construct perspective of motivation.

In summary, it appears to the researcher that:

• At any one phase of their academic life, students can have multiple motivational orientations, that is, both intrinsic and extrinsic motivational orientations, the degree of which may differ from students to students.

• Secondary school students in Singapore appear to have higher degree of autonomous motivation, although they are also extrinsically motivated when learning (Liu et al., 2009).

• As they advance in the academic hierarchy, their motivational orientation may become more extrinsic, as suggested by the motivational orientation of junior college students (Lim, 2010).

• Intrinsic motivation in learning has adaptive value. For the secondary school students in Liu et al. (2009), more autonomous motivation was associated with more positive learning experiences. At a higher level of learning (Lim, 2010), intrinsic motivation correlated positively with academic achievement.

Anderman and Midgley (1997) had shown that as students progressed through school, their extrinsic motivation increased and intrinsic motivation declined. Anderman and Midgley (1997) attributed the shift to students’ perceptions of a more extrinsically-oriented class structure later in their schooling years.

However, as educational level advances, academic demand increases. It is not sufficient for students to know information within the safe boundary of curriculum syllabus but to learn beyond what is provided in the textbooks and what teachers can teach in class. That, in the researcher’s opinion, requires self-discipline and intrinsic motivation.
Thus, the then Prime Minister of Singapore Mr Goh Chok Tong’s concerns about the learning attitudes and motivational orientations of Singapore youth were not without basis. This study on the motivational orientation of a sample of students from Singapore is therefore, timely. An understanding of the motivational orientation of students in Singapore would help inform educators on instructional behaviours to employ to nurture intrinsic motivation and enhance learning.

1.3 Objectives of Study

Thinking School, Learning Nation envisions a society of lifelong learners who constantly challenges assumptions and seeks better ways of doing things. Teach Less Learn More calls for teaching practitioners to reflect on Why we teach, What we teach and How we teach.

In light of the discussion in the earlier sections, there is a real concern about the motivational orientations of Singapore students. Having been a school teacher herself, the researcher of this study, who is reflective and always very keen in improving her teaching, is very interested to find out what instructional behaviours to adopt and how best to structure her classroom interaction so that her students will have the love for learning and be lifelong learners who constantly challenge assumptions and seek better ways of doing things.

The researcher of this study began her investigative journey with understanding the motivational profiles of the students and then explored how to tap into the inner motivational resources of the students. More specifically, in this study, the researcher sought to understand the motivational profiles of a sample of students from Singapore, from a multi-dimensional construct perspective of motivation based on the Self-Determination Theory. The researcher also sought to test out the underpinnings of the Self-Determination Theory and examined if instructional behaviours based on the Self-Determination Theory would promote more
autonomous motivation in learning and enhance learning experiences. In addition, the researcher also examined the mechanism through which the underpinnings of the Self-Determination Theory work to influence motivational regulations and learning behaviours.

The effects of the instructional behaviours on students' learning behaviours were then discussed using the bigger framework of the Ecological-Systems Perspective where the researcher discussed possible contributions of the Self-Determination Theory to Thinking School Learning Nation, Teach Less Learn More and thereby, classroom practices.

The objectives of this study are as follows:

- To understand the motivational profile of students in Singapore.
- To determine if an intervention programme aimed at perceived teacher autonomy-support has an impact on students’ motivational regulations, motivational beliefs, use of learning strategies and enjoyment and effort in learning.
- To determine if an intervention programme aimed at perceived teacher autonomy-support has an impact on students’ motivational regulations, motivational beliefs, use of learning strategies and enjoyment and effort in learning through the satisfaction of basic psychological needs.
CHAPTER TWO
LITERATURE REVIEW

This chapter is organised as follows:

2.1 The Perspective: Ecological-Systems Perspective
2.2 The Theory: Self-Determination Theory
2.3 The Person: Motivational Profiles of Students
2.4 The Environment: Teacher - The Motivating Force in the Classroom
2.5 Autonomy-Supportive Instructional Behaviours and Basic Psychological Needs
2.6 Autonomy-Supportive Instructional Behaviours and Motivational Regulations
2.7 Autonomy-Supportive Instructional Behaviours and Motivational Beliefs in Learning
2.8 Autonomy-Supportive Instructional Behaviours and Learning Strategies
2.9 Autonomy-Supportive Instructional Behaviours and Enjoyment and Effort in Learning
2.10 Definitions and Conceptualisation
2.11 Rationale of Study
2.12 Research Questions

Sections 2.1 and 2.2 give the theoretical bases of the study, sections 2.3 to 2.9 provide the review of literature in areas related to the study, section 2.10 provides the definitions and conceptualisation of the key terminologies used, section 2.11 gives the rationale of the study and section 2.12 lists the research questions pertaining to the study.
2.1 The Perspective: Ecological-Systems Perspective

The Ecological-Systems Perspective (McMahon, 1996) is used in this study to understand the interplay between the Singapore educational policies, schools, teachers and students. It is an integration of the ecological and systems theories.

![Ecological-Systems Perspective Diagram]

*Figure 2.1. Ecological-Systems Perspective*

The Ecological Theory (Bronfenbrenner, 2000) was developed by Urie Bronfenbrenner (1917 - 2005). It focuses on the social context in which children live and interact in and the people who influence their development. In his theory, Bronfenbrenner explained the concept of the person-in-environment which proposes that a child is the product of the interaction between he or she and the social systems.

Bronfenbrenner (2000) conceptualised five environmental systems that could influence a child – microsystem, mesosystem, exosystem, macrosystem and chronosystem. Microsystem is a setting in which the child spends considerable time. In this study, the topic of interest is the school and the classroom. Within this microsystem, the child has many hours of direct interaction with his or her teacher. The teacher and student influence each other and help to construct the classroom setting. The mesosystem involves linkages between the microsystems, for example, the connection between the school, family and peer. The exosystem is at work when developments in another setting in which the child does not have active participatory roles influence what teachers and students experience in the classrooms. Educational policies and examination systems are examples of exosystem at work. Macrosystem involves the broader culture such as societal values. Chronosystem is the historical conditions of the child’s development such as being born at a time when the world is concerned about knowledge-based economy.

The Systems Theory (Von Bertalanffy, 2001) according to Ludwig Von Bertalanffy (1901-1972) views the person and environment as systems. According to this theory, the person is seen as a system with various parts that are physical, psychological, political, economic, educational, spiritual, social and sexual. The environment is viewed as a system consisting of two major parts that are “nurturing” such as the family, friends and teachers and “sustaining” such as the policies and programs in society at large. These systems are interconnected and interdependent and are always trying to adapt to one another to achieve a
stage of dynamic equilibrium. When one system changes, the other systems will have to change as the systems are connected to one another; such is the interrelatedness of life (Von Bertalanffy, 2001).

The Ecological-Systems Perspective ( McMahon, 1996; Santrock, 2004) is very useful in helping us to understand the concept of the person-in-environment. It suggests that there are interactions and transactions that take place among the various “parts” of the person, that is, intra-psychically within the person and at the boundary at which the person and the environment interface, that is, interpersonally between the person and the social environment.

The Ecological-Systems Perspective ( McMahon, 1996; Santrock, 2004) and its underpinnings are relevant to this study and will be used as the overarching framework by which the study is discussed. At the chronosystem level, we are living and competing in a global economy that demands innovation. At the macrosystem level, we need to impart values and good learning attitudes so that our students can develop competencies like creativity and innovation so as to better position our students to take advantage of opportunities in a globalised world. And thus, at the exosystem level, we have Thinking School, Learning Nation and Teach Less, Learn More, governmental policies at initiating changes in the nation’s mindset and running of the Singapore educational system. At the mesosystem level, we need to understand how the school, family and peer influence the motivational orientation of our students and at the microsystem level, which is the main focus of this study, the interaction between the teachers and the students and how this can influence the students’ passion in learning. At the personal level, it would be useful for teachers to know that students have basic psychological needs and differ in their motivations towards learning. Recalling that when one system changes, the other system will adapt and change.
This spells the possibility that teachers could work on their instructional behaviours to facilitate change in the motivational orientation of the students.

Hence, this study attempts to facilitate change in the motivational orientation of the students through an intervention programme in the classroom. More specifically, this study attempts to translate and test out the theoretical underpinnings of a motivational theory – the Self-Determination Theory into practical application in the classrooms, within the framework of the Ecological-Systems Perspective. It is hoped that the research findings could help shed some light into what Singapore students are motivated by when learning and what teachers can do to promote intrinsic motivation in learning.

2.2 The Theory: Self-Determination Theory

The Self-Determination Theory is essentially a theory on human motivation.

In this section, we will discuss about:

2.2.1 Motivation
2.2.2 Assumption of Self-Determination Theory
2.2.3 Basic psychological needs
2.2.4 Factors that affect motivational regulation
2.2.5 Application of Self-Determination Theory

Section 2.2.1 explains what motivation is and elaborates on the multi-dimensional constructs of motivation set forth by the Self-Determination Theory. Section 2.2.2 explains the assumption behind the theory and section 2.2.3 details the basic psychological needs and the process of identification of these needs from empirical evidence. Section 2.2.4 discusses
the factors that affect internalisation and integration of motivational regulation. Section 2.2.5 explains how the Self-Determination Theory could be used in classrooms to promote intrinsic motivation in learning.

2.2.1 Motivation

Motivation involves the processes that energise, direct and sustain behaviours towards a goal (Ryan & Deci, 2000b). It is the driving force that propels human beings towards action. Motivation is highly valued because of its consequences and it especially concerns teachers because they have to motivate students to act.

To motivate someone is to move someone to do something. To be able to move someone to do something, we need to know what to move and how to move. Thus, we need to understand the different constructs of motivation. We first make a distinction between intrinsic motivation and extrinsic motivation and then elaborate the constructs of motivation from the perspective of the Self-Determination Theory.

Intrinsic motivation refers to doing something for its own sake, that is, the doing of the activity is an end in itself. Extrinsic motivation refers to doing something to obtain something else, that is, it is a means to an end (Santrock, 2004).

Many studies have compared between people who are intrinsically motivated and those who are extrinsically motivated. These studies have found that people who are intrinsically motivated relative to extrinsically motivated have more interest, excitement and confidence which in turn manifest themselves as persistence, enhanced performance and creativity (Deci & Ryan, 1991; Sheldon, Ryan, Rawsthorne, & Ilardi, 1997) and better general well-being (Ryan, Deci, & Grolnick, 1995).

Ryan and Deci (2000b) introduced the idea of motivation as a continuum of relative autonomy and explained the underlying attitudes and goals that led to an action. They
proposed the constructs “orientation” of motivation to explain the different types of motivation and “level” of motivation to explain the different amount of motivation.

2.2.1.1 A continuum of human motivation

![Figure 2.2. A continuum of human motivation](Source: Ryan and Deci (2000b))

Referring to Figure 2.2, on the far left of the human motivation continuum is amotivation. People who are amotivated are characterised by the lack of intention to act, they simply go through the motion. Amotivation is likely to arise from not valuing the activity (Ryan, 1995), not feeling competence to complete the activity (Bandura, 1996) or not expecting the effort to lead to a desired outcome (Seligman, 1975).

Extrinsic motivated behaviours vary in the degree to which their regulation is autonomous. The degree of regulation depends on how much the individuals internalise the action and assimilate the actions into their existing self-concept. They cover the continuum between amotivation and intrinsic motivation.
The extrinsically motivated behaviours that are least autonomous are termed external regulations. Externally regulated behaviours are performed in compliance or in response to external rewards and punishments. Individuals experience externally regulated behaviours as controlled and they typically have an external locus of causality. Externally regulated behaviours usually do not sustain once contingencies are withdrawn (Ryan & Deci, 2000b).

Somewhat more autonomous than external regulation on the continuum is introjected regulation. Introjected regulation involves taking in a regulation but not fully accepting it as part of the self. It is a relatively controlled form of regulation in which behaviours are performed to avoid guilt, anxiety and to demonstrate ability so as to enhance the ego such as pride. Individuals who experience introjected regulation are somewhat internally driven but have an external perceived locus of causality (Ryan & Deci, 2000b).

A more autonomous form of extrinsic motivation is identified regulation. Individuals who experience identified regulation consciously accept the underlying value of a behavioural goal or regulation and accept the action as personally important thus having a somewhat internal locus of causality. Identified regulated behaviours are expected to be better maintained and to be associated with higher commitment and performance (Ryan & Deci, 2000b).

The most autonomous form of extrinsic motivation is integrated regulation. Individuals who experience integrated regulation have evaluated, accepted and assimilated a value or regulation into their existing values and needs. To fully internalise a regulation and thus to become autonomous with respect to the behaviour, the individuals must inwardly grasp its meaning and worth. Integrated regulation is still considered an extrinsic form of motivation because it is done to attain a separable outcome rather than for its inherent
enjoyment. As the individuals have assimilated the value into their sense of self, they experience the behaviours from an internal locus of causality (Ryan & Deci, 2000b).

On the extreme right of the continuum is intrinsic motivation. Individuals who are intrinsically motivated perform an activity for its inherent satisfaction. The behaviours are totally self-determined. Such behaviours are performed from an internal locus of causality (Ryan & Deci, 2000b).

Ryan and Connell (1989) surveyed achievement behaviours among late-elementary and middle school children and found that external, introjected, identified and intrinsic regulatory styles were intercorrelated according to a quasi-simplex pattern. In a simplex, variables are ordered in terms of complexity or conceptual similarity, such that the variables that are deemed more similar correlate more highly than variables that are deemed less similar. When arranged in a matrix, the simplex arranges its largest correlations along a main diagonal and these increasingly taper off as they move away from that diagonal. From the simplex pattern, Ryan and Connell (1989) proposed the continuum of human motivation as shown in Figure 2.2.

From the simplex, Deci and Ryan (2002) also predicted the formula for a Relative Autonomy Index (RAI) to represent the extent to which the motivational regulation is autonomous versus controlling. The formula for the Relative Autonomy Index (RAI) is as follows: external regulation x (-2) + introjected regulation x (-1) + identified regulation x (+1) + intrinsic regulation x (+2) (Grolnick & Ryan, 1989; Ryan & Connell, 1989; Deci & Ryan, 2002; Wilson, Sabiston, Mack, & Blanchard, 2012). As presented by the formula, the more controlled the motivational regulation represented by a subscale, the larger its negative weight and the more autonomous the motivational regulation represented by a subscale, the larger its positive weight. The Relative Autonomy Index (RAI) represents the degree of
autonomy in the students' school related motivational regulation with a higher score representing a more autonomous motivational regulation and a lower score representing a more controlled motivational regulation.

2.2.2 Assumption of Self-Determination Theory

Human beings in their healthiest state are proactive organisms who are curious, striving to learn, mastering new skills and applying their talents responsibly. The fact that young children are always exploring and eager to learn about their surrounding and that most people show considerable effort and commitment in their lives suggest some very positive and persistent tendencies of human nature.

It is also an observable fact that human beings can be active or passive, constructive or apathetic at different times, at differing degrees and in different contexts. This suggests that the human spirit is more than mere dispositional differences. It bespeaks a wide range of reactions in respond to different social environments. Deductively, these social environments can catalyse personal differences in energy and personal growth. Thus, central to the concept of the Self-Determination Theory is that of the person-in-environment. The Self-Determination Theory posits that human beings are proactive organisms whose intrinsic functioning can either be facilitated or impeded by the social context (Ryan & Deci, 2000a).

2.2.3 Basic Psychological Needs

Using empirical process in the Baconian tradition, Ryan and Deci (2000a) identified three psychological needs – autonomy, competence and relatedness which appear essential for facilitating optimal functioning for growth. For experimental methods in the Baconian tradition, social contextual variables were directly manipulated and the effects of these experimental manipulations on both internal processes and behavioural manifestations
examined. From the examination of the effects of these experimental manipulations, Ryan and Deci (2000a) reasoned and induced the three psychological needs of autonomy, competence and relatedness.

Autonomy is the motive to experience free-will and self-organised behaviour. It occurs when an individual feels a sense of whole-hearted volition in his choices and that he is the cause of his behaviours. Competence is basic mastery motive. It occurs when an individual feels effective in his behaviours. Relatedness is the need to feel connected to others within a nurturing relationship. It occurs when an individual feels connected to or understood by others.

As mentioned in an earlier paragraph, the specification of these three basic psychological needs emerged from the inductive and deductive interpretation of a diverse set of research results in the area of intrinsic motivation.

2.2.3.1 Basic psychological need - Autonomy

Deci (1971), in a study on the effects of external rewards on intrinsic motivation, had participants played an inherently interesting task called the SOMA puzzle. Participants were paid to play, given verbal rewards or received no reinforcement for participating in the experimental study. The study found that participants who were paid money to play spent a significantly less amount of time than participants who were not rewarded to play. Those who received verbal rewards played for a longer amount of time than participants in the other two conditions.

In a meta-analysis of 128 studies spanning 3 decades, Deci, Koestner, and Ryan (1999) confirmed that not only monetary rewards but all forms of contingent tangible rewards significantly undermined intrinsic motivation.
In another study, Zuckerman, Porac, Lathin, Smith, and Deci (1978) had yoked pairs of subjects solved puzzles such that one member of each pair was given choice about what puzzles to work on and how much time to allot to each while the yoked subject was assigned the same puzzle and time allotment as those chosen by the first subject. The study found that the subjects who chose the puzzles and time allotment, in other word, who had choice, were more intrinsically motivated than the subjects without choice as evident from their spending more time working on the puzzles during the free-choice period.

The findings above suggested to Deci and his colleagues that an understanding of human motivation required a consideration of motivational processes other than mere external reinforcement. Deci and Ryan (2000) explained that when external rewards were given for doing an intrinsically interesting activity, people tended to feel controlled by the rewards, causing a shift in their perceived locus of causality, from internal to external. People thus felt that their behaviours did not originate from themselves and hence, displayed less intrinsic motivation. In contrast, people who were given choice had an internal locus of causality which enhanced their intrinsic motivation in doing the activities (Zuckerman et al., 1978).

Inductively, this suggests that intrinsically motivated behaviours are self-determined which means that autonomy which is the motive to experience free-will and self-organised behaviour is a basic psychological need.

2.2.3.2 Basic psychological need - Competence

Recalling the study (Deci, 1971) mentioned above where participants played SOMA puzzle under three different experimental conditions, results showed that positive feedback in the form of verbal rewards enhanced intrinsic motivation relative to no feedback. In another study, Deci and Cascio (1972) demonstrated that negative feedback and threats of
punishment decreased intrinsic motivation. In this particular study, subjects in the negative feedback condition were given more difficult puzzles to solve than subjects in the control condition so that they failed more frequently than subjects in the control condition. Subjects in the threat condition received an aversive buzzer each time they were unable to solve a puzzle while the subjects in the control condition did not. Results revealed that those in the high failure condition and threat condition showed less intrinsic motivation following their puzzle-solving session than did the control subjects as evident from the significantly less time spent on working on the puzzles during the free-choice period.

Deci and Ryan (2000) linked these results to the need for competence. As positive feedback enhances intrinsic motivation and negative feedback and threat undermine intrinsic motivation, this suggests that the nature of feedback affects intrinsic motivation which inductively suggests a psychological need for competence.

2.2.3.3 Basic psychological need - Relatedness

Deci and Ryan (2000) deduced relatedness as the third psychological need from the following experiments.

Anderson, Manoogian, and Reznick (1976) conducted a study on factors that undermined or enhanced intrinsic motivation in preschool children. In this study, the researchers had the participants drawn free-style drawing with multicoloured, felt-tipped pens, an activity that was intrinsically motivating to this subject population. In an unexpected finding, the researchers discovered that the experimenter in the control group, who did not watch the child or his drawing, resulted in a large decline in intrinsic motivation in the child. It was apparent to the experimenter that the control treatment was uncomfortable for both the experimenter and child. It was unusual to sit in absolute silence with a child who was accustomed to the presence of pleasant, attentive adult. While the experimenter was striving
rather painfully to avoid eye contact, conversation or attending to the child's drawing, the child was striving equally hard to elicit some acknowledgement from the experimenter for what he was doing. Apparently, ignoring a child's activity was in itself influential and quite different from the child drawing alone.

Ryan, Stiller, and Lynch (1994) in their investigations on students’ relationships to teachers, parents and friends as predictors of academic motivation also showed greater intrinsic motivation in students who experienced their teachers as warm and caring.

Collectively, the results suggest that intrinsic motivation will be more likely to flourish in contexts characterised by a sense of relatedness, thus providing empirical evidence that relatedness is a basic psychological need.

According to Deci and Ryan (2000), these three psychological needs of autonomy, competence and relatedness when satisfied lead to well-being and thus optimal functioning. These needs, when thwarted, lead to ill-being and pathology.

2.2.4 Factors that Affect Motivational Regulation

Ryan and Deci (2000a) proposed two sub-theories – (i) Organismic Integration Theory, and (ii) Cognitive Evaluation Theory within the Self-Determination Theory to explain (i) Internalisation and integration of motivational regulation, and (ii) Factors that affect internalisation and integration of motivational regulation, respectively.

We will first look at “internalisation” and “integration” of motivational regulation and then discuss the factors that affect internalisation and integration of motivational regulation.
2.2.4.1 Organismic Integration Theory

As mentioned in an earlier section, the Ecological-Systems Perspective helps in the understanding of the concept of the person-in-environment. It suggests that there are interactions and transactions that take place within the person and between the person and the social environment. The concept of “internalisation” can be understood as the dynamic exchange between the person and the social environment and “integration” as the dynamic transformation that takes place within the person.

According to Ryan, Connell, and Deci (1985), internalisation is the process in which individuals transform socially sanctioned mores into personally endorsed values and self-regulation. When internalisation process functions optimally, the individuals will identify with the importance of the social regulations and assimilate them into their sense of self and thus accepting the social regulations as their own. In doing so, they become integrated not only intra-psychically but also socially. Ryan et al. (1985) suggested that it is possible to integrate extrinsically motivated behaviours. When integrated optimally, the extrinsically motivated behaviours will be fully volitional.

The process of internalisation requires nutriments to function effectively (Ryan et al., 1985). The degree to which individuals are able to assimilate social demands, values and regulations into the self is dependent on the extent to which their basic psychological needs are supported as they engage in the relevant behaviours.

Next, we will discuss the factors that affect internalisation and integration of motivational regulation.

2.2.4.2 Cognitive Evaluation Theory

The Self-Determination Theory proposes that internalisation of values is likely to be supported when the psychological needs of relatedness, competence and autonomy are met.
According to Deci and Ryan (2000), people tend to internalise the values and regulations of their social groups. The internalisation will be facilitated if there is feeling of relatedness to the socialising others. Also, if the individuals are able to understand, grasp the meaning or rationale behind the regulation and feel competent enough to enact the behaviours, internalisation of the regulation will be enhanced. For a regulation to become more integral to one’s self, there must be an opportunity for the individuals to freely process, endorse, modify and transform the transmitted values. Hence, support for autonomy is important.

Field research and laboratory experiments provide empirical evidence to support the proposal that social conditions that conduce towards feelings of relatedness, competence and autonomy can facilitate internalisation and integration.

Grolnick and Ryan (1989) interviewed parents of late-elementary students and then assessed the children’s motivation and internalisation in the classrooms. The researchers found that the degree to which parents provided autonomy-support and personal involvement in their children’s school work directly affected the children’s internalisation and integration of school-related activities. Parents who were rated by the interviewers as more autonomy-supportive had children who displayed more intrinsic motivation and reported more internalised self-regulation for academic activities. In a later study, Grolnick, Ryan, and Deci (1991) reported that children’s perceptions of parental involvement and autonomy support also predicted more autonomous self-regulation.

Deci, Eghrari, Patrick, and Leone (1994) conducted a laboratory experiment to test three factors theorised to facilitate internalisation of the regulation for uninteresting activities. The three factors manipulated were: (i) Rationale, so that participants would understand why the target behaviour was important, (ii) Acknowledgement of feelings that the activity was not interesting, so that the participants would feel understood, (iii) Choice, so that the participants would feel free to accept responsibility for the behaviour.
After an experimental period of performing an uninteresting activity under one of the experimental conditions, the participants were given a free-choice period in which they could choose to continue with the same activity or do other things. Results revealed that the three factors did indeed facilitate internalisation as evident from the subsequent behaviour during the free-choice period and self-reported value and enjoyment of activity.

Deci et al. (1994) further found that in conditions with two or three facilitating factors, the internalisation tended to be integrated. In conditions with one or no facilitating factor, the internalisation appeared to be introjected as evident from the negative correlations between behaviour in the free-choice period and self-report variables. Thus, conditions that provide support for psychological needs satisfaction do promote internalisation and facilitate integration.

The Cognitive Evaluation Theory spells out the social conditions that facilitate or forestall intrinsic motivation by supporting versus thwarting people’s psychological needs. It bespeaks of the assumption that intrinsic motivation can be catalysed when individuals are in conditions that conduce towards its expression. To the teachers, it means that classroom interactions can facilitate or forestall intrinsic motivation by supporting or thwarting needs for autonomy, competence and relatedness. It gives clues to teachers who are trying to figure out how to instil passion in learning in their students on what they could do to motivate students to learn in the classrooms.

Hence, the Self-Determination Theory is concerned not only with the nature of positive development tendencies but also examines social conditions that may facilitate or hinder the growth of these tendencies. An understanding of the dramatic functioning of social conditions is important. It empowers individuals such as teachers who need to move their students to act in a way that demonstrates passion, commitment, effort and high quality
performance. It implies that classroom instructional behaviours can be modified to instil passion in learning in our students.

2.2.5 Application of Self-Determination Theory

It is every teacher’s wish that students are intrinsically motivated to learn. Whenever possible, teachers should encourage students to learn for inherent interest. However, teachers cannot always expect students to learn intrinsically for the fact that many of the tasks that students are asked to perform are not inherently interesting or enjoyable. Hence, knowing how to promote intrinsic motivation, if not, more autonomous forms of extrinsic motivation becomes a very important skill.

The Self-Determination Theory provides a comprehensive view on human psychological needs, the causes of human behaviour – motivational orientations, and details the design of the social environment that optimises people’s development, performance and well-being. It very clearly spells out the processes of internalisation and integration thereby helping teaching practitioners to understand how non-intrinsically motivated behaviours can become self-determined. It offers suggestions on ways in which the social environment can influence those processes, hence providing teaching practitioners with an idea on how to create a social environment that helps to instil passion in learning in the students.

Thus, the Self-Determination Theory and its theoretical underpinnings are adopted and tested out in this experimental study to help teachers understand the motivational orientation of Singapore students and to find out how to promote more autonomous form of learning in the students.
2.3 The Person: Motivational Profiles of Students

2.3.1 Motivational Profiles: Motivational Regulations, Relative Autonomy Index and Psychological Learning Attributes

Teachers would agree that students’ learning behaviours are multi-determined, that is, multiple reasons drive learning behaviours, such as interest in the learning material, a desire to prove oneself by getting good grades, familial expectations or future professional goals. Nevertheless, some motives might be more dominant for some students, while other motives might be of greater importance to others. Some students might combine some motives in a relatively unique manner such that they study both because they need to meet familial expectations and because they find learning enjoyable. Thus, different types of students might exist with different motivational profiles.

Research studies using the framework of the Self-Determination Theory (Deci & Ryan, 1985, 2000; Vallerand, 1997) have shown that students differ in the ways that they are motivated towards a learning activity. Importantly, these differences in motivational regulations have far-reaching influences on their approaches towards the learning activities and the cognitive, affective and behavioural consequences that follow (Deci & Ryan, 2000).

Researchers who examined motivational regulations and the consequences of motivational regulations within the Self-Determination Theory framework faced the challenge of representing motivation in a way that captures the multi-dimensionality of the construct and accurately representing the self-determination continuum (Ullrich-French & Cox, 2009).

One approach has been to examine each type of motivational regulation individually. This approach allows the retention of information on the magnitudes of the motivational
regulations and the testing of how each type of motivational regulation relates independently to theoretically relevant psychological learning attributes.

Using this approach, findings have consistently revealed that more autonomous motivational regulations such as intrinsic regulation and identified regulation are associated with more adaptive learning consequences including greater effort-expenditure (e.g. Ntoumanis, 2001; Standage, Duda, & Ntoumanis, 2003, 2005), greater use of adaptive meta-cognitive strategies such as planning and time management (e.g. Vansteenkiste, Zhou, Lens, & Soenens, 2005), better cognitive processing as indexed by more deep-level learning (e.g. Grolnick & Ryan, 1987; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005), less procrastination (e.g. Sene´cal, Julien, & Guay, 2003), better coping style (e.g. Ryan & Connell, 1989), well-being (e.g. Levesque, Zuehlke, Stanek, & Ryan, 2004) and higher grades (e.g. Soenens & Vansteenkiste, 2005).

Findings have also revealed that more controlled motivational regulations such as external regulation and introjected regulation predict a broad variety of undesirable outcomes such as less engagement in adaptive meta-cognitive strategies such as concentration and time management (e.g. Vansteenkiste, Zhou, et al., 2005), more engagement in maladaptive meta-cognitive strategies such as test anxiety (e.g. Vansteenkiste, Zhou, et al., 2005), superficial cognitive processing (e.g. Vansteenkiste, Simons, et al., 2005), more procrastination (e.g. Sene´cal et al., 2003), use of maladaptive coping strategies (e.g. Ryan & Connell, 1989) and lower achievement (e.g. Soenens & Vansteenkiste, 2005).

The second approach considers the combination of motivational regulations in the form of a Relative Autonomy Index (RAI) which was formulated in the following way: external regulation x (-2) + introjected regulation x (-1) + identified regulation x (+1) + intrinsic regulation x (+2) (Ryan & Deci, 2007). The combination of the motivational regulations is consistent with the proposition that students may have multiple reasons for
participating in learning activities (Ryan & Deci, 2007), thus capturing the multidimensionality of the construct and representing the self-determination continuum.

In the domain of sports, researches have consistently shown that students with higher Relative Autonomy Index (RAI) scores have more positive affect, greater concentration, greater intention to participate in optional physical education in the future and are more physically active both within and outside the school setting (for example, Cox, Smith, & Williams, 2008; Goudas, Biddle, & Fox, 1994; Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003; Ntoumanis, 2005; Standage et al., 2006).

In the domain of work and job employment, the Relative Autonomy Index (RAI) has associated positively with various aspects of optimal functioning including job satisfaction, physiological health and beneficial work attitudes such as organisational commitment (Gagné & Deci, 2005).

Following the premises of the research findings as discussed above, the researcher expected certain profiles to emerge from the current sample of students. Hence, the broad research question: What are the motivational profiles of students in Singapore?

2.3.2 Motivational Profiles: Clustering of Motivational Regulations and Psychological Learning Attributes

Although the Relative Autonomy Index (RAI) provides a parsimonious way of capturing the multidimensionality of the motivational construct and representation along the self-determination continuum, the absence of unique information about the magnitude of students’ scores on each motivational regulation presents a limitation (Ullrich-French & Cox, 2009; Van den Broeck, Lens, De Witte, & Van Coillie, 2013).

Ullrich-French and Cox (2009) argued that when using the formula for the calculation of the Relative Autonomy Index (RAI) (Grolnick & Ryan, 1989; Ryan & Connell, 1989;
Deci & Ryan, 2002; Wilson et al., 2012) which was formulated in the following way:

external regulation x (-2) + introjected regulation x (-1) + identified regulation x (+1) + intrinsic regulation x (+2), the weights of the autonomous and non-autonomous motivational regulations cancel each other out, resulting in a moderate score. To be specific, what does it mean for a student to experience both high levels of inherent interest and external pressure when participating in a learning activity? Using the formula used for the calculation of the Relative Autonomy Index (RAI), the student would be moderate in the relative autonomy along the self-determination continuum. As Van den Broeck et al. (2013) pointed out, an individual scoring high on both autonomous and controlled motivational regulations would have the same Relative Autonomy Index (RAI) as another individual who obtained low but also equal scores on both types of motivational regulations.

Ullrich-French and Cox (2009) suggested that a combination of multiple constructs of motivational regulations and their respective magnitudes might reveal more information regarding the relationships among the motivational regulations and whether they operated in an interactive or additive fashion. Ullrich-French and Cox (2009) proposed the use of cluster analysis to identify naturally occurring groups of students within a sample that have similar patterns of scores on the different types of motivation regulation. These profiles would then be used to examine how students with different combinations and magnitudes of motivational regulations differ in the learning experiences. Several studies (for example, Vlachopoulos, Karageorghis, & Terry, 2000; Ullrich-French & Cox, 2009) have elaborated on the cluster analysis approach to identify adaptive and maladaptive motivational profiles in learning outcomes.

Ratelle, Guay, Vallerand, Larose, and Sene´cal (2007) conducted three different studies to identify the motivational profiles of students in Canada. In their first study using a sample of high school students in Montreal, Canada, they identified three different clusters of
students which they labelled “high autonomous-high controlled” as this cluster was characterised by high scores on both autonomous and controlled motivation, “moderate autonomous-moderate controlled” as this cluster was characterised by moderate scores on both autonomous and controlled motivation, and “controlled” as the cluster was characterised by high controlled and high amotivation scores.

From the analysis of the motivational profiles with learning outcomes, Ratelle and her colleagues found that having a profile that combined high levels of autonomous and controlled motivations appeared to be adaptive because this cluster of students, despite having high levels of controlled motivation, experienced the most positive academic outcomes (better school satisfaction, a higher probability of staying in school, lower distraction and anxiety). Surprisingly, Ratelle and her colleagues did not find an autonomous profile in their first sample of high school students, which they suggested could be because the high school climate was unsuccessful in fostering such a motivational profile.

Ratelle et al. (2007) in their second study on high school students from Quebec City, Canada, which was conducted 15 years after the completion of their first study, also found a three-cluster solution among their second sample. Consistent with their findings from study 1, they found having a profile that combined high levels of autonomous and controlled motivations to be most adaptive. However, the findings from both study 1 and 2 did not allow them to determine whether having a purely autonomous profile was more adaptive than having a combined profile because they did not find an autonomous profile in either samples. In their discussion, they suggested that highly autonomous motivational regulations might be enough to ensure positive academic outcomes by protecting and buffering against the negative effects of controlled motivational regulations.

Ratelle et al. (2007) conducted a third study on Canadian college students with the hope to compare a “high autonomous-high controlled” cluster with a purely autonomous
cluster. From their sample of college students, they managed to identify a four-cluster solution with one cluster scoring high on both autonomous and controlled motivation dimensions (high quantity motivation group), one cluster scoring low on both autonomous and controlled motivation dimensions (low quantity motivation group), one cluster scoring high on autonomous motivation but low on controlled motivation (good quality motivation group) and one cluster scoring low on autonomous motivation and high on controlled motivation (poor quality motivation group). From their analyses of the motivational profiles with learning outcomes, they found that achievement was equivalent for students from the "good quality motivation group" and those from "high quantity motivation group". However, the "good quality motivation group" did predict a higher probability of persevering in an academic program than did the "high quantity motivation group". Ratelle and her colleagues concluded that depending on the specific learning outcome under study, the "good quality motivation group" could be more advantageous than a combined profile.

Ratelle and her colleagues also discussed the fact that an autonomous profile could be found in college, an educational setting characterised by less constraints, suggested that students’ motivational profiles might be context-sensitive. They suggested that as high school entailed more extrinsic controls and rigid constraints, most students developed, to some extent, controlled forms of motivational regulations. Although not always adaptive, controlled motivational regulations could inevitably be developed in order for students to meet environmental demands. However, controlled forms of motivations might be detrimental when students also failed to develop autonomous forms of motivation.

Vansteenkiste, Sierens, Soenens, Luyckx, and Lens (2009) examined the motivational profiles of secondary school and college students in Belgium. From each of the two samples, they found a four-cluster solution which they labelled "good quality" cluster as it was characterised by high scores on autonomous motivational regulations but relatively low
scores on controlled motivational regulations, "high quantity" cluster as it was characterised by high scores on both autonomous and controlled motivational regulations, "poor quality" cluster as it was characterised by high scores on controlled motivational regulations but low scores on autonomous motivational regulations, and "low quantity" cluster as it was characterised by low scores on both motivational dimensions.

Across both studies, the "good quality" cluster was found to display better cognitive processing, more determination, more meta-cognitive self-regulation and higher achievement than did the "poor quality" cluster. Also, the presence of controlled motivational regulations, next to either a high or low amount of autonomous motivational regulations yielded no benefit. Instead, the pressure and stress associated with the controlled motivational regulations seemed to lead students to procrastinate more. The additional presence of controlled motivational regulations did not detract students from cognitive processing per se, but it seemed to make the students more vulnerable to a poor regulation of their study activities and their approaches to exams. Vansteenkiste et al. (2009) discussed that perhaps, as a result of their procrastination and the pressure to do well on tests, controlled students were more anxious when taking tests and obtained lower grades.

In the domain of sports, in a sample of adult sports participants, Vlachopoulos, Karageorghis, and Terry (2000) identified two clusters with unique motivational profiles and found that students in the cluster with relatively high external regulation, introjected regulation, identified regulation and intrinsic regulation experienced greater enjoyment and put forth more effort compared with those who were relatively high on autonomous motivational regulations and low on non-autonomous motivational regulations. The study suggested an additive function of motivational regulations, that is, being relatively high on all types of motivational regulations may lead to the most adaptive consequences.
In their exploratory study, Ullrich-French and Cox (2009) identified five clusters with unique motivational profiles in a sample of sixth to eighth grades students in a mid-west region of the United States of America. The researchers labelled the five clusters as "Average" as it was represented by motivational regulation scores that were neither characterised by relatively low or relatively high (for intrinsic regulation, identified regulation and introjected regulation) though the external regulation score was considered relatively high, "Motivated" as all motivation regulations were characterised by relatively high scores, "Self-Determined" as it was characterised by relatively high scores on intrinsic regulation and identified regulation, an average level of introjected regulation and relatively low level of external regulation, "low motivation" as it was characterised by relatively low levels of all four motivation regulations, and "external" as it was characterised by relatively low levels of intrinsic regulation, identified regulation and introjected regulation and a relatively high level of external regulation.

From the association of the five clusters with learning outcomes, Ullrich-French and Cox (2009) found the "Motivated" and "Self-determined" clusters to represent the more adaptive motivational profiles with the highest levels of enjoyment, effort and value and the "external" cluster to represent the least adaptive motivational profile with the lowest levels of enjoyment, effort and value. Interestingly, having high levels of non-autonomous motivational regulations were not maladaptive when combined with high levels of autonomous forms of motivational regulations.

Boiche’, Sarrazin, Grouzet, Pelletier, and Chanal (2008), in a French sample of high school students, identified three clusters with unique motivational profiles and then associated the motivational profiles with achievement. The three clusters were labelled "Self-determined" as it was oriented towards the self-determined part of the continuum of motivation, with high levels of intrinsic regulation and identified regulation, moderate level
of introjected regulation and low levels of external regulation and amotivation, "Moderate" cluster as it presented average scores on each of the five motivational regulations and "Non-self-determined" as it was oriented towards the non-self-determined part of the continuum, with students scoring high on external regulation and amotivation, and low on other forms of motivation. The study found the "Self-determined" cluster to be most adaptive.

Interestingly, although as a more controlled form of motivational regulation, introjected regulation was theoretically assumed to lead to negative consequences, in the study, it was found to be linked to better achievement. Boiche and his colleagues pointed out that a moderate feeling of guilt or shame, as shown by the students' moderate score on introjected regulation did not necessarily have negative consequences, if at the same time the student got a certain satisfaction from the activity, that is, intrinsic regulation and anticipated that the activity would help him or her to reach personal goals, that is, identified regulation.

Conversely, when these feelings were not associated with interest or personal value for the activity, the outcomes could be less positive. Notably, a moderate level of introjected regulation in itself did not guarantee beneficial impacts on achievement. More specifically, the "Moderate" cluster with similar level of introjected regulation had lower achievement. Boiche and his colleagues suggested an additive effect from the combination of motivational regulations. It was possible that “despite the experimental demonstrations that superfluous extrinsic contingencies can undermine intrinsic interest in controlled experimental contexts, intrinsic and extrinsic motivation may, in many real-world settings, exert simultaneous positive influences on behaviour” (Lepper & Henderlong, 2000).

When taken together, the findings from the studies above seem to suggest that having autonomous motivational regulations have added benefits. As evident from the studies discussed above, students’ motivational profiles might be context-sensitive (Ratelle et al., 2007). The contextual nature of motivational profiles precludes hypotheses and hence, when
examining motivational profiles of a sample of students from Singapore, the researcher took an exploratory approach by considering a range of potential profiles that emerged from a hierarchical cluster analysis. The profiles that emerged were then examined to determine if they differed in theoretically relevant constructs of psychological learning attributes of motivational beliefs, use of learning strategies, enjoyment and effort.

To summarise this section, the researcher posits that there exist clusters of students with significantly different motivational profiles and that these clusters differ significantly in terms of motivational beliefs, use of learning strategies, enjoyment and effort.

In the following section, we will focus on the environment and discuss about the influence of the teachers in the classrooms and what teachers can do to motivate their students.

2.4 The Environment: Teacher - The Motivating Force In The Classroom

Teachers are primary adult figures in the classrooms and play important roles in the socialisation of the students. Students’ experiences of the interpersonal climate of the classroom can be important predictors of school-related functioning.

Studies have shown significant relations between teacher’s autonomy-supportive instructional behaviours and students’ motivation in learning. By autonomy-supportive, it means that the teacher displays interpersonal behaviours which involve and nurture the student’s internally-locused, volitional intentions to act; such as when a teacher supports a student’s psychological needs, interests, preferences and values (Reeve & Jang, 2006).

In one study, Ryan and Grolnick (1986) reported that students who experienced their teachers as autonomy-supportive and warm were more likely to be intrinsically motivated, to
feel competent and to have higher self-esteem than students who experienced their teachers as non-autonomy-supportive. Goodenow (1992), and Williams and Deci (1996) found that perceived teacher support was significantly associated with both perceived competence and intrinsic interest. Black and Deci (2000) revealed that students’ perception of autonomy-support from their teachers predicted perceived confidence in the subjects and a decrease in anxiety regarding course grade. Ryan et al. (1994) found that the quality of students’ relationship with their teachers uniquely contributed to school functioning such that students who felt more secure with and more able to utilise their teachers also reported more positive attitudes, greater sense of control, autonomy and engagement in school.

Together, such findings point to the importance of teachers in shaping students’ motivation. In light of consistent findings that teachers’ instructional and motivational behaviours exert clear and significant influence on students’ subsequent motivation and engagement, it is thus relevant to implement an intervention programme with the teacher as the tool to influence students’ motivational regulations in learning. The details of the intervention programme will be described in sections 2.4.1 and 2.4.2.

2.4.1 Autonomy-Supportive Versus Controlling Instructional Behaviours

The knowledge that teachers can wield influence over the classroom climate and students’ learning is very empowering for teachers. Many teachers who have been wondering how best to help their students learn would be excited to know that Deci et al. (1994) had proposed classroom instructional behaviours – autonomy-supportive instructional behaviours aimed at satisfying the three psychological needs of autonomy, competence and relatedness, to promote a more autonomous form of learning. These classroom instructional behaviours are backed by empirical evidence.
Deci et al. (1994) posited that there are three contextual conditions that may allow the acceptance of regulatory processes and thus promote integrated internalisation. The three conditions are:

(i) Providing meaningful rationale
(ii) Acknowledging the students’ perspective
(iii) Conveying choice rather than control

Providing rationale that is personally meaningful to the students can help them to understand why self-regulation of the activity would be useful. Using the context of a classroom, an example would be to tell the students to memorise the multiplication tables so that they can use the multiplication tables for counting when buying things for themselves.

However, providing meaningful rationale for activities which are not intrinsically motivating may not always work. In fact, it may create an internal conflict with the students’ inclinations, thus resulting in them feeling guilty, pressured and tensed. It may be useful to acknowledge the conflict between the request and the students’ inclinations from the students’ perspective. By doing so, the teachers convey respect for the students’ inclination and the right to choose and decide their behaviours. This can help the students to understand that the requested behaviour can coexist harmoniously with their inclination, thus reducing the inner tension they feel within. For example, conveying the understanding that it is not fun spending time memorising the multiplication table.

The way the rationale and acknowledgment are presented also matters. More specifically, rationale and acknowledgement can be presented in a way that conveys choice and minimises pressure or in a controlling and pressuring manner. For example, the use of imperative language such as “you should”, “you must” and “you have to” have the connotation of control and may hinder internalisation and integration of value. Instead of saying “You must attend to the task”, a more neutral language would be “It involves
attending to the task”. Another example would be saying “You did well” in a neutral language instead of saying “You did well as you were supposed to”.

Koestner, Ryan, Bernieri, and Holt (1984) supported the proposal that acknowledging feelings helped facilitate self-determination. In their study, six and seven years old students were asked to engage in an intrinsically motivating painting activity and limits were set regarding being neat. The controlling limit group received verbal instruction that were stated in imperative language of “should” and “must”. The informational group received the same limit on painting behaviour in the absence of external pressure and with an acknowledgement of feelings regarding the imposition of limit. During the free-choice period, the amount of time students in the informational group spent on painting was significantly more than the amount of time spent by students in the controlling group, suggesting that acknowledging feelings could help the students to maintain intrinsic motivation for painting.

Ryan (1982) and Ryan, Mims, and Koestner (1983) supported the contention that controlling language decreased intrinsic motivation in doing an activity. In both studies, the researchers investigated the effects of informational versus controlling feedback on intrinsic motivation. In the informational feedback condition, there was an absence of pressuring language whereas in the controlling feedback condition, participants were told how they should perform to live up to expectation. Results confirmed that controlling feedback undermined intrinsic motivation relative to informational feedback as evidenced from the significantly less time spent on doing hidden figure task during free-choice period.

As proposed by Deci et al. (1994), the three social conditions of providing meaningful rationale, acknowledging students’ perspective and conveying choice rather than control each contributed to the facilitation of self-determination. The absence of these factors represented non-support for self-determination. Consequently, these factors were hypothesised to predict
the amount of internalisation of a motivational regulation. More specifically, the amount and type of internalisation would be a function of the number of facilitating factors.

Deci et al. (1994) conducted a study with a 2 x 2 x 2 factorial design on 192 psychology students to investigate the effects of these three factors - providing meaningful rationale, acknowledging students’ perspective and conveying choice rather than control on students’ intrinsic motivation.

In this study, students were given a boring computer-assisted task. Intrinsic motivation was not relevant in this activity because pilot study had found that it was not a task that people would do out of inherent interest. Hence, any persistence in the activity could be attributed to the students having internalised the regulation for it. Subsequent to completing the boring task, students were given free-choice period. The amount of time the students spent on the task during the free-choice period was used as a measure of the amount of internalisation that had occurred. Results revealed that when social conditions supported self-determination (2 or 3 social conditions), there was more internalisation than when the social conditions did not support self-determination (0 or 1 social condition). Furthermore, social conditions that were supportive of self-determination promoted integration whereas social conditions that were non-supportive of self-determination promoted introjection.

The facilitating factors of providing meaningful rationale, acknowledging students’ perspective and conveying choice rather than control seemed to have worked synergistically. It appeared that the presence of a least 2 or 3 of the factors created a context sufficiently supportive of self-determination to promote integration. The absence of at least 2 of the 3 factors created a context that promoted only introjection. In this study, no single facilitating factor had strong enough effect to explain a significant amount of variance.

Taken together, when the social context provides needed nutriments that support self-determination, integration process will function optimally. When the social context does not
provide the needed support for self-determination, introjection results. Thus, socialisation agents such as the teachers could learn to present instructions, limits and requests in a way that promotes integration and self-determination. Informatively, they could try to provide meaningful rationale, acknowledge students’ perspective and convey choice rather than control in their communication.

2.4.2 What Teachers Say and Do to be Autonomy-Supportive

In the section above, the researcher discussed what it means by being autonomy-supportive. Adopting the operational definitions in Deci et al. (1994), the researcher operationalised autonomy-supportive instructional behaviours to mean providing meaningful rationale, acknowledging students’ perspective and conveying choice rather than control in the communication. Deci et al. (1994) had derived at the constructs of providing rationale, acknowledging perspective and conveying choice in an effort to be parsimonious. As this study involves the manipulation of experimental conditions, it would be useful to have a better idea on what autonomy-supportive classroom conditions could entail.

Reeve and Jang (2006) elaborated on what it means to have autonomy-supportive instructional behaviours. They suggested more ideas on what teachers can say and do to support students’ autonomy and what they say and do that can hinder it. In their study, they hypothesised 11 autonomy-supportive behaviours which included time listening, asking what students want, allowing students time to work in their own way, allowing students time to talk, providing rationale, providing praises as informational feedback, offering encouragement, offering hints, being responsive to student-generated questions, communicating perspective-taking statements and creating seating arrangement to encourage initiative and conversation. They also hypothesised 10 controlling behaviours which included time teacher talking, time monopolising learning materials, exhibiting solutions before
students have time to solve problems, uttering solutions that shaped students towards teacher-prioritised behaviours and answers, uttering directives, making should/ought to statements, uttering controlling questions that pressured students into compliance with teacher’s agenda, making deadline statements, giving praise as contingent reward and criticising students. They then established which of the reported behaviours – autonomy-supportive versus controlling correlated positively with students’ perception on autonomy and negatively with students’ perception of autonomy, respectively.

Their results revealed that behaviours associated with autonomy-supportive instructional behaviours correlated significantly and positively with students’ perceived autonomy. Out of the autonomy-supportive behaviours, 3 contributed unique variance in explaining students’ perceived autonomy. They were, offering encouragement, time allowing students to work in own way and time allowing students to talk. Out of the controlling behaviours, 6 correlated significantly and negatively with students’ perceived autonomy. They were, time monopolising learning materials, exhibiting solutions, uttering solutions, uttering directives, making should/ought to statements and asking controlling questions. Unique variances were contributed by asking controlling questions and making should/ought to statements.

In summary, this current study guided by the theoretical underpinnings of the Self-Determination Theory seeks to test out the effects of autonomy-supportive instructional behaviours on Singapore students’ psychological needs satisfaction, motivational regulation, motivational beliefs, use of learning strategies, enjoyment and effort in learning. “Autonomy-supportive instructional behaviours” in this study is operationalised by the provision of meaningful rationale, acknowledgment of students’ perspective and provision of choice in classroom communication.
Understanding that the 3 constructs were derived out of the need to be parsimonious, the researcher would like to also include the behaviours stated in Reeve and Jang's (2006) study in practical implementation of autonomy-supportive instructional behaviours.

Thus far, the researcher has discussed how the teachers’ interpersonal instructional behaviours can affect students’ motivation and learning, and elaborated on how teaching practitioners can support their students’ learning in an autonomy-supportive way. In the next few sections, the researcher will review the literature on how autonomy-supportive instructional behaviours are related to the following:

2.5 Basic psychological needs
2.6 Motivational regulations
2.7 Motivational beliefs in learning
2.8 Learning strategies
2.9 Enjoyment and effort

The researcher will then define the key terminologies used in this study, establish the rationale for the study and formulate research questions based on what the reviewed studies have found.

2.5 Autonomy-Supportive Instructional Behaviours and Basic Psychological Needs

Central to the tenets of the Self-Determination Theory are the concepts of basic psychological needs of autonomy, competence and relatedness, and social conditions that may promote or thwart psychological growth. To recapitulate, autonomy is the motive to experience free-will and self-organised behaviour. Competence is basic mastery motive.
Relatedness is the need to feel connected to others within a nurturing relationship. According to the Self-Determination Theory, social conditions rich in elements of choice, meaningful rationale and acknowledgement of feelings, that is, autonomy-supportive, could fulfil basic psychological needs. Fulfilment of basic psychological needs will lead to optimised functioning and well-being and inability to fulfil these needs may lead to pathology and ill-being.

Empirically, perceived autonomy-support had been found to relate positively and directly to satisfaction of basic psychological needs, albeit varying degree of correlations. Motivational studies often attempted to test a model based on the sequence proposed by Vallerand (1997, 2001) which was formulated as:

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Perceived autonomy-support  →  Psychological needs satisfaction  →  Autonomous motivation  →  Psychological attributes / performance outcome
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The purpose of the motivational sequence was to examine the relationship between perceived autonomy-support and psychological attributes or performance outcome and to determine whether these relations were mediated by the satisfaction of basic psychological needs and autonomous motivation.

In the domain of sports, Adie, Duda, and Ntoumanis (2008) assessed male and female participants of team sports such as hockey, cricket and netball in the United Kingdom and found that perceived autonomy-support positively corresponded to reported satisfaction of the needs for autonomy, competence and relatedness which in turn predicted more autonomous motivation and higher levels of vitality and intrinsic interest.

Alvarez, Balaguer, Castillo, and Duda (2009) in their study on Spanish teenage soccer players from soccer schools also reported that the degree to which the players perceived their
coaches as autonomy-supportive related positively to their psychological need satisfaction which in turn predicted a more autonomous motivation and higher sports involvement.

In a different method of analysis, Edmunds, Ntoumanis, and Duda (2008) manipulated the delivery of instruction to female university students and staffs who signed up for exercise classes. In this experimental study, they had independent observers blinded to experimental conditions rated the level of autonomy-support provided by the exercise instructors to confirm that the instructor in the experimental condition had indeed taught in an autonomy-supportive manner. Their findings revealed that in the control condition, participants reported an increase in competence and no change in autonomy and relatedness but in the autonomy-supportive condition, participants reported an increase in both relatedness and competence though there was no change in autonomy. Though the results were not fully aligned with the propositions of the Self-Determination Theory, they did suggest additional benefit of autonomy-support.

In the health setting, Markland and Tobin (2010) studied the impact of autonomy-support on exercise behaviours of overweight adult women who took part in a ten-week exercise referral scheme in a health facility in the United Kingdom. The researchers utilised the motivational sequence set forth by Vallerand (1997, 2001) and found autonomy-support to correlate positively and significantly with psychological needs satisfaction. In this study, psychological needs satisfaction mediated the relationship between autonomy-support and amotivation, external regulation, introjected regulation and identified regulation and partially mediated the effects of autonomy-support on intrinsic regulation.

Despite somewhat inconsistent findings from different studies, collectively, they point towards one direction and that is, a positive impact of autonomy-support on basic psychological needs. Together, the results underline the importance of the atmosphere created by instructors in the satisfaction of basic psychological needs. Following the direction of the
studies put together, the researcher postulates that perceived teacher autonomy-support predicts and promotes the satisfaction of basic psychological needs of autonomy, competence and relatedness. Also, the satisfaction of basic psychological needs mediates the relationship between perceived teacher autonomy-support and other psychological outcome variables.

2.6 Autonomy-Supportive Instructional Behaviours and Motivational Regulations

The beneficial effects of an autonomy-supportive social environment versus a less autonomy-supportive social environment have been found across culture, age groups, laboratories and more ecologically valid field studies such as those conducted in the classrooms. The following examples (Grolnick & Ryan, 1989; Williams & Deci, 1996; Black & Deci, 2000; Roth, Assor, Kanat-Maymon, & Kaplan, 2007; Williams, Rodin, Ryan, Grolnick, & Deci, 1998; Williams, Grow, Freedman, Ryan, & Deci, 1996; Williams, Freedman, & Deci, 1998) help us understand the association between autonomy-supportive instructional behaviours and motivational regulations and some beneficial effects of autonomy-support.

Perceived autonomy-support had been shown to lead to greater autonomous motivation in students (Grolnick & Ryan, 1989; Williams & Deci, 1996). In one study, Black and Deci (2000) tracked motivational orientation of American undergraduates taking an introductory organic chemistry course organised in accordance with The Workshop Chemistry Project. Traditionally, classroom instruction had organised around the lecture hall with a one-way transfer of information. In this project, students attended study groups facilitated by student instructors trained in an autonomy-supportive style of instruction. Students’ motivational orientations were measured at two points in time and the changes examined. Results revealed that students’ perceptions of instructors’ autonomy-support
explained significant increase in the relative autonomy of students in studying organic chemistry. In addition, students’ perceptions of instructors’ autonomy-support explained enhanced adjustment as indicated by significant increases in perceived competence and enjoyment and a significant decrease in anxiety during the semester. Moreover, students’ perceptions of instructors’ autonomy-support accounted for significant variance in course performance over and above the variance explained by students’ abilities. An interesting finding from the study was that it was the students who were low in initial relative autonomy whose academic performance benefitted more from perceived autonomy-support.

Roth et al. (2007) also demonstrated that perceived teachers’ autonomy-support was positively associated with autonomous motivation in students. The researchers conducted a cross-sectional survey on Jewish female teachers and grade 3-6 elementary school students from Israel. From the teachers, the researchers obtained measures of teachers’ motivational orientation for teaching and from the students, they collected responses on perceived teachers’ autonomy-support and students’ motivational orientation in learning. They hypothesised that teachers’ autonomous motivation for teaching would enhance autonomy-supportive teaching which in turn contributed to students’ autonomous motivation for learning. Their analyses of the data obtained revealed that teachers who described themselves as more autonomous in teaching had students who perceived them as more autonomy-supportive. Their results also revealed that students’ perception of their teachers as autonomy-supportive predicted students’ autonomous motivation for learning even after holding constant students’ perceptions of teachers’ competence-supportive teaching. Hence, it is the interpersonal aspect of the autonomy-supportive instructional behaviours that relates positively with students’ autonomous motivation in learning.

Perceived autonomy-support had also been shown to affect patients’ motivational orientation in medical settings and had helped to improve patients’ medical conditions. When
doctors were perceived by their patients as being more autonomy-supportive, the patients reported greater autonomous motivation for adhering to their prescribed medication regimen (Williams & Deci, 1996; Williams et al., 1998).

Perceived autonomy-support by providers had also been associated with morbidly obese patients reporting more autonomous motivations for participating in a weight loss programme (Williams et al., 1996). Perceived providers’ autonomy-support had also been shown to relate to an increase in autonomous motivation, for an increase in autonomous motivation to lead to an increase in felt competence, and for an increase in felt competence to lead to improved glucose control in diabetic patients over 12 months maintenance (Williams et al., 1998). Williams et al. (1998) explained that treatment decisions ultimately belonged to the patients and providing information in a way that allowed the patients to consider it meaningfully in making decisions appeared to encourage better glucose control than for providers to give advices in controlling or authoritarian ways.

Insofar that perceived autonomy-support relates to autonomous motivational regulation, by deduction, it is reasonable to assume that autonomy-supportive instructional behaviours could facilitate perception of autonomy-support and induce autonomous motivation in learning in the students. Thus, the researcher of this study posits that autonomy-supportive instructional behaviours will enhance perception of autonomy-support which will in turn predict and promote autonomous motivation in learning. Also, the satisfaction of basic psychological needs will mediate the relationship between perceived autonomy-support and autonomous motivation.
2.7 Autonomy-Supportive Instructional Behaviours and Motivational Beliefs in Learning

Adapting their ideas from a general Expectancy-Value Model of motivation, Pintrich and De Groot (1990) suggested (i) an expectancy component and, (ii) a value component in the motivational beliefs in learning. They explained that the expectancy component includes students’ beliefs about their abilities to perform a task and that they are responsible for their own performance. This component has often been conceptualised as perceived competence or self-efficacy. The value component includes students’ goals and beliefs about the importance and interest of a task. Conventionally, this component has often been conceptualised as intrinsic task value.

The components in the general Expectancy-Value Model of motivation have often been used to complement the Self-Determination Theory (for example, Moos & Honkomp, 2011; Liu et al., 2009; Vansteenkiste et al., 2009). While both theories appreciate that expectations of success and competence contribute to motivation, the Expectancy-Value Model provides a unique focus on the value of an activity and the assessment of value that influences motivation, whereas the Self-Determination Theory contributes a unique focus on the basic psychological needs for autonomy, competence and relatedness (Medalia & Brekke, 2010). These components in both the Expectancy-Value Model and Self-Determination Theory when together, combine to initiate and sustain behaviours. As such, the components in the Expectancy-Value Model have often been used as outcome variables associated with the Self-Determination Theory (for example, Moos & Honkomp, 2011; Liu et al., 2009; Vansteenkiste et al., 2009).
2.7.1 Autonomy-Supportive Instructional Behaviours and Self-Efficacy

Empirical evidence provides support for the relationship between perceived autonomy-support and self-efficacy. In one study, Garcia and Pintrich (1991) had American college students in different Biology, English and Social Science classes responded to survey questionnaires administered in the first two weeks (pre-test) and in the last two weeks (post-test) of the semester respectively. They next ranked the classroom means for autonomy-support variable in ascending order and classified the classrooms as low, mid and high autonomy-supportive. They then ran an ANOVA to discover a significant main effect of autonomy-support for change in self-efficacy. They examined the mean scores and reported that self-efficacy decreased from pre-test to post-test in the low autonomy-supportive classrooms, increased in the mid autonomy-supportive classrooms and remained at about the same level in the high autonomy-supportive classrooms. In their comparison of the mean scores obtained from the low autonomy-supportive classrooms and high autonomy-supportive classrooms, they noted that self-efficacy did not differ significantly at pre-test. However, there was a decrease in self-efficacy at post-test in the low autonomy-supportive classes. In contrast, the high autonomy-supportive classes maintained in self-efficacy. They explained a ceiling effect in the high autonomy-supportive classrooms and argued for a positive association between perceived autonomy-support and self-efficacy.

Williams, Holly, King, Nelson, and Glasgow (2005) and Williams, Niemiec, Patrick, Ryan, and Deci (2009) investigated the relationship between autonomy-support and perceived competence. Perceived competence, according to Williams et al. (2005) and Williams et al. (2009), assumes that a contingency between behaviour and outcome exists. People believe that if they behave in specific ways, they will be able to accomplish a task. A distinction is made here between perceived competence (Williams et al., 2005; Williams et al.,
2009) to be discussed in the next two paragraphs and competence as a basic psychological need as proposed by the Self-Determination Theory.

Williams et al. (2005) and Williams et al. (2009) operationalised perceived competence as being closely related to Garcia and Pintrich's (1991) definition of self-efficacy which is the self-appraisal of one’s ability to master a task. It includes judgements about one’s ability in accomplishing a task as well as one’s confidence in one’s skills in performing that task. In contrast, competence as a basic psychological need in the Self-Determination Theory occurs when an individual feels effective in his behaviours (Ryan & Deci, 2000a). Based on these definitions, perceived competence is both evaluative and affective while competence as a basic psychological need is affective. Hence, perceived competence as used in Williams et al. (2005) and Williams et al. (2009) is more closely related to the concept of self-efficacy. In the interest of clarity, the construct of perceived competence in the studies (Williams et al., 2005; Williams et al., 2009) mentioned below will be discussed using the term “self-efficacy”.

In the domain of medicine, clinicians who were perceived to be autonomy-supportive had patients with higher self-efficacy and better control of their diabetic situations (Williams et al., 2005) and better long-term tobacco abstinence (Williams et al., 2009). In Williams et al. (2005), researchers collected responses from diabetic patients and then performed structural equation modelling to determine the relationship between perceived clinicians’ autonomy-support, self-efficacy in maintaining blood glucose levels in a healthy range and glucose control. Results revealed that patients’ perceived clinicians’ autonomy-support correlated positively with self-efficacy and better glucose control; and self-efficacy correlated positively with better glucose control. There was an indirect relationship between perceived autonomy-support and improved glucose level, through self-efficacy.
Williams et al. (2009) was an experimental study with patients being randomly located in a tobacco intervention group and a community care group. In the tobacco intervention group, patients met clinicians 4 times within 6 months to discuss their health in a manner intended to support autonomy and self-efficacy in smoking cessation while patients in the community care group did not get to meet clinicians trained in providing autonomy-support. The study found that patients in the autonomy-supportive intervention group did indeed report better tobacco abstinence for 24 months. There was an indirect relationship between the treatment condition and long-term tobacco abstinence, through change in self-efficacy and patients’ autonomous regulation. Williams et al. (2005) and Williams et al. (2009) suggested that clinicians could focus on psychosocial factors and to provide autonomy-support to improve health outcomes, through self-efficacy.

The above studies demonstrate a relationship between perceived autonomy-support and self-efficacy. Working on the premises, the researcher extrapolates that autonomy-supportive instructional behaviours would significantly predict and enhance self-efficacy. The researcher would also be examining if autonomy-supportive instructional behaviours have mediated effect on self-efficacy via psychological needs satisfaction.

2.7.2 Autonomy-Supportive Instructional Behaviours and Intrinsic Task Value

Studies have also shown support for the relationship between autonomy-support and intrinsic task value. In the study mentioned above, Garcia and Pintrich (1991) classified classrooms as low, mid and high autonomy-supportive according to the mean scores obtained from an autonomy-supportive variable. They found no significant difference in change in intrinsic task value between the 3 types of classes. However, they pointed out interesting patterns in mean change from pre-test to post-test. From their observation, intrinsic task value decreased for all 3 types of classes. The greatest decrease in intrinsic task value was in the
low autonomy-support classes (-2.8) and least decrease in intrinsic task value was in the high autonomy-support classes (-.11). Garcia and Pintrich (1991) explained a ceiling effect which accounted for the consistent decrease in intrinsic task value across the 3 types of classrooms. Referring to the mean scores of intrinsic task value at pre-test which were 5.60, 5.76 and 6.11 for low, mid and high autonomy-supportive classrooms respectively and mean scores at post-test which were 5.32, 5.49 and 6.00 for low, mid and high autonomy-supportive classrooms respectively, Garcia and Pintrich (1991) pointed out that the high autonomy-supportive classrooms which had the highest mean at pre-test should intuitively have shown the greatest decrease in intrinsic task value but in fact, showed least decrease which inferred that the experience of self-determination might have buffered the pre-test to post-test decrease, suggesting that autonomy-supportive instructional behaviours could enhance intrinsic task value.

Joussemet, Koestner, Lekes, and Houlfort (2004) contrasted the effects of using reward (tangible, engagement-contingent reward), providing control (use of controlling languages in the instruction) and providing autonomy-support in promoting children’s involvement (free-choice persistence on a computerised vigilance task) with an uninteresting but important activity. Participants were French-speaking children from grades 3 to 6 from 3 elementary schools in Montreal, Canada. In this study, one of the outcome variables of interest was self-report on task value. Perception of task value was measured because of its pertinence to the question of internalisation. One-way ANOVA found significant effect of condition on task value. Sheffe post-hoc comparisons indicated that children in the autonomy-supportive condition found the task significantly more valuable than the children in the reward condition. Children in the controlling instruction condition reported perceived task value midway between the reward and autonomy-support conditions. From the experiment, it appeared that an autonomy-supportive condition led to a better appreciation of
the task value. The result suggested that uninteresting but important tasks seemed to be best integrated within an autonomy-supportive rather than a controlling or a reward-focused environment.

Following the premises of Garcia and Pintrich (1991) and Joussemet et al. (2004), it would be reasonable to hypothesise that autonomy-supportive instructional behaviours would predict and enhance intrinsic task value. It would also be interesting to examine whether autonomy-supportive instructional behaviours would have mediated effect on intrinsic task value via psychological needs satisfaction.

2.8 Autonomy-Supportive Instructional Behaviours and Learning Strategies

Pintrich and De Groot (1990) operationalised learning strategies as having three components: (i) cognitive strategies such as rehearsal, elaboration and organisational strategy that students use to learn, remember and understand materials, (ii) meta-cognitive strategies for planning, monitoring and modifying cognition, and (iii) management of effort on academic tasks. In this section, we will discuss the links between autonomy-supportive instructional behaviours and use of cognitive strategies and metacognitive strategy in the form of self-regulation. The relationship between autonomy-supportive instructional behaviours and effort will be discussed in a later section.

2.8.1 Autonomy-Supportive Instructional Behaviours and Use of Cognitive Strategies

There is evidence to suggest that classroom interactions and students’ perceptions of teacher’s autonomy-support affect their cognitive engagement.

Vansteenkiste, Simons, Lens, Sheldon, and Deci (2004) conducted an experiment to investigate the effects of autonomy-supportive learning context and intrinsic (community,
personal growth, health) versus extrinsic (money, image) goal content learning conditions on Belgian college students’ self-report of superficial and deep cognitive processing and behavioural measure of deep processing. Their analyses of the data obtained showed positive main effects for autonomy-supportive learning context and intrinsic versus extrinsic goal content learning conditions as well as highly significant ($p < .001$) positive interaction between autonomy-supportive learning context and intrinsic goal content; over and above the contribution made by the main effect for intrinsic goal content on community, personal growth and health.

In their discussion, Vansteenkiste et al. (2004) explained that while reframing a task in intrinsic goal content encouraged students to utilise a higher level of cognitive processing, there was a synergistically positive effect when the intrinsic goal was administered in an autonomy-supportive context. They detailed that an autonomy-supportive context allowed students to attend to and understand the meaning of an intrinsic goal so that they felt free to decide for themselves whether to learn the materials and in doing so, experienced the congruence of pursuing an intrinsic goal that was closely aligned with their basic psychological needs. Their findings provide further support for the importance of an autonomy-supportive context when encouraging students to engage in deeper processing when learning.

In a study aimed at providing information for university faculty members on enhancing teaching effectiveness, Young (2005) surveyed 257 undergraduates doing business marketing courses at a mid-western university in the United States of America and collected information on the students’ perceived classroom climate (instructor, learning and performance climates), self-regulated cognitions (achievement goal orientation, perceived autonomy and perceived competence), motivational regulations (extrinsic and intrinsic regulations) and learning strategies (superficial, deep cognitive and metacognition) and then
analysed the relationships between the variables using path analysis. The results established that the classroom climate indirectly influenced the use of learning strategies through the motivational components. To elaborate, for self-regulated cognitions (achievement goal orientation, perceived autonomy and perceived competence), achievement goal orientation mediated the effect of classroom climate on both extrinsic and intrinsic motivation; perceived autonomy and perceived competence mediated the effect of classroom climate on intrinsic motivation. For the relationships between extrinsic and intrinsic motivation and learning strategies, extrinsic motivation had a significant direct path to superficial learning strategy and had no path to deep cognitive strategy and meta-cognition. In contrast, there were significant direct path coefficients between intrinsic motivation and deep cognitive strategy and meta-cognition.

Young (2005) provided his insight to the findings. He suggested that if students are highly motivated by external rewards and competition, it may result in the use of superficial learning strategies that focus on rote memorisation and minimally meet the requirements necessary for the rewards at the expense of integrating material and higher order learning. However, when students believe that the subject matter is interesting and important, they are more likely to use higher level learning strategies and become more cognitively engaged. Young (2005) proposed that to maximally affect the use of learning strategies, a combination of active learning experience with clear learning expectations, delivered by an autonomy-supportive instructor are required.

The two studies (Vansteenkiste et al., 2004; Young, 2005) discussed in this section provide the empirical link between autonomy-supportive instructional behaviours and the use of cognitive strategies. Thus, the researcher of this study hypothesises that autonomy-supportive instructional behaviours would predict and enhance the use of cognitive strategies. It would also be interesting to examine whether autonomy-supportive instructional
behaviours would have mediated effect on the use of cognitive strategies via psychological needs satisfaction.

2.8.2 Autonomy-Supportive Instructional Behaviours and Self-Regulation

Sierens, Vansteenkiste, Goossens, Soenens, and Dochy (2009) examined the independent and interactive relations of perceived teacher autonomy-support and teacher structure on the self-regulation of secondary school students in Belgium. From their cross-sectional survey study, they learnt that both perceived teacher autonomy-support and teacher structure yielded independent positive relations to self-regulation. Although teacher structure, and not perceived teachers’ autonomy-support predicted self-regulated learning, teacher structure and perceived teachers’ autonomy-support correlated significantly and the interaction between teacher structure and perceived teachers’ autonomy-support significantly added to the prediction of self-regulated learning.

Sierens and his colleagues further elaborated that teacher structure needed to be coupled with at least a moderate amount of perceived teachers’ autonomy-support to have a positive association with self-regulated learning and that under conditions of low perceived teachers’ autonomy-support, students who experienced their teachers as offering structure were less likely to use self-regulated learning strategies. Sirens and his colleagues explained that although teacher structure allowed students to know how they could regulate their learning, it was the perceived teachers’ autonomy-support that energised and nurtured students’ interest and intrinsic motivation and promoted the endorsement of classroom activities so that students engaged in their studies in a more volitional way which in turn promoted a more willing use of self-regulated learning strategies.

Sungur and Gungoren (2009) surveyed 900 grades 6-8 students from 5 public elementary schools in Turkey and evaluated the relationships between the students’
classroom environment perceptions (autonomy-support, motivating task, mastery evaluation), motivational (mastery goal orientation, performance goal orientation, self-efficacy and intrinsic interest) and cognitive components of academic self-regulation and science achievement using structural equation modelling. In the proposed model, they hypothesised that students’ classroom environment perceptions had direct effects on both the motivational and cognitive components of self-regulation and indirect effect on science achievement. Indeed, results confirmed the hypotheses. In addition, the findings revealed that 62% of variance in the cognitive component of self-regulation was explained by classroom environment perception and both the motivational and cognitive components of self-regulation accounted for 7% of variance in science achievement.

The findings from Sierens et al. (2009) and Sungur and Gungoren (2009) provide the empirical links between autonomy-supportive instructional behaviours and self-regulation. The researcher of this study thus postulates that autonomy-supportive instructional behaviours will predict and enhance self-regulation. The researcher of this study will also be examining the possible mediated effect of autonomy-supportive instructional behaviours on self-regulation via psychological needs satisfaction.

2.9 Autonomy-Supportive Instructional Behaviours and Enjoyment and Effort in Learning

Cambridge Advanced Learner’s Dictionary (2005) defines “enjoyment” as the occupancy of something with satisfaction or pleasure, and “effort” as the exertion of physical and mental power, and persistence. “Enjoyment” has often been used as self-report measure of intrinsic motivation (Reeve, 1989). "Effort" reflects a commitment to complete one's study goals, even when there are difficulties or distractions. Effort is important to academic success.
because it not only signifies goal commitment, but also regulates the continued use of learning strategies (Pintrich, Smith, Garcia, & McKeachie, 1991).

2.9.1 Autonomy-Supportive Instructional Behaviours and Enjoyment

Many studies have demonstrated an association between autonomy-supportive instructional behaviours and enjoyment. As discussed earlier, Black and Deci (2000) assigned American undergraduates who had been attending standard full-class lectures in organic chemistry into study groups led by student instructors who had received training on how to facilitate group problem-solving, peer support and active engagement with learning materials, that is, trained to be autonomy-supportive. The undergraduates’ perceptions of the instructors’ autonomy-support were assessed before the study groups and after the study groups. Black and Deci (2000) found a significant change in the perception of leaders’ autonomy-support indicating a felt difference in the instructional style. The researchers then correlated perceived leader autonomy-support with interest-enjoyment to find significant positive correlation between the variables.

In another study, Mouratidis, Vansteenkiste, Sideridis, and Lens (2011) investigated whether PE teachers’ need-supportive teaching practices, operationalised by the provision of choice, initiative taking and social interactions, relative to their typical teaching practices would influence Greek students’ interest-enjoyment and vitality. In their study, they manipulated the provision of need support in different classes and then assessed after each of these classes, students’ interest–enjoyment and vitality. In this study, unlike a typical one-shot experimental manipulation, students were repeatedly exposed to random variation in need-supportive versus typical teaching environments as created by their teachers. The researchers argued that if students’ motivational experiences during classes could covary systematically with the provision of need support, it would suggest that depending on
teachers’ teaching practices, students could have interest and enjoyment in the lesson and be vitalised or bored from one class to the other. Mouratidis et al. (2011) revealed that class-to-class variation in teachers’ teaching style affected students’ class-to-class variation in interest–enjoyment and vitality. The results suggest that although the changes made by the teachers in their teaching styles required relatively little effort, these changes had a considerable impact on students’ interest–enjoyment and vitality. Mediational analyses further demonstrated that the contextual effects of a need-supportive teaching could be accounted for by perceptions of need support.

Apart from the studies mentioned above, other studies (for example, Reeve & Jang, 2006; Mandigo, Holt, Anderson, & Sheppard, 2008; Ciani, Summers, Easter, & Sheldon, 2008) had also demonstrated positive relationship between perceived autonomy-support and enjoyment in learning. Following the premises of the studies put together, the researcher postulates that autonomy-supportive instructional behaviours will predict and enhance enjoyment in learning. The researcher of this study will also be examining the possible mediated effect of autonomy-supportive instructional behaviours on enjoyment via psychological needs satisfaction.

2.9.2 Autonomy-Supportive Instructional Behaviours and Effort

Autonomy-supportive instructional behaviours have also been demonstrated to relate positively with effort.

In one study, Standage et al. (2006) investigated the relationship between perceived teachers’ autonomy-support, students’ autonomous motivation and effort in secondary school children from 2 state schools located in southeast England. In this study, students responded to measures on perceived PE teachers’ autonomy-support and motivational behaviours. In a slightly different methodology from the studies discussed above, Standage et al. (2006) went
beyond students’ self-reported responses to ask PE teachers to provide rating pertaining to the amount of motivated behaviour, indexed by effort and persistence, that each student put forth in their PE classes. Statistical tests performed revealed that PE teachers’ ratings on effort and persistence were positively related to students’ self-reported autonomous motivation, which in turn was positively related to perceived teachers’ autonomy-support. The findings further showed that students’ autonomous motivation predicted positive teachers’ ratings of students’ effort and persistence.

In another cross-sectional study on American senior high school students, Ferrer-Caja and Weiss (2000) used structural equation analysis to examine the relationship between students’ perceived PE teachers’ autonomy-supportive behaviors and teachers’ ratings of students’ effort and persistence in class activities. Their analyses revealed that the perceived learning climate predicted effort and persistence. Although the explained variance in the motivated behaviours was 13% for female students, Ferrer-Caja and Weiss (2000) argued that the percentage would be meaningful if PE teachers were able to increase their students’ physical activity behaviours by such an amount. Ferrer-Caja and Weiss (2000) presented their insights from their analyses: When students perceived that their physical education classes promoted learning, improving and participation, they focused on the activities and participated for reasons related to enjoyment, fun and a desire to learn and in turn chose difficult activities, put forth effort and persevered even after failures. In contrast, when students perceived their classes as promoting competition and concerns about making mistakes, they focused on the outcomes of the activities and evaluated their successes using interpersonal sources such as outperforming others and thus, less likely to participate in class for fun and enjoyment associated with the activities. Ferrer-Caja and Weiss (2000) argued for the importance of creating a classroom climate that emphasises learning and self-improvement in maximising intrinsic motivation, effort and persistence.
Collectively, the review of the literature demonstrates that teacher’s autonomy-support is associated with enjoyment and effort in learning. Developing on the results of the above studies and in accordance with the tenants of the Self-Determination Theory, the researcher of this study hereby posits that autonomy-supportive instructional behaviours predict and promote enjoyment and effort in learning. The researcher of this study will also be examining the possible mediated effect of autonomy-supportive instructional behaviours on enjoyment and effort via psychological needs satisfaction.

2.10 Definitions and Conceptualisation

Research articles often include terminologies that could be debated on and could lead to confusion and erroneous interpretation of the research purposes and findings if no clarification has been done on the terminologies involved. For this matter, this section has been devoted to the clarification of the key terms used in this study.

It shall be recalled that the title of this project is “Nurture intrinsic motivation, inspire students in learning: A study on motivating students to learn in the classroom”. As the title suggests, the main component of this study is about nurturing intrinsic motivation, thereby inspiring students in learning. What is “intrinsic motivation”? What do “nurture”, “inspire” and “motivate” entail?

2.10.1 What is “intrinsic motivation”?

Intrinsic motivation refers to motivation that is driven by an interest or enjoyment in the task itself. It exists within the individual and is solely volitional and self-determined. It arises from an internal locus of causality. It is not influenced by external reinforcement. Ryan
and Deci (2000b) described intrinsic motivation as the natural inclination towards assimilation, mastery, spontaneous interest and exploration.

Conventionally, intrinsic motivation has been operationalised and measured via two methods - the first method being persistence in behaviour during free-choice period, usually in laboratory experiments and the second method being self-report interest and enjoyment, usually in field studies (for example, Deci & Cascio, 1972; Anderson et al., 1976). In this study, the researcher employed the use of quantitative and qualitative self-report on enjoyment as measures of intrinsic motivation.

2.10.2 What do “nurture”, “inspire” and “motivate” entail?

According to Cambridge Advanced Learner’s Dictionary (2005), to “nurture” something is to provide support and help the subject of interest to develop, to “inspire” is to make someone feel that they want to do something and can do it, to “motivate” is to move someone to do something.

The constructs of “nurture”, “inspire” and “motivate” have the connotation of a third party intervention. A third party will provide support and help the subject of interest to develop certain characteristics, empower him or her to feel that he or she really wants to do something and can do it and then move the person to act. In this study, it means providing support for the development of intrinsic motivation in learning, thereby empowering the subject of interest to feel that he or she really wants to explore and continuously learn new knowledge and skills and he or she can do it and will act on it.

To reiterate, the question of interest here is: How can teachers nurture intrinsic motivation and thereby instil a love for learning in the students? The researcher of this study attempted to answer this broad research question through several minor research questions in section 2.12.
2.11 Rationale of Study

There is a paucity of local literature (Lim, 2010; Liu et al., 2009) on students’ motivational orientations especially from a multi-dimensional construct perspective of motivation. A local study examining students’ motivational orientations and the effect of an intervention on students’ motivational orientations and psychological attributes would be very useful. The facts and figures provided will help teachers to understand their students’ learning experiences, what motivates them and how they can help their students to develop the love for learning.

With more than four decades of rigorous research across domains, cultures and age groups and supported by a treasury of empirical evidence, the Self-Determination Theory provides sound principles and practices from which teachers in Singapore can learn from. However, bearing in mind the uniqueness of the Singapore society – a culture with a blend of the east and the west, it is necessary to conduct a study of mixed methods research design to examine students’ motivational orientations and the effects the intervention based on the Self-Determination Theory has on their motivational orientations and psychological learning attributes.

Particularly, it would be interesting to examine how a sample of students from Singapore would respond to the autonomy-supportive components of choice, rationale and perspective-taking. It is noteworthy that Singapore with a predominantly Chinese population, is generally a collectivistic society (Hofstede, 1980, 2008; Trompenaars, 1993; Newman & Nollen, 1996). According to Yang (1993), when collectivism is high, conformance is important. An individual who has been raised in a collectivistic context would constantly consider how his or her behaviours might be viewed by his or her social group. In contrast, an individual who has been raised in an individualistic context would generally be less
concerned with how others evaluate his or her personal behaviour. Also, an individual who has been brought up in an individualistic context would often want autonomy and to take individual responsibility for own learning outcomes (Newman & Nollen, 1996).

Although collectivism forms the foundation of the social units, students in Singapore are very much exposed to the western, more individualistic culture. Students in Singapore attend schools with English as the main medium of instruction. They are exposed to the western way of life through many avenues such as stories, movies and songs. Schein (1997) and Lim (1989) observed a shift towards individualism in the Singapore society and attributed the shift to globalisation and the country's economic development. Schein (1997) opined that to the extent that the Singapore society is becoming more affluent, it is becoming more individualistic because affluence accords people more choices.

Given the uniqueness of the Singapore society, it would therefore be very interesting to examine how a sample of students from Singapore would respond to the autonomy-supportive components of choice, rationale and perspective-taking. For example, when given choices, would the students navigate towards conformity such as going after the same things and avoiding the same things? Also, in a predominantly Chinese society like Singapore where there is a large power distance and high respect for authority (Hofstede, 1980, 2008; Newman & Nollen, 1996), would providing rationale be of any difference to students’ motivation in learning? Frijida and Mesquita (1994) had reported that respect for authority influences learning styles and behaviours of Asians. While Asian societies, including those that are predominantly Chinese, give high priority to respect for authority, this may be less so in the western countries such as America, Australia and many parts of Europe. Thus, it would be interesting to test out the tenets of the Self-Determination Theory on Singapore students, a unique breed of people exposed equally to both the eastern and western philosophies.
The researcher also conducted qualitative analysis for the purpose of triangulation and complementarity of quantitative findings. Together, the quantitative and qualitative findings would allow the researcher to identify areas that the intervention programme could look into to better modify the intervention to tailor to the needs of Singapore students.

While studies (for example, Vlachopoulos et al., 2000; Ullrich-French & Cox, 2009; Ratelle et al., 2007; Vansteenkiste et al., 2009) had investigated how students with different motivational profiles, that is, different combinations and magnitudes of motivational regulations differed in their learning experiences, and even suggested possible adaptive and maladaptive motivational profiles, no study has examined how clusters of students with different combinations and magnitudes of motivational regulations would respond to an intervention programme on teacher's autonomy-supportive. The findings from this study could perhaps help researchers under the Self-Determination Theory network to further their understanding on how different combinations and magnitudes of motivational regulations respond to teachers' autonomy-support and hence, extend existing knowledge on teachers’ autonomy-support on motivational regulations and learning outcomes.

2.12 Research Questions

This study seeks to answer the following research questions:

(1) Profile of students

   (i) What are the motivational profiles of students in Singapore?

   (ii) Are there clusters of students with significantly different motivational profiles?
(iii) Are there significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

(2) Effect of intervention

(i) Are there significant differences in students' perceived teacher autonomy-support, motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme?

(ii) Are there significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme?

(3) Process of intervention

(i) Does perceived teacher autonomy-support significantly predict motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

(ii) Does basic psychological needs satisfaction mediate the relationship between perceived teacher autonomy-support and motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?
For research questions 3(i) and 3(ii), the researcher sought to understand the relationships between the various variables and the mechanism through which perceived teacher autonomy-support affects the psychological learning attributes.

It is to be noted that for research questions 2(i), 3(i) and 3(ii), motivational regulation was evaluated using the Relative Autonomy Index (RAI). The Relative Autonomy Index (RAI) was calculated using the formula: external regulation x (-2) + introjected regulation x (-1) + identified regulation x (+1) + intrinsic regulation x (+2) (Grolnick & Ryan, 1989; Ryan & Connell, 1989). The Relative Autonomy Index (RAI) provides a parsimonious way of capturing the multi-dimensionality of the motivational construct and representation along the self-determination continuum. It represents the degree of autonomy in the students' school-related motivational regulation with a higher score to represent more autonomous motivational regulation and a lower score to represent more controlled motivational regulation.

In the interest of parsimony, the Relative Autonomy Index (RAI) was used instead of the individual motivational regulations (external, introjected, identified, intrinsic motivational regulations). Also, pertaining to research questions 2(i), 3(i) and 3(ii), the interest was in examining if the intervention programme based on the Self-Determination Theory could facilitate more autonomous motivational regulation and hence, the Relative Autonomy Index (RAI), a measure of the degree of relative autonomy was a suitable variable.

In the interest of clarity, the researcher proposed a model to sum up research questions 3(i) and 3(ii). At a glance, the model is as follows:
Figure 2.3. A model on motivating students to learn in the classroom

In this model, perceived teacher autonomy-support predicts motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies and self-regulation, enjoyment and effort, through the satisfaction of basic psychological needs of autonomy, competence and relatedness.

This proposed model presents in parsimony, the direct and indirect relationships between the different variables. It is in accordance with the Self-Determination Theory which professes that favourable social conditions, in this study, perceived teacher autonomy-support, would facilitate the satisfaction of basic psychological needs of autonomy, competence and relatedness, which would facilitate more favourable motivational and psychological learning outcomes (Ryan & Deci, 2000a).

Research questions 1(i), 1(ii), 1(iii), 2(i), 2(ii), 3(i), and 3(ii) constitute the quantitative component of this research study. In addition, the researcher triangulated and complemented the research questions pertaining to profile of students and effect of intervention with two research questions which constitute the qualitative component of this
study. For clarity, these research questions to the qualitative component of the research study, constitute the fourth set of research questions.

The fourth set of research questions are:

4(i) What are the motivational profiles of students in Singapore?
4(ii) What effects do teacher's autonomy-supportive instructional behaviours have on students’ motivational regulations, motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?
CHAPTER THREE

METHODOLOGY

This chapter presents the methodology of this study. It is organised as follows:

3.1 Research Design
3.2 Sample
3.3 Measures
3.4 Procedure
3.5 Data Analyses

3.1 Research Design

3.1.1 Mixed Methods Research Design

This study employed the use of a mixed methods research design for the investigation of the motivational profiles of a sample of students from Singapore and the effects of an intervention programme aimed at perceived teacher autonomy-support on students’ motivational regulations, motivational beliefs, use of learning strategies, enjoyment and effort in learning.

The mixed methods research design involves philosophical assumptions that guide the direction of the collection and analysis of data. The methods of inquiry focus on collecting, analysing and mixing both quantitative and qualitative data in a single study to understand a research problem (Creswell & Clark, 2011).
The mixed methods research design has as its premise that the use of quantitative and qualitative approaches in combination provides a better understanding of the research problem than either approach alone (Creswell & Clark, 2011).

The argument goes that quantitative research is deficient in understanding the context in which people talk. Also, the voices of participants are not directly heard in quantitative research. In these aspects, qualitative research makes up for these weaknesses. In a similar vein, qualitative research is also deficient because of the bias created when researchers make their personal interpretations (Creswell, 2012). Hence, the mixed methods approach offers strengths that offset the weaknesses of separately applied quantitative and qualitative approach. According to Brannen (2004), while the quantitative methods establish patterns of behaviours through enumerative induction, the qualitative methods deal with phenomenon not easily translated into numbers (Guba & Lincoln, 2006). As such, the benefits of "mixing" the quantitative and qualitative data so that together, they form a more complete picture of the problem and one can interpret either set of data with more insight (Creswell, 2012).

Greene, Caracelli, and Graham (1989) categorised the combination of the quantitative and qualitative approaches into five broad purposes:

(i) Triangulation
(ii) Complementarity
(iii) Development
(iv) Initiation
(v) Expansion

*Triangulation* seeks convergence, corroboration and correspondence of results from the different methods. *Complementarity* seeks elaboration, enhancement, illustration and clarification of the results from one method with the results from the other method.
Development seeks the use of results from one method to develop or inform the other method. Initiation seeks to discover paradoxes, contradictions and new perspective of frameworks for the recasting of questions or results from one method with questions or results from the other method. Expansion seeks to extend the breadth and range of inquiry by using different methods for different inquiry components (Greene et al., 1989).

For the present study, the use of mixed methods research design serves two main purposes - triangulation and complementarity. Stake (2003) explained that in triangulation, the convergence of data strengthens the validity of the conclusions drawn and in complementarity, the different methods offer different perspectives and one's understanding can be the richer for the complementarity of the data.

3.1.2 Embedded Design

Creswell and Clark (2011) proposed six mixed methods research designs which differ in their methodologies, that is, they differ in their purposes and philosophical assumptions that guide the direction of the collection and analysis of data. The six mixed methods research designs are: (i) The convergent parallel design, (ii) The explanatory sequential design, (iii) The exploratory sequential design, (iv) The embedded design, (v) The transformative design, (vi) The multiphase design.

For the present study, the mixed methods research design adopted was the embedded design and hence, the researcher will elaborate on the embedded design in this section.

The embedded design is a mixed methods approach where the researcher combines the collection and analysis of both quantitative and qualitative data within a traditional quantitative or qualitative research design (Greene & Caracelli, 1997). Specific to this study, the primary research design was the quantitative method which was quasi-experimental with a pre-and post-test group design. Qualitative data was collected post intervention. The
qualitative data provides a supportive, secondary role in the study (Creswell, Fetters, Clark, & Morales, 2009).

*Figure 3.1* presents a pictorial representation of the embedded design (Creswell & Clark, 2011) and *Figure 3.2* presents a pictorial view of the procedures for the embedded design.

3.1.3 **Person-Centred Approach to Variable-Centred Approach**

There are typically two analytical techniques used in examining the relationship between motivational climate and psychological learning outcomes. One is a person-centred approach and the other is a variable-centred approach.

In the person-centred approach, individuals are usually grouped into distinct groups with homogenous characteristics based on their responses to variables (Hair, Anderson, Tatham, & Black, 1998). For example, cluster analysis is often used to categorise individuals into groups whose members have similar motivational profiles.
In the variable-centred approach, variables are grouped on common underlying dimensions or factors. The independent and dependent variables are then analysed for the relationships between them (Morris & Kavusannu, 2008). For example, multiple regressions or structural equation modelling are used to examine the effects of motivational climate on psychological learning outcomes.

Marsh, Lüdtke, Trautwein, and Morin (2009) showed that the two approaches should be seen as complementary and not competing methods. They demonstrated that cluster analysis could be used to identify homogenous groups within the total sample and a variety of correlates could be used to validate the relationships between the different cluster profiles and correlates. Van den Broeck et al. (2013) echoed the complementarity of the person-centred approach to the variable-centred approach. Van den Broeck and his colleagues explained that while the person-centred approach focused on the personal experiences of individuals, the variable-centred approach focused on the strength of relationships between the variables. For example, in Van den Broeck et al. (2013), cluster analysis was used for the detection and the comparison of naturally occurring clusters defined by particular motivational profiles and then the clusters with their unique motivational profiles were used to identify which individuals were most at risk for experiencing ill-being such as burnout or conversely, were most likely to thrive at work. Hence, the two approaches are likely to yield complementary information.

In this study, the researcher adopted the person-centred approach to identify the motivational profiles of a group of students from Singapore and then utilised the variable-centred approach to examine the effects of the intervention on psychological learning attributes and to understand the processes of the intervention based on the Self-Determination Theory.
3.2 Sample

This study was conducted on secondary three students from an Independent Girls’ School in Singapore. In Singapore, Independent Schools are run by their boards of governors, have autonomy in the appointment of their principals and teachers, setting of tuition fee and in curriculum matters. Students from this all-girls school are admitted based on academic merit of being the top 10% of the Primary School Leaving Examination cohort and are placed in the 6-year Integrated Programme.

A total of 95 students participated in the study. Their ages range from 15 to 16 years old. Participants were from 3 biology classes. All 95 students were invited to respond to the quantitative survey. After pairing the cases for baseline and follow-up and removing cases with missing information, a total of 90 cases were analysed. 4-6 students from each of the biology classes volunteered for the focused-group discussions. In summary, 90 students took part in the quantitative survey and of these 90 students, 15 students participated in the focused-group discussions.

The participants were obtained by convenience sampling. The teacher and students that participated in this intervention programme were selected on the basis of negotiation with the school principal and teacher. Since it was an intervention study, the willingness of the teacher to be trained and experiment with the autonomy-supportive instructional behaviours in her classrooms was the constraint.

In this study, the students were the unit of analysis. The intervention programme and psychological measures were targeted at the students’ perceptions of autonomy-support, psychological needs satisfaction, motivational regulations, motivational beliefs (self-efficacy and intrinsic task value), use of learning strategies (cognitive strategies and self-regulation), enjoyment and effort.
3.3 Measures

The research questions were assessed in two parts – quantitative measures (Annex A) and qualitative measures (Annexes B and C).

The quantitative measures at baseline and follow-up (Annex A) were conducted using a questionnaire developed based on the instruments in Table 3.1.

It was unrealistic to utilise all the measures in their totality and hence the measures were shortened to prevent mental fatigue that might arise in students who had to complete the questionnaire in one sitting.

The final instrument for the quantitative measures consists of 7 sections in a structured questionnaire which is described in the sections below.

Essentially, section A of the questionnaire sought to obtain students’ background information.
Table 3.1

*Constructs and Instruments*

<table>
<thead>
<tr>
<th>Construct</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Perceived teacher autonomy-support</td>
<td>• The Learning Climate Questionnaire (Black &amp; Deci, 2000; Williams et al., 1997; Williams &amp; Deci, 1996)</td>
</tr>
<tr>
<td>• Basic psychological needs satisfaction</td>
<td>• Basic Psychological Needs Scale (Deci &amp; Ryan, 2000)</td>
</tr>
<tr>
<td>• Autonomy</td>
<td></td>
</tr>
<tr>
<td>• Competence</td>
<td></td>
</tr>
<tr>
<td>• Relatedness</td>
<td></td>
</tr>
<tr>
<td>• Motivational regulations</td>
<td>• Academic Self-Regulation Questionnaire (Ryan &amp; Connell, 1989)</td>
</tr>
<tr>
<td>• Intrinsic regulation</td>
<td>• Academic Motivation Scale (Vallerand et al., 1992, 1993)</td>
</tr>
<tr>
<td>• Identified regulation</td>
<td></td>
</tr>
<tr>
<td>• Introjected regulation</td>
<td></td>
</tr>
<tr>
<td>• External regulation</td>
<td></td>
</tr>
<tr>
<td>• Amotivation</td>
<td></td>
</tr>
<tr>
<td>• Motivational beliefs and motivated</td>
<td>• Motivated Strategies for Learning Questionnaire (Pintrich et al., 1991)</td>
</tr>
<tr>
<td>strategies for learning</td>
<td></td>
</tr>
<tr>
<td>• Self-efficacy</td>
<td></td>
</tr>
<tr>
<td>• Intrinsic task value</td>
<td></td>
</tr>
<tr>
<td>• Cognitive strategies</td>
<td></td>
</tr>
<tr>
<td>• Self-regulation</td>
<td></td>
</tr>
<tr>
<td>• Enjoyment and effort</td>
<td>• Intrinsic Motivation Inventory (Ryan, 1982)</td>
</tr>
</tbody>
</table>

3.3.1 Learning Climate Questionnaire (LCQ)

Section B assessed students’ perceived teacher autonomy-support. The Learning Climate Questionnaire (LCQ) was used for this purpose. The LCQ had been validated in Black and Deci (2000), Williams, Saizow, Ross, and Deci (1997), and Williams and Deci (1996) and reported good internal consistency.
It will be recalled that one of the central tenets of the Self-Determination Theory is that social conditions affect motivation, performance and well-being of the individuals. It is theorised that an autonomy-supportive social environment facilitates autonomous motivation and promotes optimal functioning. To address the research questions of this study, the LCQ was utilised to measure the degree to which students perceived their teachers to be autonomy-supportive.

The LCQ consists of 15 positively and negatively phrased items and captures responses on a 7-point likert scale, 1 being “Strongly disagree” and 7 being “Strongly agree”. Scores are calculated by averaging the individual item score. A higher score on an item indicates greater perceived autonomy-support. In this study, the questions were slightly adapted so that the wordings were relevant to the situation being assessed. Examples of items are “I feel understood by my teacher”, “I feel that my teacher provides me with choice and option” and “My teacher conveyed confidence in my ability to do well in the course”.

For the sample in this study, cronbach alphas for the measure of perceived teacher autonomy-support was .93 at baseline and .96 at follow-up.

3.3.2 Basic Psychological Needs Scale (BPNS)

Section C measured the satisfaction of basic psychological needs of autonomy, competence and relatedness using a modified version of the Basic Psychological Needs Scale (BPNS) developed by Deci and Ryan (2000). The original scale developed by Deci and Ryan (2000) had 21 positively and negatively worded items with 7 items used to measure the degree to which the need for autonomy is satisfied, 6 items used to measure the degree to which the need for competence is satisfied and 8 items used to measure the degree to which the need for relatedness is satisfied. An example of an item used to measure autonomy is “I
am free to express my ideas and opinions in Science class”. For measure of competence, an example is “People in Science class tell me that I am good at what I do” and an example to measure relatedness is “I really like the people in Science class”.

In this study, the researcher adopted the use of 3 items to measure autonomy, 6 items to measure competence and 8 items to measure relatedness. The use of 3 items for the measurement of the degree to which the need for autonomy is satisfied, is adapted from La Guardia, Ryan, Couchman, and Deci (2000). The use of 3 items to tap the need for autonomy is consistent with Adie et al. (2008), Sheldon, Elliot, Kim, and Kasser (2001), and La Guardia et al. (2000).

For scoring, the researcher first reversed the scores of items phrased negatively and then averaged the items in each subscale. Students responded to the items on a 7-point likert scale with 1 being “Not true at all” and 7 being “Very true”. Cronbach alphas for the measures on autonomy, competence and relatedness were .77, .74 and .89 respectively at baseline and .86, .77 and .91 for autonomy, competence and relatedness respectively at the follow-up.

3.3.3 Academic Self-Regulation Questionnaire (SRQ-A)

Section D sought to assess students’ motivational regulations using the Academic Self-Regulation Questionnaire (SRQ-A). The SRQ-A designed by Ryan and Connell (1989) was used to differentiate behavioural regulations of varying degree of autonomy. Ryan and Connell (1989) had empirically validated the Self-Regulation Questionnaires (SRQ) to capture intrinsic motivation and extrinsic motivation; and further differentiated the types of extrinsic motivation in terms of the degree to which they have been internalised and integrated. The different types of extrinsic motivation are external regulation, introjected
regulation, identified regulation and integrated regulation, constructs that lay on a continuum, in order from the least to the most fully internalised. External and introjected regulations are considered relatively controlled forms of extrinsic motivation, while identified and integrated regulations are considered relatively autonomous forms of extrinsic motivation.

The SRQ-A, an academic version of the SRQ, however consists of subscales for the measurement of external regulation, introjected regulation, identified regulation and intrinsic regulation. It does not include the subscale for integrated regulation because according to Ryan and Connell (1989), fully integrating a behavioural regulation is very unlikely to have occurred during childhood and adolescence and hence the SRQ-A, which is a scale used with children and adolescents does not have an integrated regulation subscale.

The measure also includes items from the Academic Motivation Scale (AMS) (Vallerand et al., 1992, 1993) to capture amotivation which is a state in which the person has no intention or motivation for a particular behaviour, that is, neither intrinsically nor extrinsically motivated.

Ryan and Connell (1989) explained that these regulatory styles, while considered individual differences, are not “trait” concepts because the regulatory styles are neither general nor stable. These regulatory styles are also not “state” concepts because they are more stable than typical states which fluctuate as a function of time and place. They also argued that a self-report measure of motivational regulations such as the measure proposed here is very useful for it gains direct access to the internal states of the actor. From the perspective of the intra-psychic self, forces within the person may be experienced as controlling or heteronomous and would not be appropriate to be described as having an internal locus of causality, even when from an observer’s perspective, environmental pressures are absent. Hence, it is appropriate to focus on how the person understands and describes his own reasons for acting in the measure of motivational regulations.
In this study, instead of a 4-point likert scale (Ryan & Connell, 1989), responses were captured on a 7-point likert scale, 1 being “Not true at all” and 7 being “Very true”, to be consistent with the other scales used in this study.

The total number of items in the measure was 17. Students were presented with a stem “My reasons for doing my work in Science” and then provided with several possible reasons that had been pre-selected to represent the different styles of regulation. An example of an item representing external regulation is “because I’ll get into trouble if I don’t”, an item representing introjected regulation is “because I want the teacher to think I’m a good student”, an item representing identified regulation is “because I want to learn new skills”, an item representing intrinsic motivation is “because school is fun” and an item representing amotivation is “but I don’t see why we should have school”.

Apart from assessing the different motivational regulations using the mean scores obtained from the different subscales, a Relative Autonomy Index (RAI) (Grolnick & Ryan, 1989; Ryan & Connell, 1989; Deci & Ryan, 2002; Wilson, Sabiston, Mack, & Blanchard, 2012) was used to represent the extent to which students’ motivational regulation was autonomous versus controlling in the following way: external regulation x (-2) + introjected regulation x (-1) + identified regulation x (+1) + intrinsic regulation x (+2). As presented by the formula, the more controlled the motivational regulation represented by a subscale, the larger its negative weight, and the more autonomous the motivational regulation represented by a subscale, the larger its positive weight. The subscale scores are weighted according to the simplex structure of the scale (Deci & Ryan, 2002; Ryan & Connell, 1989).

As mentioned in an earlier paragraph in chapter 2, Ryan and Connell (1989) surveyed achievement behaviours among elementary and middle school children and found that external regulation, introjected regulation, identified regulation and intrinsic regulation were intercorrelated according to a quasi-simplex pattern. In a simplex, variables are ordered in
terms of complexity of conceptual similarity such that the variables that are deemed more similar correlate more highly than variables that are deemed less similar. In other words, adjacent regulations on the continuum (for example, \( r_{\text{external-introjected regulation}} \)) display more positive associations with one another compared to distal regulations (for example, \( r_{\text{external-intrinsic regulation}} \)) (Wilson et al., 2012). From the simplex, Deci and Ryan (2002) asserted the conceptualisation of motivation as an underlying continuum of internalisations and hence, predicted the formula for the Relative Autonomy Index (RAI). Thus, the Relative Autonomy Index (RAI) represents the degree of autonomy in the students' school-related motivational regulation with a higher score representing a more autonomous motivational regulation and a lower score representing a more controlled motivational regulation.

Cronbach alphas for the present sample were .83, .70, .64, .86 and .57 for external regulation, introjected regulation, identified regulation, intrinsic regulation and amotivation respectively at baseline. At the follow-up, cronbach alphas were .82, .70, .57, .88 and .68 for external regulation, introjected regulation, identified regulation, intrinsic regulation and amotivation respectively.

3.3.4 Motivated Strategies for Learning Questionnaire (MSLQ)

Section E assessed students’ motivated strategies for learning. The Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich et al. (1991) was used for this purpose. The Motivated Strategies for Learning Questionnaire (MSLQ) has often been used to measure outcome variables associated with the Self-Determination Theory (Moos & Honkomp, 2011; Liu et al., 2009; Vansteenkiste et al., 2009).

Pintrich and De Groot (1990) and Pintrich et al. (1991) factor analysed items adapted from various instruments used to assess students’ motivational beliefs, cognitive strategy use
and meta-cognition (Eccles, 1983; Harter, 1981; Weinstein, Schulte, & Palmer, 1987). Their analyses of the motivational beliefs items revealed 3 distinct motivational beliefs factors – self-efficacy, intrinsic task value and test anxiety. The analyses also revealed 2 distinct learning strategies – cognitive strategy use and self-regulation. As a result, 5 subscales were developed. In this study, the researcher utilised 4 of the 5 subscales - 2 motivational beliefs subscales which are subscales to measure self-efficacy and intrinsic task value and 2 learning strategies subscales which are subscales to measure use of cognitive strategies and self-regulation.

The subscale for test anxiety was not used in this study. According to Pintrich and De Groot (1990), the motivational component of "test anxiety" concerns students' affective or emotional reactions to tests. It shall be recalled that the main purpose of this study is to examine if an intervention programme aimed at perceived teacher autonomy-support would promote more autonomous form of learning and more positive learning beliefs and behaviours. The emphasis had not been on test management. In an effort to be parsimonious and to address the objectives of this research study, the subscale of test anxiety was not included. Pintrich et al. (1991) had reported that the subscales in the Motivated Strategies for Learning Questionnaire (MSLQ) were designed to be modular and could be used together or singly to fit the needs of the researches.

The self-efficacy scale consists of 9 items regarding perceived competence and confidence in performance in class. An example is “I know that I will be able to learn the materials in this class”. The intrinsic task value scale consists of 9 items concerning intrinsic interest, perceived importance of course work and preference for mastery goal. An example of an item is “I think that what we are learning in this class is interesting”. In the cognitive strategy use subscale, 13 items pertaining to the use of rehearsal, elaboration and organisational strategies were used. An example of an item is “When reading, I try to connect
the things I am reading about with what I already know”. The self-regulation subscale consists of 9 items such as “When I’m reading I stop once in a while and go over what I have read”. Students responded to the 40 items in section D on a 7-point likert scale with 1 being “Not true at all” and 7 being “Very true”.

For scoring of the self-efficacy, intrinsic task value, cognitive strategy use and self-regulation subscales, scores were averaged to obtain mean scores with a higher score to mean higher level of self-efficacy and intrinsic task value, greater number of cognitive strategies used and greater amount of self-regulation. As some of the items were negatively phrased, the scores were reversed before being computed to obtain the average scores for the subscales.

For the sample in this study, cronbach alphas for self-efficacy, intrinsic task value, cognitive strategy use and self-regulation were .91, .87, .85 and .75 respectively at baseline and .94, .90, .85 and .77 respectively at follow-up.

3.3.5 Intrinsic Motivation Inventory (IMI)

Section F assessed students’ enjoyment and effort in their learning of biology. The enjoyment and effort subscales were extracted from the Intrinsic Motivation Inventory (IMI) developed by Ryan (1982). The IMI has been widely used in many studies related to intrinsic motivation and self-regulation (e.g. Ryan et al., 1983; Deci et al., 1994; McAuley, Duncan, & Tammen, 1989).

Essentially, the enjoyment subscale is considered a self-report measure of intrinsic motivation and consists of items such as “I think Science is quite enjoyable” and “I think Science is boring” which is an item that is negatively phrased. There are 7 items in this subscale. The effort subscale measures self-reported effort put into the learning of biology and consists of items such as “I try very hard at Science” and “I don’t put much energy in Science” which is an item that is negatively phrased. There are 5 items in the effort subscale.
Students responded on a 7-point likert scale for the items on enjoyment and effort subscales with 1 being “Not true at all” and 7 being “Very true”, with a higher score being operationalised to mean a higher level of the variable being measured. As some of the items were negatively phrased, the scores were reversed before being computed to obtain the average scores for the subscales. For the sample in this study, cronbach alphas were .97 and .83 for the enjoyment and effort subscales respectively at baseline. At the follow-up, cronbach alphas were .95 and .81 for the enjoyment and effort subscales respectively.

A summary of the statistical information on the reliability of the subscales is given in Table 3.2.
Table 3.2

*Summary of Reliability Findings*

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Subscale</th>
<th>Number of items</th>
<th>Baseline (Cronbach alpha)</th>
<th>Follow-up (Cronbach alpha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Climate Questionnaire (LCQ)</td>
<td>Perceived teacher autonomy-support</td>
<td>15</td>
<td>.93</td>
<td>.96</td>
</tr>
<tr>
<td>Basic Psychological Needs Scale (BPNS)</td>
<td>Autonomy</td>
<td>3</td>
<td>.77</td>
<td>.86</td>
</tr>
<tr>
<td></td>
<td>Competence</td>
<td>6</td>
<td>.74</td>
<td>.77</td>
</tr>
<tr>
<td></td>
<td>Relatedness</td>
<td>8</td>
<td>.89</td>
<td>.91</td>
</tr>
<tr>
<td>Academic Self-Regulation Questionnaire (SRQ-A)</td>
<td>External regulation</td>
<td>4</td>
<td>.83</td>
<td>.82</td>
</tr>
<tr>
<td></td>
<td>Introjected regulation</td>
<td>4</td>
<td>.70</td>
<td>.70</td>
</tr>
<tr>
<td></td>
<td>Identified regulation</td>
<td>3</td>
<td>.64</td>
<td>.57</td>
</tr>
<tr>
<td></td>
<td>Intrinsic regulation</td>
<td>3</td>
<td>.86</td>
<td>.88</td>
</tr>
<tr>
<td>Academic Motivation Scale (AMS)</td>
<td>Amotivation</td>
<td>3</td>
<td>.57</td>
<td>.68</td>
</tr>
<tr>
<td>Motivated Strategies for Learning Questionnaire (MSLQ)</td>
<td>Self-efficacy</td>
<td>9</td>
<td>.91</td>
<td>.94</td>
</tr>
<tr>
<td></td>
<td>Intrinsic task value</td>
<td>9</td>
<td>.87</td>
<td>.90</td>
</tr>
<tr>
<td></td>
<td>Cognitive strategies</td>
<td>13</td>
<td>.85</td>
<td>.85</td>
</tr>
<tr>
<td></td>
<td>Self-regulation</td>
<td>9</td>
<td>.75</td>
<td>.77</td>
</tr>
<tr>
<td>Intrinsic Motivation Inventory (IMI)</td>
<td>Enjoyment</td>
<td>7</td>
<td>.97</td>
<td>.95</td>
</tr>
<tr>
<td></td>
<td>Effort</td>
<td>5</td>
<td>.83</td>
<td>.81</td>
</tr>
</tbody>
</table>

101 (Total)
3.3.6 Qualitative Measure – Focused-Group Discussion

Annex B shows the questionnaire used during focused-group discussions. The questionnaire consists of 2 sections.

Section A which was administered to the students served as a formal consent form to the interview and was used to gather background information such as the students’ demographic profile and the number of years they had known their biology teacher.

Section B consists of self-formulated semi-structured interview questions which were used to gather information about the processes that happened in the classroom before and during the intervention period and the effects the intervention programme had on the students’ learning.

In an attempt to capture breadth and depth of sharing, the questionnaire used only a few pre-determined open-ended questions as a guide for the researcher to explore and probe deeper into the psyche of the students.

3.3.7 Qualitative Measure – Interview

Annex C shows the questionnaire used to interview the teacher who incorporated the autonomy-supportive instructional behaviours in her classes. The questionnaire consists of 2 sections.

Section A served as a formal consent form to the interview and was used to gather background information such as the number of years the teacher has taught biology and the number of years the teacher has served in the school.

Section B consists of self-formulated semi-structured questions which were used to understand the processes involved in the implementation of the intervention programme and the teacher's observations of the students’ motivation and learning.
In this questionnaire, the questions were kept open-ended to allow the researcher and interviewer to elaborate on the topics discussed so as to capture breadth and depth of sharing.

### 3.4 Procedure

#### 3.4.1 Teacher’s Training on Autonomy-Supportive Instructional Behaviours

The teacher and students who participated in this intervention programme were recruited on the basis of negotiation with the school principal and teacher. One female senior teacher teaching upper secondary Biology consented to participate in the intervention programme. She agreed to incorporate autonomy-supportive instructional behaviours in her biology classes.

At baseline, the teacher was trained to adopt autonomy-supportive instructional behaviours of conveying choice rather than control, providing meaningful rationale and acknowledging the students’ perspective. For example, the teacher could provide rationale for learning a particular topic by linking the biological functions to real life application instead of giving the rationale as being important for examinations. The teacher could be empathetic and acknowledge difficulties that students might have when trying to remember the many long and complex biological terminologies or in completing the task assignments on time due to the students’ very busy schedule. In addition, the teacher could enhance sense of choice by using neutral language such as “it involves…” and “it would be…” and not controlling modal operators such as “should have” and “supposed to” when communicating rational feedback and in acknowledging personal difficulties.

In this study, all the components (conveying choice, providing meaningful rationale and acknowledging students’ perspective) of an autonomy-supportive environment were included because empirical evidence had suggested that optimal functioning occurs in an environment that is completely autonomy-supportive (Deci et al., 1994).
The teacher who participated in the intervention programme received training in 4 sessions of 3 hours per session within a month. During the training, she had the opportunity to role-play the recommended instructional behaviours and was given feedback by a teacher educator cum researcher from the National Institute of Education, Singapore.

3.4.2 Implementation of Intervention and Evaluation of Treatment Integrity

The teacher implemented changes in her instructional behaviours in her classrooms for 5 weeks. During the intervention period, she made deliberate attempts to plan and implement the autonomy-supportive instructional behaviours of "conveying choice", "providing meaningful rationale" and "acknowledging perspective-taking" to the best of her ability.

For the evaluation of treatment integrity, the following procedures were observed:

(i) Two of the teacher's lessons were videotaped and observed for occurrence of autonomy-supportive instructional behaviours.

(ii) The teacher was interviewed on her intention and deliberated attempts at implementing autonomy-supportive instructional behaviours in her classrooms during the 5-week period.

(iii) The students were interviewed on their observations of their teacher's instructional behaviours during the 5-week period.

Treatment integrity refers to the degree to which the intervention is implemented as planned (Noell, Gresham, & Gansle, 2002). The measurement on treatment integrity allows researchers to draw valid conclusions about the causal relationship between the intervention and the change in target behaviours (Gresham, 1989; Moncher & Prinz, 1991).

Sanetti and Kratochwill (2011) explained that one of the primary challenges to assessing treatment integrity in schools is that interventions often occur in multiple steps and
at multiple times throughout the day, which complicate data collection. To address this challenge, researchers (Sanetti & Kratochwill, 2011; Noell, 2008; Mortenson & Witt, 1998; Noell et al., 2002; Fiske, 2008) proposed three potential methods for assessing treatment integrity: (i) Direct observations which require observers to directly observe the implementation of an intervention in vivo and record the occurrence / non-occurrence of elements of the intervention, (ii) Teacher's self-reports which require the teachers to indicate through questionnaires or interviews the extent to which they implemented the intervention, and (iii) Product reviews which include finished products such as the students' work and feedback from focused-group discussions (Leech & Onwuegbuzie, 2010).

As noted by Collins, Onwuegbuzie, and Sutton (2006), the quantitative and qualitative methods are complementary. The use of both quantitative and qualitative procedures for examining treatment integrity provides the greatest insights into treatment integrity. Hence, in this study, the researcher utilised both quantitative and qualitative procedures for the examination of treatment integrity.

For quantitative analysis of treatment integrity, two of the teacher's lessons, one lasting an hour and the other lasting thirty minutes were videotaped. Two graduate students served as observers. They were trained in data collection and were briefed by the researcher on what to look out for in the videos. Both observers were blinded to the study conditions (pre-intervention, intervention or post-intervention) and research questions.

Both observers independently rated the frequency of behavioural occurrences in the two video recordings using a behavioural checklist with operational behaviours categorised under "conveying choice", "providing meaningful rationale" and "acknowledging perspective-taking".

To prevent fatigue, the observers coded the video recordings in intervals of ten minutes. On the first viewing of video-recording, each observer looked out for behaviours
that conduced towards "conveying choice". On the second viewing, each observer looked out for behaviours that conduced towards "providing meaningful rationale". On the third viewing, each observer looked out for behaviours that were operationalised under "acknowledging perspective-taking". It is to be noted that more than one instructional behaviour could occur at the same time, for example, the teacher could at the same time be providing wait time and encouraging students to try on a question. This procedure for coding of observable behaviours from video-recordings is in line with Reeve and Jang (2006) who observed video-recordings of classroom interventions to categorise instructional behaviours as "autonomy-supportive" and "controlling" and is also in accordance with the procedure expounded by Vollmer, Sloman, and Pipkin (2008).

Next, inter-observer agreement was calculated as the number of instances of agreement divided by agreements plus disagreements, multiplied by 100%. To describe the procedure in another way, it is to count the total number of responses scored by each observer throughout the observation period, to divide the smaller number by the larger number, and to then multiply by 100%. This yields an overall percentage of agreement for that observation (Vollmer et al., 2008).

The percentage of agreement gives a rough estimate of reliability and is a popular method of computing an estimate of inter-observer reliability (Multon, 2010; Vollmer et al., 2008). According to Multon (2010), an adequate level of agreement is generally considered to be 70%.

In this study, the inter-observer agreement was above 70% for the three components of the autonomy-instructional behaviours - Convey choice, provide meaningful rationale and acknowledge perspective-taking. The observers' reports on occurrences of autonomy-supportive instructional behaviours and inter-raters' reliability are presented in Table 4.1.
For qualitative analysis of treatment integrity, the researcher interviewed the teacher on her intention and her deliberated attempts at being autonomy-supportive. In focused-groups, the students were also interviewed on what they perceived the teacher said and did to be autonomy-supportive. The qualitative data obtained from both the interview with the teacher and focused-group discussions with the students were then examined for evidence of "conveying choice", "providing meaningful rationale" and "acknowledging perspective-taking". This procedure is in line with the procedures set forth by Sanetti and Kratochwill (2011), Noell (2008), Mortenson and Witt (1998), Noell et al. (2002) and Fiske (2008) who proposed using teacher's self-reports for example, through interviewing the teacher on the extent to which she implemented the intervention and product reviews for example, students' feedback from focused-group discussions (Leech & Onwuegbuzie, 2010) as measures of treatment integrity.

3.4.3 Data Collection – Survey

Prior to data collection, ethics clearance was sought from the university’s ethic review committee. Permission was also obtained from the Data Administration Department, Ministry of Education (Singapore) for the collection of data from schools.

As the students were minors, parental consents were sought on the students’ participation in the project. Students were informed of their participation and that the surveys aimed to understand their learning experiences and hence, there was no right or wrong answer. They were also assured that the responses given would be kept confidential and thus, encouraged to be truthful in their responses. These instructions were given to minimise social-desirable responses in the surveys.

Next, quantitative measures on psychological learning variables were obtained from the students at 2 points in time - At baseline (pre-test) which was before the implementation
of the intervention programme and at follow-up (post-test) which was immediately after the 5 weeks of experimental manipulation of instructional behaviours.

For assessment of quantitative psychological variables, students completed a series of structured survey questionnaires. At baseline and follow-up, students provided information on their perceived teacher autonomy-support, basic psychological needs satisfaction, motivational regulations, motivational beliefs (self-efficacy and intrinsic task value), use of learning strategies (cognitive strategies and self-regulation), enjoyment and effort in learning.

3.4.4 Data Collection – Focused-Group Discussion

To have an in-depth understanding of the students' motivational regulations, the processes that happened in the classroom during the intervention period and the effects of the intervention programme on students’ affect and learning, the researcher conducted 4 focused-group discussions with students.

The focused-group discussion approach was adopted to collect qualitative data with its essence and nuance to allow deeper insights into the findings from quantitative data (Berg, 2009). To reiterate, according to Greene et al. (1989), data collected from the qualitative methods are used to complement data from the quantitative methods; they serve to elaborate and clarify the findings from the quantitative methods. Data collected from the qualitative methods are also used for triangulation; they seek to converge and corroborate the results from the quantitative methods, to obtain a more substantive, richer and complete picture of reality (Berg, 2009).

The focused-group discussions were conducted after the follow-up survey and each focused-group discussion had 3-4 participants. Each focused-group discussion lasted an hour. With the participants’ permission, the focused-group discussions were audio-taped.
In each focused-group discussion, students from the same class shared about their learning experiences in their biology class. The students acted as stimuli for the individual participants as they helped each other think about and respond to issues brought up by other members that they might not otherwise have remembered. As each group was formed by students from the same class, the students were familiar with each other and were open in their sharing. The researcher of this study was careful about group dynamics and set the tone that there was no right or wrong response but differing views and opinions which was a very natural phenomenon as each individual was unique; the students agreed that they could disagree. The students were very candid and honest with their responses, built on each other’s observations and at times, offered different views from their group members.

3.4.5 Data Collection – Interview

The researcher of this study also complemented and triangulated the quantitative findings from the surveys and qualitative findings from the focused-group discussions with information from an interview with the teacher who implemented the intervention in her classrooms. The interview was conducted after the follow-up survey.

The teacher was interviewed on her observations of her students’ motivational regulations and her experiences implementing the intervention. This allowed the researcher to have a deeper understanding of the teacher's perceptions on the students' learning experiences and her teaching and intervention processes. The interview lasted an hour and was audio-taped with the teacher’s permission.
3.5 Data Analyses

The quantitative and qualitative data gathered were analysed:

(i) To evaluate the treatment integrity of the intervention programme.

(ii) To address research questions pertaining to the profiles of the students, the effects of the intervention programme and the processes of the intervention.

To be specific, the research questions are as follows:

(1) Profile of students

(i) What are the motivational profiles of students in Singapore?

(ii) Are there clusters of students with significantly different motivational profiles?

(iii) Are there significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

(2) Effect of intervention

(i) Are there significant differences in students' perceived teacher autonomy-support, motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme?

(ii) Are there significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme?
(3) Process of intervention

(i) Does perceived teacher autonomy-support significantly predict motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

(ii) Does basic psychological needs satisfaction mediate the relationship between perceived teacher autonomy-support and motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

As highlighted earlier, there are two components to this study – quantitative and qualitative. The nature of the data collected for the two different components calls for different methods of data analysis. Essentially, the methods employed for data analyses are dependent on the research questions.

3.5.1 Analyses of Quantitative Data

It shall be recalled that the quantitative methods of data analyses were employed:

(i) To evaluate treatment integrity

(ii) To address research questions pertaining to the profiles of the students, the effects of the intervention programme and the processes of the intervention.

As mentioned in section 3.4.2, for the evaluation of treatment integrity, two observers independently rated the frequency of behavioural occurrences in the two video recordings using a behavioural checklist with operational behaviours categorised under "conveying choice", "providing meaningful rationale" and "acknowledging perspective-taking".
Next, inter-observer agreement was calculated as the number of instances of agreement divided by agreements plus disagreements, multiplied by 100%. According to Multon (2010), the percentage of agreement gives a rough estimate of reliability and is a popular method of computing an estimate of inter-observer reliability.

Prior to the statistical analyses to addressing the research questions pertaining to the profiles of the students, the effects of the intervention programme and the processes of the intervention, negatively-phrased items were re-coded so that a high response code was indicative of a positive rating. Responses obtained at baseline and follow-up were paired and missing cases were removed. Cases with response bias were eliminated. Data collected was then analysed using SPSS.

The statistical analyses employed were dependent on the research questions. To be systematic, we will first recall the research questions and then discuss the statistical analyses relevant to the research questions.

3.5.1.1 Profile of Students

To understand the motivational profiles of students in Singapore, the researcher asked the following research questions:

1(i) What are the motivational profiles of students in Singapore?

1(ii) Are there clusters of students with significantly different motivational profiles?

1(iii) Are there significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?
To establish the motivational profiles of a sample of students from Singapore, the researcher obtained descriptive statistics such as the means and standard deviations of the different motivational regulations and Relative Autonomy Index (RAI) at pre-test.

To understand if there exist clusters of students with significantly different motivational profiles, the researcher performed agglomerative hierarchical cluster analysis using motivational regulations at pre-test as the clustering variables. MANOVA and ANOVAs were then used to test for significant differences between the clusters.

To further understand if there are significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort, the means, standard deviations and $z$-scores for self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort were compared. MANOVA and ANOVAs were performed to test for significant differences between the clusters for the learning outcomes.

For clarity, cluster analysis is a statistical technique used to group students into distinct clusters with homogenous characteristics (Hair, Anderson, Tatham, & Black, 1998). In this study, the students were clustered based on their responses to the measures on amotivation, external regulation, introjected regulation, identified regulation and intrinsic regulation which were used as the clustering variables.

As mentioned earlier, the agglomerative hierarchical cluster analysis was used to identify motivational profiles that were naturally occurring among the sample of students. It is "naturally occurring" because the motivational profiles were allowed to emerge instead of forcing the motivational profiles through apriori categories such as the median split (Ratelle et al., 2007).

Cluster analysis is used in this study to analyse motivational profiles because this statistical technique is able to capture the combination of multiple constructs of motivational
regulations and their respective magnitudes (Ullrich-French & Cox, 2009). It will be recalled that in chapter 2, the researcher discussed that while the Relative Autonomy Index (RAI) provides a parsimonious way of capturing the multi-dimensionality of the motivational construct and representation along the self-determination continuum, it is not able to capture information about the magnitude of each motivational regulation (Ullrich-French & Cox, 2009; Van den Broeck et al., 2013). Hence, the use of cluster analysis to capture both the combination of multiple constructs of motivational regulations and their respective magnitudes.

Vansteenkiste et al. (2009) discussed the practical advantage of cluster analysis. They explained that from an applied perspective, it is informative to gain insight on the percentages of students characterised by an optimal or a suboptimal motivational profile. Such information would be useful both from a diagnostic viewpoint and from an intervention viewpoint. To elaborate, students’ cluster assignment which reflects a particular combination of scores on the motivational regulations could yield diagnostic information pertaining to students' motivational regulations towards learning. Also, gaining insight on students’ motivational profiles is instructive because motivational interventions can then be better tailored to each particular cluster. For example, while some groups of students might particularly benefit from more autonomy-supportive instructional behaviours, other groups of students might need more structure. Cluster analysis also allows for a more detailed examination of the additive or interactive effect of autonomous and controlled motivational regulations on optimal learning (Ullrich-French & Cox, 2009; Vansteenkiste et al., 2009). In addition, the comparison of clusters with different motivational profiles also allows the researcher to directly test and compare predictions on learning outcomes that follow from the quantitative and qualitative perspectives on motivation (Ullrich-French & Cox, 2009; Vansteenkiste et al., 2009).
Hence, in addition to analysing motivational profiles using descriptive statistics such as the means and standard deviations of the different motivational regulations, and Relative Autonomy Index (RAI) at pre-test, the researcher also analysed motivational profiles using cluster analysis.

3.5.1.2 Effect of Intervention

In an earlier section, the researcher discussed about the propositions of the Self-Determination Theory which suggest that teachers may be able to impact students’ motivational regulations, motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort through autonomy-supportive instructional behaviours.

In line with the terminology used in recent research on autonomy-support (e.g., Black & Deci, 2000; Ng, Kenney-Benson, and Pomerantz, 2004), the term effect is used in this study. However, it is noted that the word is used to describe the relationship between perceived teacher autonomy-support and the psychological learning attributes, and causal effect is not being implied.

To establish the effects of intervention, the researcher asked the following research questions:

2(i) Are there significant differences in students’ perceived teacher autonomy-support, motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme?
2(ii) Are there significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme?

To evaluate whether autonomy-supportive instructional behaviours promote perceived teacher autonomy-support, autonomous motivational regulation (measured using RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort in learning, the paired-sample \( t \)-tests were performed to compare the pre-and post-test measures.

To evaluate whether there are significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme, repeated-measures MANOVA followed by ANOVAs were performed.

3.5.1.3 Process of Intervention

To have a better understanding of the dynamics between perceived teacher autonomy-support, basic psychological needs satisfaction and the psychological learning attributes, the researcher examined the following research questions:

3(i) Does perceived teacher autonomy-support significantly predict motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?
3(ii) Does basic psychological needs satisfaction mediate the relationship between perceived teacher autonomy-support and motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

The researcher evaluated the predictive value of perceived teacher autonomy-support on motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort and the mediational effect of basic psychological needs satisfaction by first evaluating the bivariate correlations between the variables and then performing Structural Equation Modelling on a hypothesised model as depicted below:

![Figure 3.3. A model on motivating students to learn in the classroom](image)

Theoretically, Structural Equation Modelling (Byrne, 2010) takes a confirmatory, hypothesis-testing approach to the analysis of a structural theory bearing on some phenomenon. It involves two main aspects:
(i) The causal processes are represented by a series of structural, regression equations.

(ii) These structural relations are modelled pictorially to give an overview of the conceptualisation of the theory under study.

The hypothesised model is then tested in simultaneous analyses of the entire system of variables. If the goodness-of-fit is adequate, the model argues for the plausibility of postulated relations among variables; if it is inadequate, the tenability of the relations is rejected (Byrne, 2010).

3.5.2 Analyses of Qualitative Data

The qualitative methods of interview and focused-group discussions were employed:

(i) To evaluate treatment integrity

(ii) To have a deeper understanding of the motivational profiles of Singapore students and the effects of autonomy-supportive instructional behaviours on the students' motivational regulations, self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort?

Essentially, the researcher sought to have a deeper understanding to the following research questions:

4(i) What are the motivational profiles of students in Singapore?

4(ii) What effects do teacher's autonomy-supportive instructional behaviours have on students' motivational regulations, motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?
To reiterate, the qualitative methods of interview and focused-group discussions in this study serve two purposes (Greene et al., 1989):

(i) They are complementary. They serve to elaborate and clarify the findings from the quantitative method.

(ii) They are for triangulation. They seek to converge and corroborate the results from the different methods.

After the focused-group discussions were completed, information gathered from each discussion was analysed individually for code categories and themes. The code categories and themes were then put together to identify common codes and salient themes.

Likewise, information gathered from the interview with the teacher was also analysed for code categories and themes.

In the next chapter, we will discuss the findings of the study.
CHAPTER FOUR

FINDINGS

This chapter presents the findings of the study. It is organised in three parts:

4.1 Evaluation of Treatment Integrity

4.2 Quantitative Findings

4.3 Qualitative Findings

The first part, section 4.1, presents the quantitative and qualitative findings from the evaluation of treatment integrity. In this section, the researcher presents the inter-raters' findings from observations of video recordings of classroom intervention, qualitative self-report of treatment integrity by the teacher who implemented the intervention and qualitative reports of treatment integrity by the students who experienced the teacher's instructional behaviours first-hand.

The second part, section 4.2, features the quantitative findings of the study. It includes descriptive and inferential statistics pertaining to the following research questions:

Research questions:

(1) Profile of students

(i) What are the motivational profiles of students in Singapore?

(ii) Are there clusters of students with significantly different motivational profiles?
(iii) Are there significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

(2) Effect of intervention

(i) Are there significant differences in students' perceived teacher autonomy-support, motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme?

(ii) Are there significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme?

(3) Process of intervention

(i) Does perceived teacher autonomy-support significantly predict motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

(ii) Does basic psychological needs satisfaction mediate the relationship between perceived teacher autonomy-support and motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?
The third part, section 4.3, features the qualitative findings of the study. In this section, the researcher presents the results gathered from the interview with the teacher who carried out the intervention, and focused-group discussions with the students. The findings will be presented with reference to the following research questions:

Research questions:

4(i) What are the motivational profiles of students in Singapore?

4(ii) What effects do teacher’s autonomy-supportive instructional behaviours have on students’ motivational regulations, motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

4.1 Evaluation of Treatment Integrity

As discussed in chapter 3, treatment integrity refers to the degree to which the intervention is implemented as planned (Noell et al., 2002). The measurement on treatment integrity allows researchers to draw valid conclusions about the causal relationship between the intervention and the change in target behaviours (Gresham, 1989; Moncher & Prinz, 1991).

In this study, the researcher utilised both quantitative and qualitative procedures for the examination of treatment integrity. For quantitative analysis, two observers rated the frequency of behavioural occurrences in two video recordings of classroom interventions. The findings are reported in section 4.1.1. For qualitative analysis, the researcher interviewed the teacher on what she said and did to be autonomy-supportive and the students on what they perceived the teacher said and did to be autonomy-supportive. The findings from the
interview with the teacher are reported in section 4.1.2 and the findings from the focused-group discussions with the students are reported in section 4.1.3. These methods of assessing treatment integrity are in line with the assessment methods utilised by Sanetti and Kratochwill (2011), Noell (2008), Mortenson and Witt (1998), Noell et al. (2002) and that professed by Fiske (2008), Leech and Onwuegbuzie (2010), and Collins et al. (2006).

4.1.1 Observers' report on treatment integrity

In this study, autonomy-supportive instructional behaviours were operationalised as conveying choice, providing meaningful rationale and acknowledging perspective-taking (Deci et al., 1994). These operational definitions of autonomy-supportive instructional behaviours were translated into behavioural components as described in Annex D.

From the two video recordings, one lasting an hour (video recording 1) and the other lasting 30 minutes (video recording 2), there was evidence to suggest that the teacher in the intervention programme did implement the instructional behaviours as taught in the teachers' training programme. The observers' report is presented in table 4.1.
Table 4.1

*Occurrences Of Autonomy-Supportive Instructional Behaviours and Inter-Raters’ Reliability*

<table>
<thead>
<tr>
<th></th>
<th>Frequency of occurrence</th>
<th>Percentage of agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rater 1</td>
<td>Rater 2</td>
</tr>
<tr>
<td>Convey choice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video recording 1</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Video recording 2</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Provide meaningful rationale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video recording 1</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Video recording 2</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Acknowledge perspective-taking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video recording 1</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>Video recording 2</td>
<td>52</td>
<td>47</td>
</tr>
</tbody>
</table>

From table 4.1, the raters agreed on at least 70% of their observations on all three components of autonomy-supportive instructional behaviours operationalised as conveying choice, providing meaningful rationale and acknowledging perspective-taking.

According to Multon (2010), an adequate level of agreement is generally considered to be 70%. Hence, there is sufficient evidence to suggest that the teacher was cognizant of being autonomy-supportive and she did implement the autonomy-supportive instructional behaviours to the best of her ability.
4.1.2 From the perspective of the teacher: What the teacher said and did to promote an autonomy-supportive classroom climate

It shall be recalled that the operational definitions for autonomy-supportive instructional behaviours in this study are (i) Convey choice, (ii) Provide meaningful rationale, and (iii) Acknowledge perspective-taking (Deci et al., 1994).

To what extent had the teacher implemented the intervention in her classrooms? What did the teacher say and do to promote an autonomy-supportive classroom climate?

4.1.2.1 Convey choice

Mrs T shared that while involved in this project, she was very conscious about conveying choice. She deliberately conveyed choice through the use of her language, setting of tasks and management of group dynamics.

*Language used*

Mrs T shared, “Traditionally,… the way I talked will be “this is important, you must highlight this in your notes”. I am willing to try and move away...For example, “you have a choice, which leaf structure do you want to work on?”

She gave another example, “…if the class does not want to do certain things, I will ask them what other choices do you have? Can you explain to the class why you want different choices and we will put this to a vote.”

*Class assignments*

There were also deliberate attempts at incorporating choice in class assignments. Mrs T narrated her attempt at crafting a class assignment including the element of choice, “…traditionally, I give them a textbook drawing and say, ok, these are the different layers,
this is the structure, what is the function, … for this particular project, I introduced choice. I took from the internet 3 different types of leaves, a leaf that is found in very dry area and a monochot leaf which has vascular bundle, very different from the normal type of leaf, which is not in the syllabus, which is beyond the curriculum. I gave them a choice ...“Do you want a normal type or you want to be stretched by a monochotomous leaf or even going for one that is in a very strange habitat?”

For the Student-Initiated Assignment, she also incorporated choice, either the students worked in group or they worked alone. She recounted, “One is on diet pills, they do group work. There is another one on carbon climate change where they try to reduce carbon emission so that is another group work. There is also one that is individual and that is dissection of a fish. Those who cannot stand blood, they don’t do that.”

*Management of group dynamics*

On managing students, Mrs T shared that she tried to move away from telling the students what to do. She tried to empower the students by guiding them through the options that they could work things out. Here is what she shared.

Mrs T: ...we never teach them the model way of dealing with free loaders because every group dynamics is different. We will tell them that these are the possible ways that you can deal with free loaders...the first option is they get the free loaders to chip in, second option is that if they are not comfortable with the free loader and they are not able to handle her, then maybe the free loader can do a different task, customised by the teacher.

From the responses above, the researcher is confident that Mrs T did deliberate and incorporate the element of choice during the intervention project.
4.1.2.2 **Provide meaningful rationale**

When asked to share about how she provided meaningful rationale for the learning tasks, Mrs T was momentarily stumped.

After much prompts, she shared, “…even after the project, when we have staff meetings and sometimes, the rationale for certain things are not explained, then I will be wondering, hmm, we are supposed to explain the rationale to the kids when the assignments are important and urgent and they have no choice but how come the adults are not using the same kind of language. As adults, when you want adults to do things, it is better to give a rationale rather than saying that’s the way we have been doing it.”

She explained that her focus for the project had been on conveying choice but she recalled that she did provide rationale for getting the students to do group project and the students responded better after she had provided the rationale. The transcript helps the researcher to understand what she did.

Mrs T: For the bio project. I had to explain the rationale because it was very difficult for them to do groupwork...I have to explain the rationale that this is groupwork so that you can learn to contribute because different people have different strength, to explain to them why they need to do a group project rather than individual project.

This self-report from the teacher on her deliberated attempts and lack thereof in providing meaningful rationale is interesting. The findings suggest that perhaps, for some Singaporean adults, providing rationale for doing things is not a usual practice. Perhaps intrapsychically, they yearn to understand the meanings for the things they do. However, it is not a practice for them to express their request for meaning.
4.1.2.3 Acknowledge perspective-taking

According to Deci et al. (1994), the environment is autonomy-supportive when the interpersonal style of the person in authority (in the case of a classroom, the teacher) takes the perspective of individuals into consideration. Connell and Wellborn (1990) professed that autonomy-support by teachers begins with taking the students' frame of reference. By understanding the students' motivational and cognitive starting point, teachers will be able to relate to the students in a way that encourages internal motivation for engagement in the learning processes. Lyness, Lurie, Ward, Mooney, and Lambert (2013) explained that taking and acknowledging perspective-taking satisfy the need for autonomy and relatedness. By taking students' perspective, the teacher supports their sense of autonomy and by acknowledging perspective-taking, the teacher conveys empathy, enhances a sense of belongingness, and fosters the students' sense of relatedness to the "person in authority".

Qualitative data from the interview provided evidence for "acknowledge perspective-taking". The researcher will elaborate how the teacher acknowledged perspective-taking under the categories of “creating an open and friendly classroom climate”, "encouraging students' participation", “providing the space for students to explore and learn from mistakes” and "communicating perspective-taking". By "creating an open and friendly classroom climate” and "encouraging students' participation", the teacher enhanced the sense of belongingness and fostered the students' sense of relatedness to the "person in authority”; by “providing the space for students to explore and learn from mistakes”, the teacher conveyed empathy; and by "communicating perspective-taking", the teacher demonstrated empathy and also her understanding of the students' motivational and cognitive starting point.

What did Mrs T say and do to acknowledge perspective-taking?
Creating an open and friendly classroom climate

Mrs T shared that she saw her students as young ladies and related to them with respect. When she was involved in this project, she openly told the girls she was trying to change the way she spoke and appealed to the girls to help her in her learning process. The following exchange illustrates the open and friendly climate for learning in the classroom.

Interviewer: Just now you said that you lapsed back into a certain way of speaking and they laughed?

Mrs T: Ya, I said “this is important for exam” and they said “No, you are not supposed to say that. This is good for your learning, it will reinforce your concept for the next lesson.”…we had quite a nice time laughing…I told them I am doing an experiment, I am trying to change the way I speak.

From the response, the researcher infers a classroom climate of openness and friendliness where the teacher modelled that it was alright to make mistakes and everyone helped each other in the learning process. In so doing, the teacher enhanced the sense of belongingness and fostered the students' sense of relatedness to herself.

Encouraging students' participation

Mrs T tried many ways to encourage her students to participate in the class learning process. She shared, “…whenever we have new concepts to introduce, we will ask the students to present. So when they present and they did a good job, their classmates will acknowledge, give them the praises and the feedback. If there is error, they will have their classmates to support them.”
The response gives evidence to acknowledging perspective at two levels. First, allowing students’ expression through participation in the class learning process and second, allowing students’ expression though giving feedback to their classmates’ performance. In doing so, the teacher demonstrated her understanding of the students' motivational and cognitive starting point, enhanced the sense of belongingness, and fostered the students' sense of relatedness to the teacher and their classmates.

*Providing the space for students to explore and learn from mistakes*

Mrs T explained that coincidentally coinciding with the start of the research project, the department decided to lift the grading system off daily assignments. Said Mrs T, “Last year, we still include the assessment for daily assignments and our feedback was there was a lot of copying...this year, no mark is given to assignments. I tell them to try first, even if there are certain parts that they do not know how to do, they just put a question mark and ... I will discuss the question”.

Evidently, by conveying the message to the students "to try first, even if there are certain parts that they do not know how to do, they just put a question mark...", the teacher demonstrated empathy and in this sense, she did "acknowledge perspective-taking".

*Communicating perspective-taking*

On whether the students were prompt in their submission of homework and what measures she took for students who failed to meet the deadlines, Mrs T was full of trust and empathy for the girls, She explained that for those who did not submit homework, it was because they were busy and she would usually grant extra time to help them meet the deadlines.

The following transcript explains her position,
“The children here did not submit work not because they didn’t want to do but they prioritised. They are busy. They have other programmes like Art Elective Programme, Music Elective Programme and my secondary 3 girls are leaders in their CCAs, so they prioritise their time. Some of them are in Science Mentorship Programme, attached to external institutions, so for these kids, as long as they alert us, we give them one week extension…”

Mrs T gave another example where she acknowledged students’ perspective, through demonstrating her understanding of the students' motivational and cognitive starting point. She knew that one of the classes was crazed about Korean pop culture and thus, she often made reference to the Korean pop stars in a bid to engage the girls in her lessons.

Mrs T shared,

Mrs T: …this particular class likes Korean dramas and Korean singers so I try to use some interesting examples that are related to Korean dramas, songs and singers.

Interviewer: What you are trying to say is that you will try to get them engaged by trying to link them back to the students’ interest, coming back to their perspective. But how would that encourage them to learn?

Mrs T: When I told them about the cartilage, the c-shaped cartilage that is supporting the trachea. To them, cartilage is nothing but when you talked about their movie stars, for example, when they cut their noses to make their noses sharper, you know about the Korean actors and actresses, they are very interested.
Taken together, the teacher did deliberate and put in conscious effort at being autonomy-supportive although from the responses, there was more evidence of conveying choice and acknowledging perspective-taking and less on providing meaningful rationale.

For further triangulation, we will examine if the teacher had been autonomy-supportive, from the perspective of the students.

4.1.3 From the perspective of the students: Perceived teacher autonomy-support

The students were aware that their teacher was on a project and they did notice that she was making some attempts at changing some teaching habits.

For the purpose of an evaluation on treatment integrity, we will examine if the students perceived attempts at conveying choice, providing meaningful rationale and acknowledging perspective-taking.

4.1.3.1 Convey choice

There were many instances when the teacher conveyed choice. Choice was conveyed in the language used by the teacher, in the assignments - the students’ project known as Student-Initiated Assignment and class assignments, quiz dates and deadlines for submission of work.

Language used

From a group’s sharing, the researcher figured that there were attempts at making the language and instruction less controlling. The responses below could help explain the point.

Interviewer: How about the way she gives instruction?
C: It is more vague.

FA: It has a lot of room for us to self-discover.

C: It is not step-by-step kind of thing but more for you to learn yourself.

FA: She gave us like, kind of no boundary and let us self-discover along the way.

Interviewer: So you were saying that before that, there were boundaries?

A: She would tell us exactly what to study.

FA: Like there were learning objectives.

C: Because there were notes so we just read the notes, that’s it. But for once, she gave us the dichotomous leaf, then we have to research and find out about the leaf...If it is the old way, she would give us notes and we just read it.

Assignments

Instead of the usual worksheets with questions that everyone was expected to attempt, the students observed that choice was given in their assignments. They described one class assignment to allow the researcher to understand how choice was conveyed.

Interviewer: Did Mrs T give you choice?

JA: The leaf worksheet.

JW: The one is on whether you want to do an easy one on the monochot leaf or a normal one in the syllabus which is a dichot leaf or a hard one, the one I don’t know.
JA: The one with the funny cuticles.

In another focused-group discussion, the students elaborated on the choice that was incorporated in the leaf assignment.

QE: ...We had to pluck a leaf, then we had to wait for it to dry up, then we had to label it, any leaf from the garden.

Interviewer: Do you prefer that or do you prefer that your teacher gives you a leaf?

QE: It was fun, to pick my own leaf and paste it.

On whether the students liked the idea of choice in their class assignments, they responded favourably to it. Student JE felt that having choices allowed her to select the one she was most comfortable with, “you can weigh the pros and cons and choose the one that is the best option”. Student W enjoyed the sharing by her classmates on the different leaves and student SR shared that “we learn more materials in a shorter period of time”.

Quiz dates

The students also shared that the teacher was flexible on the dates of the class quizzes and gave them a choice on the dates to which they took the class quizzes. Said students FI and JA,

FI: … pop quizzes. Like if we tell her that we have a lot of other Math or Chemistry quizzes, she will postpone it most of the times.

Interviewer: Did she ask you which day you want it?

JA: Yes and then she will quickly write it down.
Deadlines

The teacher also gave the students a choice on the dates to homework submission. The students appreciated the arrangement, felt less anxiety and were more committed to submitting the homework. The following exchange illustrates the point.

W: She let us choose our deadlines once in a while when we were really busy ... she would ask us when would be the best time to hand in?

JE: So that we would not be too stressed because we have too much stuff to do.

4.1.3.2 Provide meaningful rationale

There was very little evidence on the teacher providing rationale for the learning tasks assigned. The impression that the researcher had from the discussions was that it was not a usual practice for educators to provide rationale for doing things and also not a practice for the students to actively search for meaningful rationale for doing things.

The following conversation helps to illustrate the point.

Interviewer: Have you ever asked your teacher what is the purpose of doing these things? Like what relevance do these have in our lives? How did she usually take this kind of questions?

C: We never ask. We take it that it is part of the syllabus and we need to take exams.

For most students, they could not recall an event when the teacher actively provided rationale for the learning activities or they had very vague memory of the matter.
Student P shared,

“Maybe in my vague memory, there was once or twice when some students asked why do we have to learn about the plants because it is not exactly related to us in our lives ... she told us something like it is really part of what we are experiencing.”

On whether providing rationale would motivate them in learning, the students shared that providing meaningful rationale would be useful because it would help allay their anxieties about the uncertain and unknown future and give a meaningful purpose to their endeavours. The following responses help shed light into the matter.

Interviewer: What are some of the answers you hope to hear which you think will motivate you in learning?

QE: Some assurances.

JA: You are not wasting your time in school. You are not killing yourself studying and in the end, you won’t be using them in your life. We are like feeling we are just wasting our time in school, not doing anything productive.

JW: Give us some examples on how these work in real life and how they are applicable like some real life applications.

Interviewer: How would the teachers’ answers motivate you?

FI: I don’t know. Actually, I think any answer would be good to make me feel that there is a point to this.

Interviewer: What you want to see is a point. What is the point of wanting to see “a point”?
QE: Make learning more purposeful and goal-orientated. We are learning this because it will be useful for us in the future not because we are learning it to get marks for the exams because it is pointless. I mean like, in the long run, you get all these marks right, you don’t get to use what you have learnt, you feel very cheated in the end because you study so hard and nothing happens.

It was not very evidenced from the focused-group discussions that there were conscious attempts at providing meaningful rationale; the students did not perceive it to be so. However, the researcher managed to gain some understanding from the students’ perspective on why providing meaningful rationale would be desired. Providing meaningful rationale not only serves to reduce anxiety about uncertainties but it also gives a purpose to all the sweat and tears; purpose is a very strong motivating force.

The finding from focused-group discussions is congruent with the finding from the interview with the teacher on providing meaningful rationale. It appears to the researcher that adults and students alike, have been socialised to accept and follow instructions. The recursive pattern appears to be a dance without end where educators and learners are seemingly comfortable with each other where one does not say and the other does not ask.

4.1.3.3 Acknowledge students’ perspective

From the focused-group discussions with the students, the researcher gathered that the teacher did acknowledge students' perspective. This is evident from the autonomy-supportive instructional behaviours of “creating an open and friendly classroom climate”, "encouraging students’ participation", “providing the space for students to explore and learn from mistakes”, and "communicating perspective-taking statements".
Creating an open and friendly classroom climate

There was unanimous agreement that the teacher was “open”, “fun” and “approachable” and her lessons “full of jokes” and “light-hearted”.

The descriptions by students JR, W and JE gave a glimpse into the characteristics of the teacher and clue to the classroom atmosphere created by the teacher.

JR: She is very approachable.

W: She is very open.

JR: She will definitely help you no matter what the question is and she will share the question with the class.

W: She will talk about basically everything under the sun...we learnt about sexual reproduction which is a very awkward topic but for her, it seemed very normal and casual. Her lessons were enjoyable.

Interviewer: Why do you like it when the teacher is “open”? 

W: Most teachers keep to themselves about their personal lives and do not say anything about their families and whatsoever but for her, she jokes about her family like she told us about her daughter scolding her because she was always playing on facebook...she is not uptight.

JE: She made fun of herself and she is not afraid of being made fun of and she shares a lot on what she knows.

Students A and C shared about how the teacher managed her students in a light-hearted way.
A: To the students who sometimes don’t listen in class, she will just tease them to make sure they stay awake in a fun way.

C: In a joking way and everyone just takes it well in a way, no one gets offended or anything.

Student FI explained that “when you can relate to her better, it makes you want to listen to her more”. By relating to the students in a light-hearted manner and allowing the students to relate to her, the teacher had created an atmosphere of openness and understanding. In doing so, she enhanced the students' sense of belongingness and fostered the students' sense of relatedness to herself, and thus acknowledging perspective-taking.

**Encouraging students’ participation**

The students had many examples to give regarding students’ participation in the classroom. According to the students, they sometimes helped to teach part of the lesson, partook in whole class dance and movement and even roped in the foreign exchange students in class learning.

Students JR and W shared,

JR: ...when she was trying to teach...phloem and companion cells, we happened to have a few exchange students with us so she involved the exchange students as well so that they would pay more attention. She ended up involving the whole class and the exchange students.

Interviewer: How else did she get students to participate in class?

W: She got people to go up to answer some questions or to annotate the questions on the visualiser or made them go up there to teach.
was one time there was the cell and she got us up to label it and teach a certain part of it.

According to the students, the teacher was able to engage her students, there were many hands-on activities and the teacher was able to get the students involved in the learning processes. The following conversation further illustrates the point.

FI: I think she has a very hands-on approach.

QE: She used like everyday items. She just grabbed things off the table and used them.

JA: To demonstrate like very difficult concepts.

QE: And she splashes water on you.

JW: To show hydrolysis.

As evidenced from the descriptions above, the teacher did involve the students and got them to participate in class learning. In doing so, she demonstrated her understanding of the students' motivational and cognitive starting point, enhanced the sense of belongingness, and fostered the students' sense of relatedness to the teacher and their classmates.

Providing the space for students to explore and learn from mistakes

The students shared that school assignments presented higher-order thinking questions which they found challenging and they appreciated their teacher for giving them the time and space to explore, and providing scaffold to guide them along with their learning.

Student P recounted how the teacher provided space for her to explore and learn from her mistakes, “...for example, Student-Initiated Assignment, we had the whole semester to do it and although there was a deadline but she created another deadline like one or two weeks
before so these deadlines were actually for us to submit our drafts to her to see if there is anything to correct so it gives us a chance to redo our work, like a window time to correct whatever that needs to be corrected...that is exceptionally helpful because our Student-Initiated Assignment is fish dissection, and this kind of thing you can’t nail it at one shot, you need to do it a couple of times, so by looking at the comments she gave like “it is not this species of fish”, you have a vague idea on what to change so it is good.”

The students agreed that the way the teacher managed the assignments gave them space to explore and make mistakes, and learn from their mistakes, thereby encouraging learning. Said student PY, “…the way she managed it gave us a chance to change our mistakes so it is not about finishing it in one time and seeing what grade you get but maybe you do it like two times or three times and in the midst of it, in the process, you actually know your mistakes.”

For non-graded class assignments, the teacher also encouraged attempts and provided the space for students to explore and learn from their mistakes. As student A shared, “…she said it doesn’t matter if it is right or wrong, you just try your best, then she will mark and after that she will go through the answers.”

Evidently, by providing the space for students to explore and learn from their mistakes, the teacher demonstrated empathy and enhanced the students’ sense of relatedness.

*Communicating perspective-taking*

The students felt that the teacher understood them, was able to empathise with them and they respected her for it. The following transcript illustrates the point.

A: ...when some students do not want to do things, she will keep encouraging, she doesn’t force us to learn.
FA: She will make people do things in a way that they will be willing to do it, not like being forced to do it.

C: She will make us see things her way.

FA: And she will see things in our way.

C: And we will compromise.

A: And she understands our feelings so before the pop quiz, she will give us some time to study and so you feel quite reassuring.

In this transcript, the teacher understood the anxiety and fear of the students. Although work must be done but with her skilled therapeutic hands, she held the students' anxiety and fear and supported the students by giving them time to refresh their memories with their notes and then gently got the students to face their fears.

Taken together, the students did perceive that the teacher had been autonomy-supportive, although from the examples given, the researcher figured out that there were more attempts at conveying choice and acknowledging students’ perspective with providing meaningful rationale being less evident.

Treatment integrity refers to the degree to which the intervention is implemented as planned (Noell et al., 2002). From the quantitative method of observation of video recordings and qualitative methods of interview with the teacher and focused-group discussions with the students, the researcher gathered evidence that the teacher had indeed been autonomy-supportive, with conveying choice and acknowledging students' perspective being more evident and providing meaningful rationale being less evident.

We will now address the research questions of this study.
4.2  Quantitative Findings

4.2.1  Profile of Students

We will examine the motivational profiles of students using descriptive statistics and cluster analysis.

4.2.1.1 Research question 1(i): What are the motivational profiles of students in Singapore?

Table 4.2 shows the means and standard deviations obtained for the subscales of amotivation, external regulation, introjected regulation, identified regulation and intrinsic regulation. Table 4.3 shows the minimum and maximum scores, mean and standard deviation obtained for the Relative Autonomy Index (RAI) which was calculated using the formula “external regulation x (-2) + introjected regulation x (-1) + identified regulation x (+1) + intrinsic regulation x (+2)” (Grolnick & Ryan, 1989; Ryan & Connell, 1989; Deci & Ryan, 2002; Wilson et al., 2012). The scores for the motivational regulations which were also used in the calculation of the Relative Autonomy Index (RAI) were obtained at pre-test, which was before the intervention programme.

Table 4.2

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amotivation</td>
<td>3.11</td>
<td>1.22</td>
</tr>
<tr>
<td>External regulation</td>
<td>4.51</td>
<td>1.40</td>
</tr>
<tr>
<td>Introjected regulation</td>
<td>4.49</td>
<td>1.05</td>
</tr>
<tr>
<td>Identified regulation</td>
<td>5.43</td>
<td>0.84</td>
</tr>
<tr>
<td>Intrinsic regulation</td>
<td>4.36</td>
<td>1.31</td>
</tr>
</tbody>
</table>
Table 4.3

*Descriptive Statistics for Relative Autonomy Index (RAI) at Pre-Test*

<table>
<thead>
<tr>
<th>Score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>-12.25</td>
</tr>
<tr>
<td>Maximum</td>
<td>11.58</td>
</tr>
<tr>
<td>Mean</td>
<td>0.64</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>4.33</td>
</tr>
</tbody>
</table>

For scoring, the researcher averaged the items in each subscale with a higher score to mean a higher level of the variable being measured. As observed from Table 4.2, in general, the students experienced a higher level of identified regulation \((M = 5.43, SD = 0.84)\) where they could identify with the underlying value of the studying behaviours and accepted the studying behaviour as personally important; followed by external regulation \((M = 4.51, SD = 1.40)\) where studying behaviours were performed in compliance or in response to external rewards and punishments; closely followed by introjected regulation \((M = 4.49, SD = 1.05)\), which could be taken to mean that they studied to avoid guilt, anxiety and for ego enhancement. They demonstrated to a lesser degree, intrinsic regulation \((M = 4.36, SD = 1.31)\) which is the regulation to learn for its inherent satisfaction. The students were least amotivated \((M = 3.11, SD = 1.22)\) which is a finding in line with Karsenti and Thibert (1995) and Lim (2010) who explained that amotivation correlated negatively with achievement. To recapitulate, the participants surveyed in this study were students who were ranked in the top 10 percentile in the Primary School Leaving Examination (PSLE) for their cohort and thus, were associated with achievement. Also, the slightly positive value obtained for the Relative Autonomy Index (RAI) \((M = 0.64, SD = 4.33)\) indicates that the students experienced slightly
more autonomous motivational regulations than controlled motivational regulations in their learning.

In summary, descriptive statistics on the students’ motivational regulations at baseline revealed that the students were generally more motivated relative to being amotivated. In addition, the findings also revealed that the students experienced slightly more autonomous motivational regulations than controlled motivational regulations in their learning.

4.2.1.2 Research question 1(ii): Are there clusters of students with significantly different motivational profiles?

To establish the motivational profiles of a sample of students from Singapore, the researcher utilised the standardised $z$ scores (scores with means of 0 and standard deviations of 1) for amotivation, external regulation, introjected regulation, identified regulation and intrinsic regulation obtained at pre-test.

Due to the exploratory nature of the research question, the agglomerative hierarchical cluster analysis using Ward’s (1963) method was used to determine the appropriate number of clusters. The dendrogram obtained suggested that a three-cluster solution was suitable. The agglomeration coefficient (Table 4.4) showed the first large increase (26.8%) when three clusters merged into two clusters hence confirming a three-cluster solution. The decision for a three-cluster solution was made in accordance with Hair, Black, Babin, Anderson, and Tatham (2006) who professed that a larger increase means that more dissimilar solutions were merged, that is, the clustering becomes increasingly artificial.
Table 4.4

**Analysis of Agglomeration Coefficients for Hierarchical Cluster Analysis**

<table>
<thead>
<tr>
<th>Number of Cluster</th>
<th>Agglomeration Coefficient</th>
<th>% Change in Coefficient to the Next Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>215.843</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>240.538</td>
<td>11.4</td>
</tr>
<tr>
<td>3</td>
<td>271.409</td>
<td>12.8</td>
</tr>
<tr>
<td>2</td>
<td>344.042</td>
<td>26.8</td>
</tr>
<tr>
<td>1</td>
<td>445.000</td>
<td>29.3</td>
</tr>
</tbody>
</table>

Table 4.5 presents the non-standardised and standardised means and standard deviations for all the clustering variables in the three-cluster solution. Values of ±0.5 or greater were used as criteria to determine whether a variable was considered “higher” or “lower” in each cluster group, respectively (Wang & Biddle, 2001). Figure 4.1 shows the graphical representation of the characteristics of the clusters according to the clustering variables, at pre-test.

From the characteristics based on the clustering variables, the cluster memberships were labelled. In cluster 1 \((n = 36)\), the students were characterised by high amotivation, moderate external regulation, moderate introjected regulation, low identified regulation and low intrinsic regulation hence labelled “Unmotivated” cluster. In cluster 2 \((n = 24)\), the students were characterised by low amotivation, low external regulation, low introjected regulation, moderate identified regulation and moderate intrinsic regulation, hence labelled “Moderate-autonomous” cluster. In cluster 3 \((n = 30)\), the students were characterised by...
moderate amotivation, moderate external regulation, high introjected regulation, high identified regulation and high intrinsic regulation, hence labelled “Highly-motivated” cluster.

Table 4.5

Means, Standard Deviations and z-Scores for the Clustering Variables in the Three-Cluster Solution

<table>
<thead>
<tr>
<th>Clustering variable</th>
<th>Cluster 1 (n = 36) “Unmotivated”</th>
<th>Cluster 2 (n = 24) “Moderate-autonomous”</th>
<th>Cluster 3 (n = 30) “Highly-motivated”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>z</td>
</tr>
<tr>
<td>Amotivation</td>
<td>3.76</td>
<td>1.05</td>
<td>0.53</td>
</tr>
<tr>
<td>External regulation</td>
<td>4.88</td>
<td>1.05</td>
<td>0.26</td>
</tr>
<tr>
<td>Introjected regulation</td>
<td>4.02</td>
<td>0.71</td>
<td>-0.44</td>
</tr>
<tr>
<td>Identified regulation</td>
<td>4.89</td>
<td>0.59</td>
<td>-0.65</td>
</tr>
<tr>
<td>Intrinsic regulation</td>
<td>3.29</td>
<td>0.88</td>
<td>-0.82</td>
</tr>
</tbody>
</table>
Figure 4.1. Cluster profiles of the clustering variables for the three-cluster solution.

Note. <---- > denotes significant difference at .017 level.

MANOVA revealed significant difference between the three clusters, Wilks’ $\lambda = 0.16$, $F(10, 166) = 25.42, p < .001, \eta^2 = .61$. Follow-up ANOVAs revealed significant differences between the means for all the clustering variables in the three-cluster solution.

Tests of homogeneity of variances for all the motivational regulations were non-significant. Therefore, equal variances for all the motivational regulations were assumed. Post-hoc comparisons were then conducted with the use of the Tukey HSD method. To control for Type I error, pairwise comparisons were conducted with significance set at the
0.05/3 = .017 level. To be specific, pairwise comparisons were conducted between cluster 1 and cluster 2, cluster 1 and cluster 3 as well as cluster 2 and cluster 3, hence, the significance at .017 level.

Table 4.6 summarises the results for post-hoc comparisons.
Table 4.6

Pairwise Differences Between Standardised Scores for Motivational Regulations

<table>
<thead>
<tr>
<th>Motivational regulation</th>
<th>Cluster</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>F</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amotivation</td>
<td>1</td>
<td>3.90</td>
<td>0.97</td>
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<td></td>
<td>11.68</td>
<td>.21</td>
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<td>3.22</td>
<td>1.12</td>
<td>[.44,</td>
<td>1.76*]</td>
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<td></td>
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<tr>
<td></td>
<td>3</td>
<td>1.89</td>
<td>0.75</td>
<td>[.08,</td>
<td>1.33*]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[-1.09, 0.29]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External regulation</td>
<td>1</td>
<td>5.83</td>
<td>0.86</td>
<td></td>
<td></td>
<td>23.32</td>
<td>.35</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>4.10</td>
<td>1.28</td>
<td>[.63,</td>
<td>1.83*]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4.13</td>
<td>1.33</td>
<td>[-.76,</td>
<td>.37]</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td>[-2.05, -.79*]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introjected regulation</td>
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<td>5.38</td>
<td>0.58</td>
<td></td>
<td></td>
<td>55.33</td>
<td>.56</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3.89</td>
<td>0.78</td>
<td>[-.30,</td>
<td>.69]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5.14</td>
<td>1.07</td>
<td>[-1.96,</td>
<td>-1.03*]</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[-2.20, -1.17*]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identified regulation</td>
<td>1</td>
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<td>0.65</td>
<td></td>
<td></td>
<td>40.33</td>
<td>.48</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>4.95</td>
<td>0.61</td>
<td>[-.97,</td>
<td>.11]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>6.45</td>
<td>0.43</td>
<td>[-2.09,</td>
<td>-1.08*]</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[-1.72, -1.60*]</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Intrinsic regulation</td>
<td>1</td>
<td>4.79</td>
<td>1.03</td>
<td></td>
<td></td>
<td>45.44</td>
<td>.51</td>
</tr>
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<td>2</td>
<td>3.67</td>
<td>1.06</td>
<td>[-1.54,</td>
<td>-.50*]</td>
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<td></td>
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<tr>
<td></td>
<td>3</td>
<td>5.83</td>
<td>0.72</td>
<td>[-2.13,</td>
<td>-1.15*]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[-1.17, -.08*]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* indicates that the difference in means is significant at the .017 level using Tukey HSD procedure. The significant level of .017 was used to control for Type I error.
4.2.1.3 Research question 1(iii): Are there significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

Table 4.7 shows the means, standard deviations and z-scores for self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort in the three-cluster solution. Figure 4.2 shows the graphical representation of the learning outcomes for the different clusters.

Table 4.7

Means, Standard Deviations and z-Scores for Learning Outcomes in the Three-Cluster Solution

<table>
<thead>
<tr>
<th>Learning outcome</th>
<th>Cluster 1 (n = 36) “Unmotivated”</th>
<th>Cluster 2 (n = 24) “Moderate-autonomous”</th>
<th>Cluster 3 (n = 30) “Highly-motivated”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>z</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>3.56</td>
<td>.77</td>
<td>-.71</td>
</tr>
<tr>
<td>Intrinsic task value</td>
<td>4.44</td>
<td>.64</td>
<td>-.67</td>
</tr>
<tr>
<td>Use of cognitive strategies</td>
<td>4.70</td>
<td>.66</td>
<td>-.62</td>
</tr>
<tr>
<td>Self-regulation</td>
<td>4.44</td>
<td>.61</td>
<td>-.62</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>3.68</td>
<td>1.42</td>
<td>-.58</td>
</tr>
<tr>
<td>Effort</td>
<td>4.69</td>
<td>.92</td>
<td>-.58</td>
</tr>
</tbody>
</table>
To examine whether the clusters differed according to their learning outcomes, MANOVA was conducted using cluster as the independent variable and self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort, as the dependent variables. Results indicated that the three clusters differed in their learning outcomes, Wilks’ $\lambda = 0.47$, $F(12, 162) = 6.24$, $p < .001$, $\eta^2 = .32$. Follow-up ANOVAs revealed significant differences between the clusters for the learning outcomes.

Table 4.8 summarises the results for post-hoc comparisons.
Table 4.8

Pairwise Differences Between Standardised Scores for Learning Outcomes at pre-test

<table>
<thead>
<tr>
<th>Motivational regulation</th>
<th>Cluster</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>F</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy</td>
<td>1</td>
<td>3.56</td>
<td>.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>4.43</td>
<td>.61</td>
<td>[-1.45, -.27*]</td>
<td></td>
<td>26.06</td>
<td>.38</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4.95</td>
<td>.92</td>
<td>[-1.93, -.84*]</td>
<td>[-1.14, .09]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic task value</td>
<td>1</td>
<td>4.44</td>
<td>.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>5.10</td>
<td>.77</td>
<td>[-1.18, -.13*]</td>
<td></td>
<td>24.73</td>
<td>.37</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5.66</td>
<td>.72</td>
<td>[-1.70, -.73*]</td>
<td>[-1.10, .01*]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of cognitive strategies</td>
<td>1</td>
<td>4.70</td>
<td>.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>5.34</td>
<td>.74</td>
<td>[-1.14, -.14*]</td>
<td></td>
<td>17.35</td>
<td>.29</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5.65</td>
<td>.61</td>
<td>[-1.41, -.49*]</td>
<td>[.83, .21]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-regulation</td>
<td>1</td>
<td>4.44</td>
<td>.61</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>5.09</td>
<td>.73</td>
<td>[-1.15, -.16*]</td>
<td></td>
<td>17.64</td>
<td>.29</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5.38</td>
<td>.67</td>
<td>[-1.41, -.49*]</td>
<td>[-.81, .22]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enjoyment</td>
<td>1</td>
<td>3.68</td>
<td>1.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>5.17</td>
<td>1.17</td>
<td>[-2.55, -.44*]</td>
<td></td>
<td>13.08</td>
<td>.23</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5.29</td>
<td>1.56</td>
<td>[-2.58, -.63*]</td>
<td>[-1.21,.98]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effort</td>
<td>1</td>
<td>4.69</td>
<td>.92</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>5.48</td>
<td>.82</td>
<td>[-1.44, -.13*]</td>
<td></td>
<td>13.97</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5.80</td>
<td>.86</td>
<td>[-1.71, -.50*]</td>
<td>[-1.00, .36]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* indicates that the difference in means is significant at the .017 level using Tukey HSD procedure. The significant level of .017 was used to control for Type I error.
Figure 4.2 and Table 4.8 show that students in cluster 3 (Highly-motivated cluster) had significantly higher scores for self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort than students in cluster 1 (Unmotivated cluster). In addition, students in cluster 3 (Highly-motivated cluster) had significantly higher score for intrinsic task value than students in cluster 2 (Moderate-autonomous cluster).

Students in cluster 2 (Moderate-autonomous cluster) had significantly higher scores for self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort than students in cluster 1 (Unmotivated cluster).

In summary, at pre-test, cluster 3 appears to be the most adaptive cluster as suggested by the higher scores for the learning outcomes of self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort.

4.2.2 Effect of Intervention

We will now examine if students' perceived teacher autonomy-support facilitates motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort.

4.2.2.1 Research question 2(i): Are there significant differences in students' perceived teacher autonomy-support, motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme?

Paired-samples $t$ tests were conducted to evaluate whether autonomy-supportive instructional behaviours promote perceived teacher autonomy-support, autonomous motivational regulation (RAI) in students, motivational beliefs of self-efficacy and intrinsic
task value in learning, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort.

For the overall sample, there were significant mean gains for perceived teacher autonomy-support and self-efficacy.

More specifically, the mean score for post-perceived teacher autonomy-support ($M = 5.15, SD = 0.91$) was significantly higher than the mean score for pre-perceived teacher autonomy-support ($M = 4.96, SD = 0.81$), $t(89) = 2.20, p < .05$, with standardised effect size index, Cohen’s $d = .22$.

Mean for post-self-efficacy ($M = 4.51, SD = 1.03$) was significantly higher than the mean for pre-self-efficacy ($M = 4.26, SD = 0.97$), $t(89) = 3.02, p < .01$ with standardised effect size index, Cohen’s $d = .25$.

For the overall sample, there was significant mean loss for effort. More specifically, the mean for post-effort ($M = 5.07, SD = 0.94$) was significantly lower than the mean for pre-effort ($M = 5.27, SD = 0.99$), $t(88) = -2.17, p < .05$, Cohen’s $d = .21$.

Table 4.9 presents the mean scores obtained for pre-and post-test measures.
Table 4.9

*Mean Scores Obtained for Pre-and Post-Test Measures for Overall Sample*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Subscale</th>
<th>Mean score obtained at pre-test</th>
<th>Mean score obtained at post-test</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived teacher autonomy-support</td>
<td>Perceived teacher autonomy-support</td>
<td>4.96</td>
<td>5.15</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Motivational regulation</td>
<td>Relative autonomy index</td>
<td>0.64</td>
<td>0.68</td>
<td>n.s.</td>
</tr>
<tr>
<td>Motivational belief</td>
<td>Self-efficacy</td>
<td>4.26</td>
<td>4.51</td>
<td>&lt; .01</td>
</tr>
<tr>
<td></td>
<td>Intrinsic task value</td>
<td>5.03</td>
<td>5.05</td>
<td>n.s.</td>
</tr>
<tr>
<td>Learning strategy</td>
<td>Cognitive strategy use</td>
<td>5.18</td>
<td>5.24</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>Self-regulation</td>
<td>4.92</td>
<td>4.93</td>
<td>n.s.</td>
</tr>
<tr>
<td>Enjoyment and effort</td>
<td>Enjoyment</td>
<td>4.61</td>
<td>4.72</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>Effort</td>
<td>5.27</td>
<td>5.07</td>
<td>&lt; .05</td>
</tr>
</tbody>
</table>

A further examination of mean scores obtained for pre-and post-test measures for overall sample revealed that motivational regulation (RAI), intrinsic task value, use of cognitive strategies, self-regulation and enjoyment increased after intervention, albeit not statistically significant.

In essence, the statistics seem to suggest that in general, perceived teacher autonomy-support is an important facilitator of psychological learning attributes except for the exertion of effort in learning. The reasons for the perceived reduction in effort were not known but speculations were made based on the qualitative focused-group discussions with the students and will be presented at a later section.
4.2.2.2 Research question 2(ii): Are there significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme?

A 2 x 3 repeated-measures MANOVA was conducted to evaluate whether autonomy-supportive instructional behaviours promote motivational beliefs of self-efficacy and intrinsic task value in learning, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort in the students in each cluster.

For analyses, the cluster main effect, time main effect and cluster x time interaction effect were examined using the multivariate criterion of Wilks's lambda (Λ). In line with Green and Salkind (2011), for significant cluster x time interaction effects, the researcher would not be examining the findings for main effects but would examine the findings for simple effects instead.

Results revealed significant cluster x time interaction effect for self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation and effort in learning. As there were significant cluster x time interaction effects for self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation and effort in learning, simple effects of time using .05/2 as cut-off value and simple effects of cluster using .05/3 as cut-off value were examined.

Table 4.10 presents the findings from 2 x 3 repeated-measures MANOVA. Table 4.11 presents the findings for simple effects of time at the three different clusters and Table 4.12 presents the findings for simple effects of cluster at pre-and post-test.

Cluster main effect for enjoyment was significant, $F(2,86) = 12.03, p < .001$. Post-hoc tests revealed significant mean differences between cluster 1 and cluster 2, and between cluster 1 and cluster 3.
Time main effect for enjoyment was not significant, $\Lambda = .99$, $F(1,86) = .71$, $p = \text{n.s.}$, partial $\eta^2 = .01$.

Likewise, cluster x time interaction effect for enjoyment was not significant. For enjoyment, $\Lambda = .94$, $F(2,86) = 2.91$, $p = \text{n.s.}$, partial $\eta^2 = .06$. 
Table 4.10

Findings from 2 x 3 Repeated-Measures MANOVA with Cluster as Between-Subject Factor and Time as Within-Subject Factor

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
<th>F_{cluster x time}</th>
<th>η^2_{cluster x time}</th>
<th>F_{cluster}</th>
<th>η^2_{cluster}</th>
<th>F_{time}</th>
<th>η^2_{time}</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-efficacy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 1</td>
<td>M(0.77)</td>
<td>z</td>
<td>M(0.95)</td>
<td>-0.39</td>
<td>4.74*</td>
<td>.10</td>
<td>15.88***</td>
<td>.27</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>4.45(0.61)</td>
<td>0.19</td>
<td>4.61(0.87)</td>
<td>0.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 3</td>
<td>4.95(0.92)</td>
<td>0.70</td>
<td>4.94(1.08)</td>
<td>0.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intrinsic Task Value</strong></td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 1</td>
<td>4.44(0.64)</td>
<td>-0.67</td>
<td>4.60(0.82)</td>
<td>-0.48</td>
<td>3.16*</td>
<td>.07</td>
<td>17.82***</td>
<td>.29</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>5.11(0.76)</td>
<td>0.10</td>
<td>5.22(0.75)</td>
<td>0.19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 3</td>
<td>5.66(0.72)</td>
<td>0.73</td>
<td>5.45(0.93)</td>
<td>0.44</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Use of cognitive strategies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 1</td>
<td>4.70(0.66)</td>
<td>-0.62</td>
<td>4.98(0.64)</td>
<td>-0.35</td>
<td>4.88**</td>
<td>.10</td>
<td>11.73***</td>
<td>.21</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>5.33(0.73)</td>
<td>0.19</td>
<td>5.30(0.77)</td>
<td>0.08</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Cluster 3</td>
<td>5.65(0.61)</td>
<td>0.59</td>
<td>5.50(0.75)</td>
<td>0.36</td>
<td></td>
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</tr>
<tr>
<td><strong>Self-regulation</strong></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 1</td>
<td>4.44(0.61)</td>
<td>-0.62</td>
<td>4.65(0.59)</td>
<td>-0.37</td>
<td>3.10*</td>
<td>.07</td>
<td>12.78***</td>
<td>.23</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>5.06(0.72)</td>
<td>0.19</td>
<td>5.04(0.71)</td>
<td>0.15</td>
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</tr>
<tr>
<td>Cluster 3</td>
<td>5.38(0.67)</td>
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<td>5.19(0.89)</td>
<td>0.35</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Enjoyment</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 1</td>
<td>3.68(1.42)</td>
<td>-0.58</td>
<td>4.06(1.18)</td>
<td>-0.49</td>
<td>2.91</td>
<td>.06</td>
<td>12.04***</td>
<td>.22</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>5.17(1.17)</td>
<td>0.36</td>
<td>5.12(0.94)</td>
<td>0.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 3</td>
<td>5.29(1.56)</td>
<td>0.43</td>
<td>5.20(1.49)</td>
<td>0.36</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Effort</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 1</td>
<td>4.69(0.92)</td>
<td>-0.58</td>
<td>4.86(0.90)</td>
<td>-0.22</td>
<td>6.09**</td>
<td>.12</td>
<td>8.09***</td>
<td>.16</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>5.48(0.82)</td>
<td>0.21</td>
<td>5.07(0.84)</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 3</td>
<td>5.80(0.86)</td>
<td>0.53</td>
<td>5.33(1.02)</td>
<td>0.28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: *p < .05, **p < .01, ***p < .001*
Table 4.11

Simple Effect of Time at the Three Different Clusters

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cluster 1 (n = 36)</th>
<th>Cluster 2 (n = 24)</th>
<th>Cluster 3 (n = 30)</th>
<th>F</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M(SD)</td>
<td>M(SD)</td>
<td>M(SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>3.56(0.77)ab</td>
<td>4.45(0.61)a</td>
<td>4.95(0.92)b</td>
<td>26.36***</td>
<td>.38</td>
</tr>
<tr>
<td>Intrinsic task value</td>
<td>4.44(0.64)ab</td>
<td>5.11(0.76)ac</td>
<td>5.66(0.72)bc</td>
<td>25.03***</td>
<td>.37</td>
</tr>
<tr>
<td>Use of cognitive strategies</td>
<td>4.70(0.66)ab</td>
<td>5.33(0.73)a</td>
<td>5.65(0.61)b</td>
<td>17.54***</td>
<td>.29</td>
</tr>
<tr>
<td>Self-regulation</td>
<td>4.44(0.61)ab</td>
<td>5.06(0.72)a</td>
<td>5.38(0.67)b</td>
<td>17.57***</td>
<td>.29</td>
</tr>
<tr>
<td>Effort</td>
<td>4.69(0.92)ab</td>
<td>5.48(0.82)a</td>
<td>5.80(0.86)b</td>
<td>13.97***</td>
<td>.24</td>
</tr>
<tr>
<td>Post-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>4.11(0.95)a</td>
<td>4.61(0.87)</td>
<td>4.94(1.08)a</td>
<td>5.98**</td>
<td>.12</td>
</tr>
<tr>
<td>Intrinsic task value</td>
<td>4.60(0.82)ab</td>
<td>5.22(0.75)a</td>
<td>5.45(0.93)bc</td>
<td>8.79***</td>
<td>.17</td>
</tr>
<tr>
<td>Use of cognitive strategies</td>
<td>4.98(0.64)a</td>
<td>5.30(0.77)</td>
<td>5.50(0.75)a</td>
<td>4.60*</td>
<td>.10</td>
</tr>
<tr>
<td>Self-regulation</td>
<td>4.65(0.59)a</td>
<td>5.04(0.71)</td>
<td>5.19(0.89)a</td>
<td>4.87*</td>
<td>.10</td>
</tr>
<tr>
<td>Effort</td>
<td>4.86(0.90)</td>
<td>5.07(0.84)</td>
<td>5.33(1.02)</td>
<td>2.09(n.s.)</td>
<td>.05</td>
</tr>
</tbody>
</table>

Note. *p < .05, **p < .01, ***p < .001. Means in the same row with different subscripts differ significantly at p < .025.

Table 4.12

Simple Effect of Cluster at Pre- and Post-Tests

<table>
<thead>
<tr>
<th>Cluster 1 (n = 36)</th>
<th>Pre-test M(SD)</th>
<th>Post-test M(SD)</th>
<th>t</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy</td>
<td>3.56(0.77)</td>
<td>4.11(0.95)</td>
<td>-4.04***</td>
<td>-.64</td>
</tr>
<tr>
<td>Intrinsic task value</td>
<td>4.44(0.64)</td>
<td>4.60(0.82)</td>
<td>-1.45</td>
<td>-.23</td>
</tr>
<tr>
<td>Use of cognitive strategies</td>
<td>4.70(0.66)</td>
<td>4.98(0.64)</td>
<td>-2.80**</td>
<td>-.43</td>
</tr>
<tr>
<td>Self-regulation</td>
<td>4.44(0.61)</td>
<td>4.65(0.59)</td>
<td>-2.31**</td>
<td>-.35</td>
</tr>
<tr>
<td>Effort</td>
<td>4.69(0.92)</td>
<td>4.86(0.90)</td>
<td>-1.38</td>
<td>-.19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cluster 2 (n = 24)</th>
<th>Pre-test M(SD)</th>
<th>Post-test M(SD)</th>
<th>t</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy</td>
<td>4.45(0.61)</td>
<td>4.61(0.87)</td>
<td>-1.00</td>
<td>-.16</td>
</tr>
<tr>
<td>Intrinsic task value</td>
<td>5.11(0.76)</td>
<td>5.22(0.75)</td>
<td>- .67</td>
<td>-.12</td>
</tr>
<tr>
<td>Use of cognitive strategies</td>
<td>5.33(0.73)</td>
<td>5.30(0.77)</td>
<td>- .22</td>
<td>.04</td>
</tr>
<tr>
<td>Self-regulation</td>
<td>5.06(0.72)</td>
<td>5.04(0.71)</td>
<td>.24</td>
<td>.06</td>
</tr>
<tr>
<td>Effort</td>
<td>5.48(0.82)</td>
<td>5.07(0.84)</td>
<td>2.20*</td>
<td>.49</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cluster 3 (n = 30)</th>
<th>Pre-test M(SD)</th>
<th>Post-test M(SD)</th>
<th>t</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy</td>
<td>4.95(0.92)</td>
<td>4.94(1.08)</td>
<td>.03</td>
<td>.01</td>
</tr>
<tr>
<td>Intrinsic task value</td>
<td>5.66(0.72)</td>
<td>5.45(0.93)</td>
<td>2.01*</td>
<td>.25</td>
</tr>
<tr>
<td>Use of cognitive strategies</td>
<td>5.65(0.61)</td>
<td>5.50(0.75)</td>
<td>1.67</td>
<td>.22</td>
</tr>
<tr>
<td>Self-regulation</td>
<td>5.38(0.67)</td>
<td>5.19(0.89)</td>
<td>1.77</td>
<td>.24</td>
</tr>
<tr>
<td>Effort</td>
<td>5.80(0.86)</td>
<td>5.33(1.02)</td>
<td>3.04**</td>
<td>.50</td>
</tr>
</tbody>
</table>

Note. *p < .05, **p < .01, ***p < .001.
With reference to Table 4.10, at pre-test, cluster 1 (Unmotivated) was significantly lower than cluster 2 (Moderate-autonomous) and cluster 3 (Highly-motivated) in self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort. However, after the intervention at post-test, cluster 1 (Unmotivated cluster) was only significantly lower than cluster 2 (Moderate-autonomous) and cluster 3 (Highly-motivated) in intrinsic task value, and significantly lower than cluster 3 (Highly-motivated) in self-efficacy, use of cognitive strategies and self-regulation.

Also at pre-test, cluster 2 (Moderate-autonomous) was significantly lower than cluster 3 (Highly-motivated cluster) in intrinsic task value. However, after the intervention at post-test, there was no significant difference in learning outcomes between cluster 2 (Moderate-autonomous) and cluster 3 (Highly-motivated).

Figure 4.3 shows the graphical representations of the interaction effect of time and cluster on learning outcomes for the different clusters.

In summary, cluster 1 (Unmotivated) appeared to respond most positively to the intervention programme with respect to the learning outcomes of self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort. Cluster 3 (Highly-motivated) appeared to be least receptive to intervention as reflected by the negative effect on self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort.
Figure 4.3. Graphical representations on the interaction effect of time and cluster on learning outcomes for the different clusters.
4.2.3 Process of Intervention

In this section, the researcher addresses research questions 3(i) and 3(ii) and evaluates model fit of a hypothesised model.

To recapitulate, research questions 3(i) and 3(ii) state that:

3(i) Does perceived teacher autonomy-support significantly predict psychological needs satisfaction, motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

3(ii) Does basic psychological needs satisfaction significantly mediate the relationship between perceived teacher autonomy-support and motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

The hypothesised model evaluating the mechanism through how the classroom teacher with autonomy-supportive instructional behaviours motivates students and influences learning outcomes is as follows:

![Diagram of the hypothesised model](image-url)

*Figure 4.4. A model on motivating students to learn in the classroom*
To evaluate the *predictive value* of perceived teacher autonomy-support on basic psychological needs satisfaction, motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort, the *mediation effect* of basic psychological needs satisfaction between perceived teacher autonomy-support and motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort and to evaluate *model fit*, standardised mean scores obtained from post-test measures were subjected to analyses using Structural Equation Modelling in AMOS 21.

The researcher first examined the bivariate correlations between the variables. The correlations are presented in Table 4.13.

**Table 4.13**

*Correlations Between the Variables*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Perceived teacher autonomy-support</td>
<td>-</td>
<td>.32**</td>
<td>.61**</td>
<td>.64**</td>
<td>.58**</td>
<td>.49**</td>
<td>.33**</td>
<td>.46**</td>
<td>.54**</td>
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<td>2 Relative autonomy index</td>
<td>.61**</td>
<td>.40**</td>
<td>.63**</td>
<td>.67**</td>
<td>.63**</td>
<td>.54**</td>
<td>.38**</td>
<td>.43**</td>
<td>.41**</td>
</tr>
<tr>
<td>3 Psychological needs satisfaction</td>
<td>:40**</td>
<td></td>
<td>.61**</td>
<td>.63**</td>
<td>.58**</td>
<td>.43**</td>
<td>.38**</td>
<td>.40**</td>
<td>.41**</td>
</tr>
<tr>
<td>4 Intrinsic task value</td>
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<td>.76**</td>
<td>.63**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Self-efficacy</td>
<td></td>
<td>.63**</td>
<td>.54**</td>
<td>.43**</td>
<td>.41**</td>
<td>.37**</td>
<td>.52**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Enjoyment</td>
<td></td>
<td></td>
<td>.76**</td>
<td>.63**</td>
<td>.58**</td>
<td>.41**</td>
<td>.37**</td>
<td>.52**</td>
<td></td>
</tr>
<tr>
<td>7 Effort</td>
<td></td>
<td></td>
<td></td>
<td>.70**</td>
<td>.65**</td>
<td>.49**</td>
<td>.59**</td>
<td>.71**</td>
<td></td>
</tr>
<tr>
<td>8 Cognitive strategies used</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>9 Self-regulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).
4.2.3.1 Analyses on the Predictive Value of Perceived Teacher Autonomy-Support on Motivational Regulation (RAI) and Learning Outcomes and Psychological Needs Satisfaction as Mediator

A composite score for basic psychological needs satisfaction was first obtained by summing the scores from the autonomy, competence and relatedness measures.

Next, the proposed path model was tested using Structural Equation Modelling, assessing direct effects between:

(i) Perceived teacher autonomy-support and psychological needs satisfaction;

(ii) Perceived teacher autonomy-support and motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort;

(iii) Psychological needs satisfaction and motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort;

and indirect effects of:

(iv) Perceived teacher autonomy-support on motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort mediated by psychological needs satisfaction.

The error terms of the outcome variables were allowed to covary because as evident from Table 4.13, the variables were correlated to one another.

Table 4.14 presents the standardised regression weights for the structural model and Table 4.15 presents the standardised direct, indirect and total effects from Structural Equation Modelling.
Table 4.14

*Standardised Regression Weights and Squared Multiple Correlations for the Structural Model*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Criterion Variable</th>
<th>$\beta$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived teacher autonomy-support</td>
<td>Psychological Needs Satisfaction</td>
<td>.612***</td>
<td>.375</td>
</tr>
<tr>
<td></td>
<td>Motivational regulation</td>
<td>.399***</td>
<td>.159</td>
</tr>
<tr>
<td></td>
<td>Self-efficacy</td>
<td>.507***</td>
<td>.407</td>
</tr>
<tr>
<td></td>
<td>Intrinsic task value</td>
<td>.555***</td>
<td>.490</td>
</tr>
<tr>
<td></td>
<td>Use of cognitive strategies</td>
<td>.608***</td>
<td>.369</td>
</tr>
<tr>
<td></td>
<td>Self-regulation</td>
<td>.646***</td>
<td>.418</td>
</tr>
<tr>
<td></td>
<td>Enjoyment</td>
<td>.547***</td>
<td>.300</td>
</tr>
<tr>
<td></td>
<td>Effort</td>
<td>.384***</td>
<td>.148</td>
</tr>
<tr>
<td>Psychological Needs Satisfaction</td>
<td>Self-efficacy</td>
<td>.187**</td>
<td>.035</td>
</tr>
<tr>
<td>Intrinsic task value</td>
<td></td>
<td>.205*</td>
<td>.042</td>
</tr>
</tbody>
</table>

Table 4.15

*Standardised Direct, Indirect and Total Effects*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Criterion Variable</th>
<th>Direct Effect</th>
<th>Indirect Effect</th>
<th>Total Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived teacher autonomy-support</td>
<td>Basic Psychological Needs Satisfaction</td>
<td>.612</td>
<td>-</td>
<td>.612</td>
</tr>
<tr>
<td></td>
<td>Motivational regulation</td>
<td>-</td>
<td>.244</td>
<td>.244</td>
</tr>
<tr>
<td></td>
<td>Self-efficacy</td>
<td>.187</td>
<td>.310</td>
<td>.497</td>
</tr>
<tr>
<td></td>
<td>Intrinsic task value</td>
<td>.205</td>
<td>.340</td>
<td>.545</td>
</tr>
<tr>
<td></td>
<td>Use of cognitive strategies</td>
<td>-</td>
<td>.372</td>
<td>.372</td>
</tr>
<tr>
<td></td>
<td>Self-regulation</td>
<td>-</td>
<td>.396</td>
<td>.396</td>
</tr>
<tr>
<td></td>
<td>Enjoyment</td>
<td>-</td>
<td>.335</td>
<td>.335</td>
</tr>
<tr>
<td></td>
<td>Effort</td>
<td>-</td>
<td>.235</td>
<td>.235</td>
</tr>
<tr>
<td>Basic Psychological Needs Satisfaction</td>
<td>Motivational regulation</td>
<td>.399</td>
<td>-</td>
<td>.399</td>
</tr>
<tr>
<td></td>
<td>Self-efficacy</td>
<td>.507</td>
<td>-</td>
<td>.507</td>
</tr>
<tr>
<td></td>
<td>Intrinsic task value</td>
<td>.555</td>
<td>-</td>
<td>.555</td>
</tr>
<tr>
<td></td>
<td>Use of cognitive strategies</td>
<td>.608</td>
<td>-</td>
<td>.608</td>
</tr>
<tr>
<td></td>
<td>Self-regulation</td>
<td>.646</td>
<td>-</td>
<td>.646</td>
</tr>
<tr>
<td></td>
<td>Enjoyment</td>
<td>.547</td>
<td>-</td>
<td>.547</td>
</tr>
<tr>
<td></td>
<td>Effort</td>
<td>.384</td>
<td>-</td>
<td>.384</td>
</tr>
</tbody>
</table>
To elaborate, the standardised regression weights and squared multiple correlations as presented in Table 4.14 were obtained when the hypothesised model was evaluated using Structural Equation Modelling, with the error terms of the psychological learning variables (namely, motivational regulation, self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort) being allowed to correlate freely among themselves. When the variables in a hypothesised model are evaluated using Structural Equation Modelling, shared variances are taken into consideration, giving $R^2$ values different from the values obtained by squaring the bivariate correlation coefficients.

To address research question 3(i) which states "Does perceived teacher autonomy-support significantly predict psychological needs satisfaction, motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?" and as evident from standardised regression weights and squared multiple correlations in Table 4.14, the researcher concludes that perceived teacher autonomy-support does significantly predict psychological needs satisfaction, motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort in learning.

To address research question 3(ii) which states "Does basic psychological needs satisfaction significantly mediates the relationship between perceived teacher autonomy-support and motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?" and as evident from standardised direct, indirect and total effects in Table 4.15 and path analyses in Figure 4.4, the researcher surmises that basic psychological needs satisfaction significantly mediates the relationship between perceived teacher autonomy-support and motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort. In addition, path analyses also revealed that
psychological needs satisfaction partially mediates the relationship between perceived teacher autonomy-support and self-efficacy, and also partially mediates the relationship between perceived teacher autonomy-support and intrinsic task value.

Sobel test analyses supported the findings from Structural Equation Modelling thus confirming the mediating effect of psychological needs satisfaction.

Figure 4.4 presents the path analysis results for the direct and indirect relations among perceived teacher autonomy-support, motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort with psychological needs satisfaction as mediator. For a detailed path analysis results for the direct and indirect relations among perceived teacher autonomy-support and the psychological learning variables with psychological needs satisfaction as mediator; including the correlations among the psychological learning variables, please refer to annex D.
Predictor Variable | Mediating Variable | Criterion Variable
--- | --- | ---
Perceived Teachers’ Autonomy-Support | Psychological Needs Satisfaction | Motivational Regulation
| | | Self-Efficacy
| | | Intrinsic Task Value
| | | Use of Cognitive Strategies
| | | Self-Regulation
| | | Enjoyment
| | | Effort

Figure 4.5. Path analysis results for the direct and indirect relations among perceived teacher autonomy-support, motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort with psychological needs satisfaction as mediator.

4.2.3.2 The Final Model – How Perceived Teacher Autonomy-Support Works

To evaluate the fit of the model, several fitness indices were employed. This is because most indices have been reported to have their own limitations (Kline, 2005). Hence, model fit for the hypothesised model was evaluated using Chi-square ($\chi^2$), Root Mean
Squared Error of Approximation (RMSEA), Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI).

Chi-square ($\chi^2$) statistics tests the independence of the hypothesised model and the analysed covariance. If the $\chi^2$ is not significant, that is, if $p > .05$, then the null model is not rejected (Hox & Bechger, 1998). RMSEA is based on the assumption that a perfect model fit is unrealistic and that reality can only be approximated. If the value of RMSEA is less than 0.08, the model can be regarded as a reasonable fit model (Knoke, 2005). According to Bentler (1992), cut-off values over .90 for CFI and TLI indicate adequate fit and cut-off values close to .95 indicate good fit (Hu & Bentler, 1999).

Confirmatory Factor Analyses revealed that the sample data did not fit the model well in some of the fit indices, $\chi^2 (6) = 14.48, p < .05, \chi^2/df = 2.41$ and RMSEA = .13 with 90% confidence interval ranging from .04 to .21, PCLOSE = .06. Hox and Bechger (1998) had cautioned against the sensitivity of the chi-square statistics for sample size. MacCallum, Browne, and Sugawara (1996) had also alerted that the value of RMSEA and its confidence interval can be influenced by the sample size. It is likely that the use of chi-square and RMSEA in this study requires a larger sample size.

However, the sample data fit the model well in some of the fit indices, CFI = .98 and TLI = .90, suggesting good fit for the final model.

When taken together, the significant path coefficients along with the good fit indices (CFI and TLI) provide support for the theoretical claim that perceived teacher autonomy-support has an effect on motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort through satisfying the basic psychological needs of the students.
4.3 Qualitative Findings

In this section, the researcher addresses the following research questions:

4(i) What are the motivational profiles of students in Singapore?

4(ii) What effects do teacher's autonomy-supportive instructional behaviours have on students' motivational regulations, motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

4.3.1 Research question 4(i): What are the motivational profiles of students in Singapore?

Descriptive statistics revealed that the students were generally motivated when learning relative to being amotivated. They were also able to identify with the value of their studying behaviours and accepted their studying behaviours as personally important, as evident from the relatively higher mean score obtained for identified regulation ($M = 5.43$, $SD = 0.84$). However, the students were also rather controlled in their motivational regulations when learning, as indicated by the second highest mean score obtained for external regulation ($M = 4.51$, $SD = 1.40$) which was followed closely by introjected regulation ($M = 4.49$, $SD = 1.05$). They were regulated, to a lesser degree, by intrinsic means ($M = 4.36$, $SD = 1.31$).

Cluster analysis revealed three distinct clusters, labelled "Unmotivated", "Moderate-autonomous" and "Highly-motivated". The "Unmotivated" group ($n = 36$) was characterised by high amotivation, moderate external regulation, moderate introjected regulation, low identified regulation and low intrinsic regulation. The "Moderate-autonomous " group ($n = 24$) was characterised by low amotivation, low external regulation, low introjected regulation,
moderate identified regulation and moderate intrinsic regulation. The "Highly-motivated" group \((n = 30)\) was characterised by moderate amotivation, moderate external regulation, extremely high introjected regulation, high identified regulation and high intrinsic regulation. The clusters were labelled "Unmotivated", "Moderate-autonomous" and "Highly-motivated" based on a comparison of the standardised scores on motivational regulations relative to the other clusters.

Qualitative findings from the interview with the teacher and focused-group discussions with the students reveal likewise. When taken together, the patterns that emerged suggest that the students in this sample are in general, very motivated towards learning relative to being amotivated; they could identify with the value of their learning behaviours and see their learning behaviours as personally important but they are also to a large extent, regulated by external and introjected reasons when learning.

In the next two sections, I will highlight the observations made by the teacher who implemented the intervention in her classrooms and then comments made by the students that best illuminate the students’ motivational regulations. The qualitative findings will be discussed with reference to the quantitative findings.

4.3.1.1 Motivational profiles of current sample of students from Singapore - Teacher's perspective

From the perspective of the teacher, the students were highly-driven when learning. Grade was certainly a driving force but according to the teacher, most of the students went beyond mere grades when learning. The teacher, Mrs T shared, “…they are always very driven by new things. They will take control of their learning. Sometimes, before the assignment is due, they will ask me questions on how to do the assignments or when can they
hand up. In fact, I was the one who said “Huh? Is it due now?” So, it is very interesting to
know that they are very autonomous…”

The teacher went on to elaborate that the level of preoccupation with grade depended
on the ability levels of the students, “The very high-ability girls are definitely not motivated
by grade results, they go beyond that….the weaker ones, basically have problems
understanding concepts so results to them at this stage is still important.”

Mrs T described an event in which she received different responses from the students,
“For the high-ability classes, everyone wants to try something new. If I am not wrong, they
have already studied before the lesson, so most of them went for the difficult leaf from
strange habitats. Some went for monochot, only a minority went for the normal leaf…for the
weaker ones, they wanted the traditional leaf so I gave most of them the traditional leaf …”

From Mrs T’s responses, the researcher gathered that in general, students were
concerned about their grades but for those who were able to manage their studies and who
were not struggling with meeting the expected marks for their tests and examinations, they
could go beyond external regulation to more autonomous regulation when learning. These
findings are congruent with findings from quantitative data which suggested that students are
motivated relative to being amotivated. Interestingly, from the teacher's point of view, the
students are autonomous in their learning; their motivational regulations become more
controlled in face of tests and examinations.

What say the students? What are they motivated by when learning?
4.3.1.2 Motivational profiles of current sample of students from Singapore - Students’ perspective

There are numerous comments to suggest that students are rather externally regulated. To many of the students interviewed, learning was largely a means to achieving some external end. From the data gathered, students appeared to be largely driven by (i) Grade, (ii) Career options, (iii) Compliance, and (iv) Convenience when learning.

Grade

When asked if she was mostly motivated by marks when learning, student QE promptly retorted “That’s how the system works!” Student JR confirmed the presumption when queried about her preference for learning within the syllabus, “It is not a very good mentality but because we are quite concern about our marks so for anything that does not affect our overall score, we don’t really take much notice of it.”

Student P explained the students’ concerns about grades,

“…very realistically speaking, all those reading up on extra might be good for your grades in the long run but I think what we need now is not the extra information but the information that would aid us in our results because after all, results mean almost everything, like application to subject combination in Junior College and what not, so it is primarily more important than reading for the sake of learning in that sense.”

Student KY gave her opinion on why students needed to emphasise on grade.

“Unless examination is abolished, it is impossible for students to learn just based on interest because no matter what you do, you are still thinking of the examinations in the long run. You know that you have to face this exam at this period of time, your learning is still to
prepare you for that, but unless you really like it very much, it is impossible for you to learn just by interest.”

The students’ preoccupation with grades was so intense that when the school lifted the grading system off everyday class assignments, there was much relief among the students who then felt less uptight about class assignments and were more willing to explore and experiment with learning.

Student KY’s comment expressed such sentiment.

“When they grade everything, they make it very stressful for us because we need to complete it and score well so it is ultimately out of a score so in the morning sometimes, you bring your assignment early in the morning to discuss the answers so that we all do well…but I have friends like last year, they get the past year worksheets of their seniors so they just copy all the answers so they get A, but this year, it no longer happens because we all know it is not graded and sometimes, if I do not know the answer, I just google it so I learn more.”

Student QE echoed the view of student KY,

“I like the idea that the assignments are not graded. Then, I don’t have to copy from people. If I do not know how to do, I just have to write my own answers eventhough they may be wrong. There is lesser risk in non-graded work than graded work because if it is graded, everything would be very scary because if you get it wrong, you will lose mark and your overall is affected, then people would want to put a safe answer. If it is not graded, then, I dare to write stuff I have not learnt but have read elsewhere.”

The students’ responses provide very good feedback on the effect of the assessment system on students’ learning. The very fact that they found non-graded assignments “encouraging us to try” (Student C) and as student F put it, “encourage a lot of new ideas in
the answers because in the past, people will put in the correct model answer but now, there are more new ideas and not everyone will have the same answers”, suggest this as an area where educators may like to look into in their search for a way to encourage the originality of thought and to inspire the love for learning.

Career options

When interviewed on what drove the students to put in a great amount of effort in learning, a few students proclaimed that they had in mind future career options.

As student KY put it “…ultimately, the grade will affect our subject combination…and what we can choose to do for example, there are some programmes in university that require your cap to be kept at a certain score, so you will work towards that, like you study to reach the goal, to satisfy what you want rather than trying to gain more knowledge about the world.”

Apparently, this sample of students from Singapore has been socialised to associate good academic grades with high-paying jobs which they believe will provide the means to satisfy their wants. The following exchange between the interviewer and student JA illustrates the perception held by some students.

Interviewer: Where does the stress come from?

JA: From myself. Because I want to do well for my future.

Interviewer: What is the future you envision?

JA: Rich.

Interviewer: How will study make you rich?

JA: I will get a good job. (The group laughs.)
What we know now is we study so that we can continue to study in university so that we can get a degree so that we can get a good job.

**Compliance**

When interviewed on whether students sought for meaning and purpose in what they were doing and learning, students’ responses demonstrated compliance.

The comment by student FI illustrates the point,

“I think for a lot of us in this system, I think we just learn to accept whatever is in the syllabus. We don’t really question, like why is it in here because from primary 1 to now, we don’t really have the kind of mindset, like to question constantly, about what we are doing.”

Student JW agreed with the response made by student FI,

“A lot of times, especially during exam period, we will start questioning. ‘Oh, why are we doing all these? How will these benefit us later in life?’ But we just study, we just go for exams, we just know we are supposed to do well.”

Students FI and QE elaborated on the matter and suggested that perhaps, the mindset of compliance pervades through the systems in the excerpt below:

FI: I can’t really recall but then again, no teacher ever tells us why we are doing it, no subject.

QE: That time we asked our Math teacher and he just giggled and there was no answer.

FI: Honestly, I don’t think they have an answer to our question.
Convenience

The huge concern about grades was so strong that it could have inhibited the spirit of taking on a good challenge. The following exchange demonstrates this.

JR: Our student-initiated assignment...takes up 20% of our overall grade. There are three tasks that we could choose from. There is one fish dissection, one on diet pills and the other one to research on carbon. Most people did the fish dissection because it is the easiest to score.

W: Only two people in our class did the diet pills.

JR: Because the “diet pills” is very difficult to score where the fish dissection, many of us scored full mark.

Interviewer: So you did the fish dissection because it is the easiest to score?

W: And it is the least tedious.

JR: And it is the fastest to complete.

As evidenced by the responses above, students are in general, very much motivated by external factors when learning, in particular, grades and future career options. The findings lie congruent to a local research study (Lim, 2010) which had surfaced the extrinsic drivers behind junior college students’ interest and effort in learning. The findings from this study lend support to the suggestion that students in Singapore are in general, a pragmatic lot of people. What emerged from the qualitative data of this study are also the environment factors that foster the pragmatic approach towards learning; namely, societal beliefs, values and attitudes, national examination system, familial beliefs, values and attitudes and the school’s assessment practices.
Invaluably, two other insights surfaced from the focused-group discussions - The compliant mindset and the convenient attitude. The compliant mindset and convenient attitude are worthy of note because they reflect the concern raised by the then Prime Minister Mr Goh Chok Tong on students’ lack of passion in learning. In his statement mentioned in Chapter 1, he felt that students could thrive better if they could have a more entrepreneurial spirit of taking up challenges and always asking searching questions. Perhaps, herein lays a clue to instilling the love for learning in the students.

What a review of local literature did not surface were the introjected reasons of students’ motivation towards learning (e.g., Lim, 2010; Liu et al., 2009). Qualitative findings from this study revealed that students’ motivations are also governed by ego enhancement such as pride and overlappingly, guilt, anxiety and failure avoidance. The following excerpts illustrate the point.

Ego enhancement and pride

On finding a balance between preoccupation with grades and examinations, and experimentation and exploration with learning, students KY and PY shared,

Interviewer: Does it help that you are in the Integrated Programme and that the national examination is a few more years down the road?

KY: It doesn’t help because to be frank, we are xxxxx (name of school) girls and xxxxx (name of school) girls…

PY: We are all perfectionists in one way or another.

KY: Ya, and we can’t lose. So even if it is just examinations within the school, we can’t allow ourselves to do badly.
I mean because we all came in with relative high PSLE score, and to be frank, people around us will expect us to do well based on the fact that you are a xxxxx (name of school) girl. Naturally, when others expect you to do well, you need to have high expectations of yourself.

Interviewer: Who are the ones who expect you to do well?

KY: Parents and possibly yourself because you have been doing well for the past period of time, you can’t allow yourself to suddenly become the worst out of the whole bunch…so you would want to continue to do well even when you know that now the academic standard has upped a level, things are tougher now but you would still want to do well.

Anxiety and failure avoidance

Driven by ego enhancement, coupled with anxiety and failure avoidance, students PY and LH also shared what drove them to learn, as always, with reference to tests and examinations.

PY: For me, I wasn’t good at chemistry right from the start, so it was like after the time I did very badly for the chemistry test, I was very motivated to perfect it, so it was from there.

Interviewer: What motivated you to want to perfect it?

PY: The low score. I felt very discouraged looking at it so after that I was motivated to improve the score so as I tried to improve the score, I realised how I could actually do it.
Student LH shared, “...ultimately, we are restricted by our own expectations of ourselves, the requirements of certain programmes and also ultimately, we need to do well for the ‘A’ levels and this is the foundation of what we need to know before we go to Junior College…so ultimately, you still have to do well now. And we would feel a greater sense of security if we do well now rather than we do badly and then we go on to Junior College and struggle with the subjects.”

Anxiety and failure avoidance also presented themselves in a higher degree as fear. The exchange below illustrates this.

Interviewer: Would you say that being in the Integrated Programme allows you to focus less on your grade but on your learning?

JA: No. The possibility of retaining is very frightening so we will study very hard.

In accordance with findings from descriptive statistics which revealed a relatively high mean score for identified regulation \((M = 5.43, SD = 0.84)\), students could identify with the underlying value of their studying behaviours, could accept their studying behaviours as personally important and they wanted to do well in school.

On identified regulation, student JW said that she wanted to study "...because it is nice to learn about things around us and to gain knowledge..." and student F commented that "...it is) good to have a lot of knowledge at your finger tips..." Student J also shared about her strong wish to do well in school, "...I want to do well for my future...I tell myself I have to study."

On intrinsic regulation, some of the students gave reasons that they enjoyed learning. Student F shared, "I like to learn because I feel that learning is quite fun and enjoyable..."

Some students were motivated to read beyond the content in their textbooks because they
wanted "to have a better understanding of the topic. And answering the questions based on my own understanding....for self-satisfaction" (Student QE).

Codes and themes that emerged unravelled the mystery to the psyche of this sample of students from Singapore. Collectively, they support quantitative findings that students in general, could identify with the value of their learning behaviours but also demonstrated rather controlled form of learning as evident from the many external and introjected reasons that regulated their learning behaviours. In addition, qualitative data provides insights into the forces that drive students in learning, which as evidenced from the responses, centred largely on tests and examinations. Salient from the teacher's and students' responses is that grading and examinations can be double-edged swords. While grading and examinations can be strong driving forces towards achievement, they can also be strong binding forces that restrict learning, exploration and growth.

Interestingly, while the teacher observed a group of highly-driven and hardworking students and assumed autonomous regulation in learning, saved a small group of students who were struggling to meet expectation for promotion to the next grade level, what emerged from the focused-group discussions directly from the students' perspective was less encouraging. Enlighteningly, the qualitative methods surfaced systemic structure that fostered controlled forms of motivational regulation, namely, values and attitudes, familial beliefs, school’s assessment practices, national examination system and societal beliefs.

Now, we will turn our attention to the next research question.
4.3.2 Research question 4(ii): What effects do teacher’s autonomy-supportive instructional behaviours have on students’ motivational regulations, motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

Feedback on effects of intervention is best obtained directly from the students. It is from the students’ direct responses that the researcher could have a better understanding on the students' experiences and the dynamics that occurred between the interpersonal intervention and intrapsychic forces. While the teacher was able to observe outward displays of behaviour, she would not be able to read the internal states of the students. Hence, to address research question 4(ii), the researcher deliberately gathered responses from the students on their direct learning experiences.

4.3.2.1 Effects on students’ motivational regulations

In this section, the researcher seeks to understand if the intervention had any bearing on students’ motivational regulations. In particular, she examines if perceived teacher autonomy-support could encourage more autonomous form of learning.

There are indications to suggest that perceived teacher autonomy-support could encourage more autonomous form of learning.

On the teacher’s de-emphasis on studying according to the syllabus and an emphasis on learning, the students felt it gave them more reasons to learn and it had the effect of motivating them to learn. The following excerpt illustrates the point.

A: Now, she will say things like “This is good to know.”

FA: She will say “This is interesting. You can read more about it.”
Interviewer: How does saying that impact you?

C: What she is implying is that what she is teaching us is not just for the exams and it is good to know, they are facts for your own information…it makes it less mundane because if you know that you are just studying for exam, it is not really a motivation or anything but if you study out of curiosity or for knowledge, it gives us more reasons to study.

Students PY and LH’s articulations help us understand the dynamics at play.

PY: When we hear her say “you are encouraged to find out” instead of “it is not tested”, it is actually quite motivating because sometimes you feel that education is just for the exams and if she says it like the way she did in the past like “it is not tested”, it emphasises once again that you are studying for the examinations but if she says “it is good to find out”, it is encouraging to know that you can find out about it because you want to know more about it and not just because you want to manage the examinations.

PY: If she tells us like “this is tested” or “that is not tested”, the way we study will be based on the fact that “this is tested in the examinations” and if we have time, we will find out about what we are not required to know so the way she says it like “you are encouraged to find out”, then we will be more motivated to find out. It is like if you do not need to know this, you can just leave it aside and if she says you are encouraged to find out and she tells you a little bit about it, it kind of sparks off your curiosity and interest in it.
LH: I think in a sense when carrying out this method of encouraging us to learn more, when we actually go to learn external information about biology, it sort of let us cultivate our interest for biology because we learn things like outside of syllabus, so there is a lot more to explore, there is a wider range of information that you open yourself to.

PY: …it also makes us feel that she is more open to questions, so we also ask her questions more actively, although it is not related to the curriculum but still they are knowledge on biology that can be applied.

On the school’s de-emphasis on grading every piece of assignment, in particular, the new practice of not grading everyday class assignments, there are also indications that it encourages students to explore and has the possible effect of encouraging more autonomous form of learning. The effect is illuminated by the following exchange.

Interviewer: So if your assignments are not graded, would you go beyond your normal reading and read extra?

QE: Yes. Online. Textbook. Not everything is in the lesson notes so I might look at the textbook or I might just go online and explore around.

Interviewer: What motivates you to want to read beyond what is required?

QE: To have a better understanding of the topic. And answering the questions based on my own understanding.

Interviewer: And why do you want to do that?

QE: Self-satisfaction.
The responses suggest that perceived teacher autonomy-support could encourage more autonomous form of learning. It appears that the language used by the teacher and a de-emphasis on grading had the effect of conveying autonomy and reducing pressure in learning. It has the effect of shifting the emphasis on learning for examinations and grades which are external forms of regulation to an emphasis on learning for knowledge and to satisfy one’s interest and curiosity which are more autonomous forms of regulation. Thus, perceived teacher autonomy-support has the possible effect of promoting more autonomous forms of motivational regulation when learning.

4.3.2.2 **Effects on students’ motivational beliefs of self-efficacy and intrinsic task value**

What effects does perceived teacher autonomy-support have on students’ motivational beliefs of self-efficacy and intrinsic task value?

*Effect on self-efficacy*

Descriptive statistics revealed an increase in mean scores from baseline to follow-up for self-efficacy. While most of the students reported an improvement in their self-efficacy, an analysis of qualitative responses showed that there were some students who perhaps needed more scaffolding as they attempted to adjust to more autonomy in their learning.

Perhaps, accustomed to the traditional way of direct feeding of notes and repetitive worksheet practices for reinforcement, a few students found it difficult to adjust and felt unsure and lost some of the time and certainly did not feel self-efficacious. Students JR and C provided feedback on their learning processes.
Student JR shared,

“I hope she gives more forced work as in written work. I think for stuff that really needs a lot of reinforcing, it will be better for me if everyone does the same thing because I have more friends to check with so that I know I am doing the right thing…last year, her notes were set of worksheets so we were supposed to go home and find out ourselves and do it … and so this year when she asked us to go online, I am very scared that I will go off the point and start researching on stuff that are not related to what she is teaching. “

Similarly, student C shared that “For me, I prefer the notes way because I learn better like that because I don’t trust my own information and stuff.”

Interestingly, some students requested for more structure in the instructional processes. With regard to notes, student FA commented, “If there are structured notes right, we can write down interesting things that she said like maybe at the side note, we can write down things that help us remember better but even if we don’t remember right, there are still the notes that can guide us.”

From the responses above, the researcher figured that educators need to be mindful when they introduce autonomy in learning. While most students like choices and the freedom to explore and learn, they are some students who need more scaffolding either because they are too entrenched in the traditional way of learning or need more time to pick up new learning skills. For either of the reason, educators could consider crafting more structure in their instructional design with autonomy embedded in the structure.

Effect on intrinsic task value

In general, there were very few responses relating to students seeing the intrinsic value in their tasks. Many students partook in the learning activities because they were
required to do so. As discussed in an earlier section, students had very few examples on their
teachers providing meaningful rationale. In general, students agreed that “any answer would
be good to make me feel that there is a point to this. I think if my teacher had given me some
rationale about Math, I think I would be very interested and proactive to solve my challenges
with Math” (Student FI). Perhaps, the key to helping the students see the intrinsic value in the
tasks lies in helping them to see meaning in their learning activities.

Although an analysis of the transcripts revealed very few responses relating to
students seeing the intrinsic value in their tasks, there are indications that suggest that
perceived teacher autonomy-support facilitates intrinsic task value.

As student PY shared, “if she says you are encouraged to find out and she tells you a
little bit about it, it kind of sparks off your curiosity and interest in it” and student LH
commented, “we actually go to learn external information about biology, it sort of let us
cultivate our interest for biology because we learn things like outside of syllabus, so there is a
lot more to explore, there is a wider range of information that you open yourself to”.

Student FA shared about her learning experience, “There was once I went online to
research on what the teacher said, so I came out with a lot of notes about my own reading so
when there is a test and they ask questions about it, ya, I know answers from the syllabus but
sometimes, I will include many things that are not in the syllabus because I will be thinking
like since I have read this before so why not I just put this in. So, sometimes, it will make you
learn more like after reading the more difficult knowledge right, you will understand the
simpler ones better.” The researcher gathered from student FA’s response that as students
cultivated their own interest in the subject, they grew to like the subject better.
Perhaps, autonomy-supportive instructional behaviours work through encouraging students to explore on their own and from there, they cultivate their own interest and realise the intrinsic value of what they are learning.

4.3.2.3 Effects on students' learning strategies of cognitive strategies and self-regulation

The researcher also attempted to understand the effects of perceived teacher autonomy-support on learning behaviour, in particular, cognitive strategy use and self-regulation.

Pintrich and De Groot (1990) operationalised cognitive strategies to include rehearsal, elaboration and organisational strategy that students use to learn, understand and remember materials. Rehearsal involves rereading class notes, listing down the important terms and concepts, making up images or rhymes to help with recall, and memorising key words and concepts. Elaboration involves summarising or paraphrasing the material read in the notes, creating analogies and relating the materials to the students' prior knowledge. Elaboration strategies help students to integrate and connect new information with prior knowledge. Organisational strategies help the students select appropriate information and construct connections among the information to be learned. Organisational strategies generally involve outlining course material and identifying where the text and class notes overlap and do not overlap, making charts, diagrams, or tables of the important concepts.

On cognitive strategies used, the students gave some examples on how their teacher’s instructional behaviours helped them in their understanding of material and affected the strategies they used for recall. The following examples explain how the teacher's instructional behaviours affected elaboration through making up images and creating analogies.
Said student PY,

“…she used the objects around her, like our pencil and stuff to demonstrate. Like the bicuspid valves and the valves in the heart, she used the door to demonstrate like how it works, so it makes learning the concept more memorable. And she does it in this classroom and we take our examinations in this classroom, so you will be recalling like what did Mrs T do to which object that day.”

Students QE and JA elaborated,

QE: Everything becomes more visual.

JA: Like when you are going to answer a question, you will remember her doing something strange then you oh, you remember, then you can remember you answers.

Student FA also shared on how the teacher's instructional behaviours encouraged her to note down the important terms and concepts, and helped in creating analogies, “There was this lesson when I tried to take down what are the interesting things she said, so I wrote down all the funny quotes that she said and all the actions that she did to make us remember, and when I looked back on that when reading my notes, oh, I got it.”

On conveying more autonomy and reducing pressure in the form of a de-emphasis on grading, students shared that their learning strategy employed shifted from one on tackling examinations to one on “understanding the materials better”. Often, without a score given by their teacher, the students had to self-regulate to check their understanding which further prompted them to employ more cognitive strategies such as elaboration and organisation. The following illustration illuminates the point.

JA: I personally prefer not to have (class) assignments graded.
Interviewer: So how do you know if you have improved or not?

JA: By my year-end exam results and my understanding over the materials.

JW: I think the fact that (class) assignments are not graded is better because we are like not too focused about scoring for our assignments so that it can pull our grade up but we are more likely to explore the qualities and do the questions by ourselves instead of copying from someone else just to get the grade. I will go google and check and see if I can put anything else in my assignments.

Interviewer: Cut and paste?

JW: No. I see then take down the information, then synthesise, then put down. See what is relevant.

Together, the responses suggest that the teacher’s instructional behaviours did indeed influence the students’ use of cognitive strategies and self-regulation.

4.3.2.4 Effects on students’ enjoyment and effort

Effect on enjoyment

On the effects of perceived teacher autonomy-support on enjoyment, the students shared that they enjoyed the lessons tremendously and looked forward to attending lessons. They remarked that because the lessons were captivating and they, very engaged in the learning process, they actually felt they learnt more.

Student W, who was in the teacher’s class for two years made her observation, “Last year was more dry compared to this year. This year was more fun. She really did have a lot of
movement and she really used a lot of stuff in the class and for me, because her lessons really captured my attention so I really paid attention and I learnt a lot.”

Student JW echoed the view, “I like it because the teacher is fun and interesting. She is very hands-on. She just makes me want to pay attention in class because she grabs my attention…”

Thus, from the responses above, perceived teacher autonomy-support does appear to facilitate enjoyment in learning.

**Effect on effort**

On the effects of perceived teacher autonomy-support on effort, student KY commented that the taking away of grading of class assignments encouraged more effort at trying instead of copying answers to get a good score, “…because we all know that it is not graded and sometimes if I do not know the questions, I will go and google it so I learn more”.

Student A also shared the same view on non-grading of class assignment, “..it kind of encourage us to try, whatever we have learnt, we just put it down rather than copying”.

When the teacher conveyed to the students that they could read up on some websites that she suggested while at the same time using facebook, the students actually felt less pressure and more willing to put in effort to read up more on biology. Student FA commented, “…when she tells us when you go and find out more about this information right, you can still do what you are enjoying like you can go online so it will make us feel more like doing it (reading up)” Thus, from the responses above, perceived autonomy-support does have the possible effect of reducing pressure and encouraging effort.

Interestingly, in general, students reported expending less effort in their school work as indicated by the significantly lower mean score obtained at post-test ($M = 5.07$) than at
pre-test ($M = 5.27$). The perceived reduction in effort could in part, be attributed to the structure of graded assignments.

During the intervention programme, daily classroom assignments were not graded. Graded work included only the science practicals and a project-based Student-Initiated Assignment which spanned over a period of six months. In comparison with previous years, students did not see and feel themselves completing piles of worksheets and tedious drills and practices. The following exchange could perhaps help us understand why some of the students felt that they had not put in a lot of effort and energy in their work.

SR: Our graded assignments this year for bio is pretty much just our SIA.

J: Practicals.

SR: For practicals, we have to finish in the lab itself so there really isn’t a choice and our bio SIA stretches over 6 months...

...sometimes I feel that I don’t really get to do enough actual work...

Interviewer: What is your idea of actual work?

JR: The idea of doing assignments and things because our bio syllabus itself doesn’t have a lot of assignments and last year her notes were like sets of worksheets so we were supposed to go home and find out ourselves...

J: ...and I only read when she gave us the worksheets and I have to complete the worksheets...

Student JR's reiteration that, "I hope she gives more forced work as in written work" suggested that the students were likely to view compulsory written assignments presented in stacks as effortful work. Interestingly, the project-based Student-Initiated Assignment which educators are likely to view as requiring much research, planning, synthesis of ideas and
executing was to the students, not as demanding and requiring as much effort as everyday drills and practices.

In addition, for some students, because the daily assignments were not graded, they did not feel the need to be constantly on their toes making sure that their daily assignments were completed.

J: This year because our worksheets are not graded so we don’t really like take it seriously.

Interviewer: What do you mean by don’t take it seriously?

W: That means…because it is not graded so it won’t affect our results so we do not care as much if we do well or not or if we actually complete it.

As the students did not feel as conscientious as before in ensuring that every piece of work and every question completed, reflectively, they reported putting in less effort and energy in their school work.

The quantitative and qualitative information are like different pieces of a puzzle. Having collected the different pieces of the puzzle, we are now ready to fit the pieces together to form a coherent picture.

We will now discuss the quantitative and qualitative findings in relation to the Self-Determination Theory, within the framework of the Ecological-Systems Perspective.
CHAPTER FIVE

DISCUSSION

This chapter is organised as follows:

5.1 The Ecological-Systems Perspective

5.2 The Person

5.3 The Environment

5.4 Implications

5.5 Limitations and Recommendations

5.6 Conclusion - A Final Note

Liken to a photographer playing with her focal lens, the researcher will examine and discuss the study and findings from several lens perspectives. In section 5.1, we will begin with a panoramic approach to the discussion. We will recall the researcher’s motivations for embarking on this research study and discuss the motivations within the framework of the Ecological-Systems Perspective with an overview of the person-in-environment. In section 5.2, we will zoom into research findings pertaining to “the person”. We will discuss the motivational profiles of the current sample of students from Singapore, from a multi-dimensional construct perspective based on the Self-Determination Theory. In section 5.3, we will turn our lens to “the environment”. We will focus our attention on the microsystem and the interface between the microsystem and the person. In particular, we will discuss the practical application of autonomy-supportive instructional behaviours in Singapore classrooms and the effects these instructional behaviours had on students’ motivation and
learning outcomes. We will also discuss how factors in the other environmental systems can influence students’ motivation in learning. In section 5.4, we will discuss the implications of the study. In section 5.5, we will discuss the limitations of the study and recommendations for future researches before concluding our discussion in section 5.6.

5.1 The Ecological-Systems Perspective

Ecological-systems analysts often begin their analyses with a question - Who has what problem and why now (McMahon, 1996)? In this study, this systemic question has been examined at two levels: (i) Student, and (ii) Teacher.

It will be recalled that our main subjects of interest in this study are the students. For the teacher, our interest relates to how the teacher could help the students with their problems. Let us now recap what problems the students and teachers have and why now, using the framework of the Ecological-Systems Perspective.

At the chronosystem level of analysis, students today face challenges in a rapidly-evolving landscape of knowledge-based economy. In the knowledge-based economy, ideas and innovations are the key sources of opportunities (Teo, 1999). Unlike their grandparents who faced the industrial economy and made their marks through labour and technical know-how, students today face the challenge to be creative and innovative. This means that in order to thrive, they need to go beyond mere hardwork; they need to constantly ask themselves searching questions and think out-of-the-box. Hence, for the teachers, they face challenges in preparing the students for the knowledge-based economy.

At the macrosystem level of analysis, in order to thrive in this fast-changing landscape of knowledge-based economy, students need to have more flexible mindsets towards learning. They need to recognise that rote-learning of content knowledge and regurgitation of
information memorised are no longer sufficient. They need to be able to learn independently, to synthesise knowledge, to be creative and innovative and to have an entrepreneurial spirit when learning. To do that, they need to first change their mindsets towards learning. They need to adopt good learning attitudes and skills so that “they can think for themselves, be creative and find their own solutions to manage whatever new challenges that come their way in the future” (Goh, 1997). Hence, for the teachers, they face the challenges of helping students adopt good learning attitudes and skills.

At the exosystem level of analysis, in an attempt to help the students develop good learning attitudes and skills necessary to thrive in the knowledge-based economy, policy makers had put in place *Thinking School Learning Nation* and *Teach Less Learn More*, policies aimed at changing students’ mindset towards learning and teachers’ mindset towards teaching. With the implementation of the education policies, students will now have to prepare themselves for classroom experiences different from their previous experiences of learning which were largely learning within the syllabus and rote-learning of materials. For the teachers, they will have to break away from frontal teaching and adopt teaching strategies useful for promoting independent learning, creativity and innovation.

At the mesosystem level of analysis, there needs to be communication and understanding between the microsystems such as the school and family on the objectives of *Thinking School Learning Nation* and *Teach Less Learn More*. Students and teachers may need to help parents understand that what the students experience in classrooms today may be different from what the parents experienced in their classrooms in yesteryears. Parents may have to prepare themselves that their children will have more independent learning and will be challenged to be more creative and innovative.

And hence, at the microsystem level of analysis, classroom teachers need to adopt effective instructional behaviours to prepare students for learning experiences in which they
have to challenge themselves to question, to think, to synthesis, to create and to innovate with an entrepreneurial spirit. To get students to partake in more independent and challenging learning which often requires huge amount of discipline and perseverance, teachers must first assess the inner motivational resources of the students. They also need to know how to tap into these inner motivational resources to fuel their students in learning. To do that, teachers need to first understand what the students are motivated by when learning.

At the personal level of analysis, students have psychological needs. In accordance with the Self-Determination Theory, when these psychological needs are satisfied, the students will experience more autonomous motivation and will be able to function at their optimal capacity (Ryan & Deci, 2000a). To be effective, we need to understand from the frame of reference of the students, how their learning experiences had been? What motivated them when learning? In so doing, perhaps then we could be enlightened on what educators can do to help the students enjoy learning and to unleash the potential within them.

In summary, who has what problem and why now? The researcher’s responses to this systemic question and hence, her own motivation for embarking in this study is as follows:

(i) Students in Singapore may have motivational issues with learning. This is a problem because in order to thrive in the knowledge-based economy, they need to always ask searching questions and continuously learn on their own. To be able to continuously learn on their own way after they have left school, the students need to have a love for learning and that love has to come from within them.

(ii) Teachers need to adopt effective instructional behaviours that are useful in nurturing intrinsic motivation and in promoting the love for learning in the students. This is so that the students would be lifelong learners so that they could thrive in the knowledge-based economy.
In the next section, we will turn our focal lens on “the person”. We will discuss the research findings pertaining to the research questions:

1(i) What are the motivational profiles of students in Singapore?

1(ii) Are there clusters of students with significantly different motivational profiles?

1(iii) Are there significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

5.2 The Person

5.2.1 Motivational Profiles of the Current Sample of Students from Singapore

What are the motivational profiles of students in Singapore? Before the researcher discusses the results, it must be highlighted that regrettably, due to the limitation of convenient sampling, the term "students in Singapore" in this study refers to a sample of students from Singapore, framed within the context of an independent girls' school for high-ability students. Being cognizant of the characteristics of the research sample, it is apparent that the findings cannot be generalised to the whole student population in Singapore. The limitations presented by the research sample will be discussed further in section 5.5.

In this section, the researcher will address the findings with reference to descriptive statistics obtained for the individual motivational regulations and Relative Autonomy Index (RAI), cluster profiles obtained from cluster analysis and the association between the cluster profiles and psychological learning attributes.
5.2.1.1 Motivational profiles of current sample of students from Singapore – From descriptive statistics

Findings from descriptive statistics suggest that in general, the students from this sample were motivated relative to being amotivated when learning. As a whole, while the students could identify with the societal values in learning and see learning as personally important, they also experienced relatively more controlled than intrinsic motivational regulation when learning.

To be specific, as evidenced from descriptive statistics obtained from the sample at baseline, students scored in descending order, highest in identified regulation, followed by external regulation, closely followed by introjected regulation, next by intrinsic regulation and they scored lowest in amotivation. Also, the Relative Autonomy Index (RAI) recorded a marginal positive value suggesting that the students were slightly more autonomous than controlled in their motivational regulations. The marginal positive value in Relative Autonomy Index (RAI) could be a function of the relatively higher score obtained for the measure on identified regulation.

As explained by Ryan and Deci (2000a), students who are externally regulated participate in learning behaviours in compliance or in response to external rewards and punishments. Students who are externally regulated have an external locus of causality and externally regulated behaviours usually do not sustain once contingencies are withdrawn. For students who are introjectedly regulated, they participate in learning behaviours to avoid guilt, anxiety or for ego enhancement. They are somewhat internally driven but have an external locus of causality. Students who experience identified regulation consciously accept the value of a behavioural goal and the learning behaviours as personally important. They have somewhat internal locus of causality and their behaviours are associated with higher
commitment. For students who are intrinsically motivated, the learning behaviours are self-determined and are performed from an internal locus of causality. For students who are amotivated, they are likely not to value the learning activity, not feel competent to complete the learning activity or not expecting their efforts to reap desired outcomes (Ryan & Deci, 2000a).

Given the relatively higher score for identified regulation compared to scores obtained for controlled motivational regulations (external regulation and introjected regulation), to the lower score obtained for intrinsic regulation and lowest score obtained for amotivation, together with the marginally positive value obtained for Relative Autonomy Index (RAI), when taken together, suggest that while the students were not spontaneously attracted to their learning activities, they were able to learn in a relatively autonomous manner. It was likely that they could see the personal relevance of the learning activities and could identify with the personal importance of the learning activity as the learning served a personally endorsed goal.

The findings from this study are similar to the findings from Lim (2010) who examined the motivational regulations of Singapore students using a junior college sample. In Lim (2010), the students were more extrinsically motivated (external regulation, introjected regulation and identified regulation) than intrinsically motivated when learning. Also, in terms of the motivational regulations, the students were the least amotivated. In contrast to the current study, the junior college sample in Lim (2010) experienced higher external regulation than identified regulation while the sample in this study reported higher identified regulation than external regulation. The higher external regulation in the junior college sample could be a function of the students' impending 'A' level examinations, a high-stakes national examination that students in the Integrated Programme have to take at the end of their six years of high school education. In the current study, the students were secondary
three students who were not experiencing the pressure of an impending high-stakes national examination and hence, although not spontaneously attracted to their learning activities, were still able to learn in a relatively autonomously manner.

5.2.1.2 Motivational profiles of the current sample of students from Singapore – From cluster analysis

Cluster analysis provides a more in-depth understanding of the motivational profiles of the students. From cluster analysis, the multi-dimensionality of the motivation construct and the magnitude of each motivational regulation were shown. The findings confirm the Self-Determination thesis that students can have multiple motivational regulations, to varying degree, in their learning experiences.

Cluster analysis using external regulation, introjected regulation, identified regulation, intrinsic regulation and amotivation as clustering variables revealed three distinct clusters of students, labelled “Unmotivated” cluster, “Moderate-autonomous” cluster, and “Highly-motivated” cluster. The “Unmotivated” cluster had a cluster membership of 36 students. The students were characterised by high amotivation, moderate external regulation, moderate introjected regulation, low identified regulation and low intrinsic regulation. The “Moderate-autonomous” cluster had a cluster membership of 24 students. The students were characterised by low amotivation, low external regulation, low introjected regulation, moderate identified regulation and moderate intrinsic regulation. The “Highly-motivated” cluster had a cluster membership of 30 students. The students were characterised by moderate amotivation, moderate external regulation, high introjected regulation, high identified regulation and high intrinsic regulation.
Informatively, the "Highly-motivated" cluster differed significantly from the "moderate-autonomous" cluster in four of the clustering variables (external, introjected, identified and intrinsic regulations) except for amotivation. The "Highly-motivated" cluster also differed significantly from the "Unmotivated" cluster in four of the clustering variables (amotivation, introjected, identified and intrinsic regulations) except for external regulation. The "moderate-autonomous" cluster differed significantly from the "Unmotivated" cluster in three of the clustering variables (amotivation, external and intrinsic regulations) except for introjected and identified regulations.

The emergence of a "Highly-motivated" cluster with the combinatory characteristics of high introjected regulation and high autonomous regulations was not surprising. Vansteenkiste et al. (2009) and Ratelle et al. (2007) had found clusters characterised by both high controlled and high autonomous motivational regulations among their samples of high school and college students in Belgium and Canada, respectively. Both Vansteenkiste et al. (2009) and Ratelle et al. (2007), associating the clusters characterised by both high controlled and high autonomous motivational regulations with learning outcomes, had suggested that a combination of both high controlled and autonomous motivational could be adaptive.

Interestingly, cluster analysis did not find a purely "Autonomous" cluster among this group of Singapore students. This is in line with Ratelle et al. (2007) who in their exploratory agglomerative hierarchical cluster analyses, also did not find a purely "Autonomous" cluster among their samples of high school students in Canada. However, Ratelle and her colleagues did find an "Autonomous" cluster among their sample of college students; in which levels of autonomous motivational regulations were high and levels of controlled motivational regulations were low.

Ratelle et al. (2007), in their discussion, suggested that students’ motivational profiles might be context-sensitive, that is, the types of clusters that emerged through cluster analysis
vary as a function of the social environment to which students are exposed. It was likely that
in Canada, high school entailed more extrinsic controls and rigid constraints which could
explain the absence of a purely "Autonomous" cluster and why most students developed, to
some extent, controlled forms of motivational regulation. Ratelle et al. (2007) elaborated that
these controlled forms of motivational regulation, although not always adaptive were
inevitably developed to allow students to meet environmental demands. Ratelle and her
colleagues suggested that the high school environment in Canada could be improved to make
it more sensitive to students’ needs.

The absence of an "autonomous" cluster was however, not consistent across countries.
Vansteenkiste et al. (2009) did find "autonomous" clusters among their high school and
college students in Belgium. In the domain of sports, Ullrich-French and Cox (2009) found a
"self-determined" cluster among their sample of high school students in mid-western
America and Boiche´ et al. (2008) found a "self-determined" cluster among their sample of
high school students in France.

The fact that a purely "autonomous" cluster was not found among this sample of
students from Singapore but in students in other countries suggests that the secondary school
environment under study could have entailed "extrinsic controls and rigid constraints"
(Ratelle et al., 2007). In accordance with the propositions of the Self-Determination Theory,
it is therefore recommended for the teachers in this school to be more sensitive to the
psychological needs of the students.

Surprisingly, there emerged from the sample of this study, an "Unmotivated" cluster
with a characteristically high standardised score in amotivation, relative to the other two
clusters. The relatively high standardised score in amotivation was surprising as the student
sample in this study was considered "high-ability". Karsenti and Thibert (1995) had shown in
their study that amotivation correlated negatively with achievement. Also, the studies
reviewed (for example, Ratelle et al., 2007; Vansteenkiste et al., 2009; Ullrich-French & Cox, 2009; Boiche´ et al., 2008) had not revealed clusters distinctively high in amotivation. Thus, it is important to note that "high-ability" students can also be amotivated.

A scrutiny of the unstandardised mean score for amotivation in the three clusters revealed that in comparison to the other motivational regulations, the mean scores for amotivation were relatively low. Yet, there surfaced a cluster characterised by high amotivation relatively to the other two clusters. According to Ryan and Deci (2000b), for students who are amotivated, they are likely not to value the learning activity, not feel competent to complete the learning activity or not expecting their efforts to reap desired outcomes. For some students who are amotivated, they are likely to be just going through the motion of being in school or could even be experiencing learned helplessness in learning. Teachers, particularly, may like to pay more attention to the psychological needs of this group of students and find ways to help this group of students develop the interest and love for learning.

5.2.1.3 Motivational profiles of the current sample of students from Singapore – Clusters and psychological learning attributes

The researcher next contrasted and examined how the three motivational profiles related to the psychological learning variables of self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort.

The findings suggest that for the sample of students in this study, the most adaptive motivational profile is the "Highly-motivated" cluster with characteristically high introjected regulation, high identified regulation and high intrinsic regulation. The least adaptive motivational profile is the "Unmotivated" cluster with characteristically high amotivation. By
adaptive, the researcher meant that the motivational profile was associated with the most optimal psychological learning variables.

Specifically, students in the "Highly-motivated" cluster had significantly higher self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort than students in the "Unmotivated" cluster. Referring to Figure 4.1, it shall be recalled that the "Highly-motivated" group differed significantly from the "Unmotivated" group in four of the clustering variables (amotivation, introjected, identified and intrinsic regulations). Comparing the motivational regulations, it is not surprising that the combined effect of high controlled (introjected) and high autonomous (identified and intrinsic) regulations is more advantageous than high amotivation.

Lepper, Corpus, and Iyengar (2005) had suggested that "It may be quite adaptive for students to seek out activities that they find inherently pleasurable while simultaneously paying attention to the extrinsic consequences of those activities in any specific context. Seeking only immediate enjoyment with no attention to external contingencies and constraints may substantially reduce a student’s future outcomes and opportunities. Conversely, attending only to extrinsic constraints and incentives can substantially undermine intrinsic interest and the enjoyment that can come from learning itself." Hence, it may be adaptive to have both high controlled and autonomous motivational regulations.

Also, students in the "Moderate-autonomous" cluster had significantly higher self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort than students in the "Unmotivated" cluster. Referring to Figure 4.1, it shall be recalled that the "moderate-autonomous" group differed significantly from the "Unmotivated" group in three of the clustering variables (amotivation, external and intrinsic regulations). Comparing the motivational regulations, it is again not unexpected that the moderate intrinsic regulation
is more advantageous than the combined effect of high amotivation and moderate external regulation.

On autonomous motivational regulations such as intrinsic regulation, Vansteenkiste et al. (2009) found that being autonomously motivated for one’s studies was associated with various learning benefits compared with being unmotivated. Specifically in their study, the "high quality" (high autonomous, low controlled) group had better cognitive processing, better meta-cognition regulation, better meta-cognitive strategy use, better time and environment use, better effort regulation, less test anxiety than the "low quantity" (low autonomous, low controlled), therefore unmotivated group.

Lastly, students in the "Highly-motivated" cluster differed significantly from the "Moderate-autonomous" cluster in only one psychological learning variable - intrinsic task value. Referring to Figure 4.1, it shall be recalled that the "Highly-motivated" cluster differed significantly from the "moderate-autonomous" cluster in four of the clustering variables (external, introjected, identified and intrinsic regulations). In fact, the "Highly-motivated" cluster registered significantly higher means in the four clustering variables than the "Moderate-autonomous" cluster, yet the two clusters differed only in one psychological learning variable. This suggests to the researcher that having moderate autonomous motivational regulations can also be adaptive. It is perhaps the quality of the motivational regulations that matters, less so the magnitude of the motivational regulations. Vansteenkiste et al. (2009) had suggested that the quality of the motivational regulations might be more adaptive than the magnitude of the motivational regulations in promoting and enhancing learning behaviours. According to Ryan and Deci (2000) and Vansteenkiste, Lens, and Deci (2006), the quality of the motivational regulations refers to the type of motivational regulations, with more autonomous motivational regulations being of better quality and more controlled motivational regulations being of poorer quality. The magnitude of the
motivational regulations refers to the quantity, amount or intensity of the motivational regulations (Ryan & Deci, 2000; Vansteenkiste et al., 2006).

In summary, motivation is a multi-dimensional construct and students can have multiple motivational regulations, to varying degree towards different learning experiences. For the students who participated in the research study, their motivations in learning were regulated by, in order of magnitude: Identified regulation, followed by external regulation and introjected regulation, and to a lesser degree intrinsic regulation and amotivation. Relative Autonomy Index (RAI) recorded a slight positive value indicating that as a whole, the students' motivational regulation was tilted slightly towards the autonomous end.

Cluster analysis provides further support for the multi-dimensionality of the construct. From the findings, the researcher found that the motivational profiles of the students were not entirely homogenous. Three clusters of students emerged, labelled "Unmotivated", "Moderate-autonomous" and "Highly-motivated" with each cluster having unique characteristics. Among the three clusters, the "Highly-motivated" cluster was found to be most adaptive. The "Unmotivated" cluster was found to be least adaptive. Interestingly, the "Highly-motivated" cluster differed from the "Moderate-autonomous" cluster in only one psychological learning outcome - intrinsic task value, despite the two clusters being significantly different in external, introjected, identified and intrinsic regulations. This suggests to the researcher that it is the quality of the motivational regulations and less so the magnitude of the motivational regulations that is associated with psychological learning outcomes. It seems to the researcher that having a moderate amount of autonomous motivational regulations can also be adaptive.

What the statistics (descriptive and cluster analysis) show is to which end of the motivation continuum (amotivation, external regulation, introjected regulation, identified
regulation, intrinsic regulation) the students’ motivational regulation is inclined towards, the motivational profiles of the students and how the students’ motivational profiles relate to their psychological learning outcomes.

Although the researcher had learnt from the Self-Determination Theory that to be externally regulated means that the students partake in learning activities out of compliance and in response to external rewards and punishment; to be introjectedly regulated means that the students study to avoid guilt, anxiety and for ego enhancement; to experience identified regulation means that the students partake in the learning activities because they have accepted the value of learning; to be intrinsically motivated means that the students study for the inherent satisfaction, that they enjoy and love learning (Ryan & Deci, 2000a), it would be informative to hear from the students how their learning experiences had been. Do they endorse the value of what they had learnt? Have their learning experiences been mostly about compliance, achieving rewards and avoiding punishment, to avoid guilt, anxiety and for ego enhancement? How much do the students enjoy what they are learning?

5.2.1.4 Motivational profiles of the current sample of students from Singapore – From the perspective of the students

Focused-group discussions provided a glimpse into the psyche of this sample of students from Singapore and helped the researcher to understand how their learning experiences had been, directly from the students’ frame of reference, in the context of the Singapore society.

Salient codes and themes derived from the transcripts revealed the reasons behind students' reported motivational regulations.
From the qualitative data gathered, pertaining to external regulation, motivational force appeared to gravitate towards examinations and their peripherals such as grades and future career options. From the perspective of the students, national examinations were extremely high-stakes. According to the students, the results from national examinations determined their entries into universities, the courses they could take, thereafter their career options, the material benefits that accorded the jobs and also their social status in the society. In short, in the students’ psychology, good grades equate higher paying jobs which equate higher material gains and higher social status. To this end, whatever that could help them increase their stakes in the national examinations would be taken very seriously and that included grades in class assignments, class tests and school examinations to the extent of copying from the assignments of their seniors and including safe model answers so that quoting from student SR, “we all do well together”. For these students, they had been socialised to believe that good performance in examinations is the passport to good life.

Focused-group discussions also surfaced "compliant mindset" and "convenient attitude" from the students. The sharing from students FI and C highlighted the "compliant mindset". Student FI shared, "...for a lot of us in this system...we just learn to accept whatever is in the syllabus. We don't really question...from primary 1 to now, we don't really have the kind of mindset, like to question constantly, about what we are doing". Student C echoed, "We never ask. We take it that it is part of the syllabus and we need to take exams.” Consequently, for many of the students, they just did what they were told, not understanding the purpose for doing what they did and the rationale for the tasks they had to complete. Despite yearning for some meaning to what they were doing, they did not clarify the rationale with the higher authorities; in the context of the classroom, their teachers. It appears that the students have been socialised and conditioned to accept and follow instruction. Obedience, while ensuring orderliness, runs contrary to the spirit of Thinking School Learning Nation.
where students are encouraged to “...constantly challenging assumptions and seeking better ways of doing things.." (Ministry of Education, 2011a) and *Teach Less Learn More*, the tenet of which is "...to encourage curiosity and critical thinking and to ask searching question..." (Ministry of Education, 2011b).

The focused-group discussions also showed up "convenient attitude". In their attempts to improve their grades in the examination, the students wittingly navigated themselves towards projects that were "easiest to score, least tedious, fastest to complete". While sensible and pragmatic, their preference reflects a lack of spirit in adventure and risk-taking. This may be an area of concern because in order to thrive, not merely to survive in this ever-changing landscape, students could benefit better with an entrepreneurial spirit.

Recalling the tenet of *Teach Less Learn More* as cited in chapter one of this study, "We teach values, attitudes and mindsets that will be the guiding principles for the learners in their journey through life, not only how to score good grades in examinations" and "teachers could focus more on the process of learning, to build confidence and capacity in the learners, to encourage curiosity and critical thinking and to ask searching questions, less on following prescribed answers and replicating products" (Ministry of Education, 2011b), perhaps the way forward would be getting the students to manage uncertainty, to seek purpose and to develop a spirit of adventure and risk-taking. For teachers, the challenges would be to focus on the process of learning and on the design of tasks that would bring forth such mindset and attitude.

Apparently, the introjected reasons for learning also centred on examinations. Performing well in examinations allowed the students to meet the expectations and therefore gain the social approval of their significant others such as parents, relatives, friends and teachers. In so doing, their egos could be enhanced. As student KY put it, "...we can't lose. So even if it is just examinations within the school, we can't allow ourselves to do badly...people
around us will expect us to do well...when others expect you to do well, you need to have high expectations of yourself”. Performing mediocrity in examinations was therefore a situation they should avoid if the students could help it as it would disappoint themselves and their significant others. The possibility of performing worse than social expectations or even being retained and not allowed to be promoted to the next level of education was such a frightening thought that they would expend their efforts towards avoiding getting themselves into such anxiety-ridden and failure conditions. As student JA shared, "The possibility of retaining is very frightening so we will study very hard." For some students, saving their grades would be their main preoccupation. For some of these students, to a greater degree, fear drove them to learn.

According to the Self-Determination Theory (Deci & Ryan, 2000), when students have introjected reasons for learning, they have swallowed the reasons for performing the activity, but not yet fully accepted the reasons for studying on their own. Their learning behaviours come with feelings of inner compulsion and conflicts. Deci and Ryan (2000) suggested that this may be because the students' basic psychological needs for autonomy, competence and relatedness are not met. As a remedy to help students lessen the inner pressure and conflicts, teachers could be more sensitive to the psychological needs of the students.

Although rather regulated by external and introjected reasons when learning, many of the students in this study could personally endorse the importance of education, and could personally identify with the importance of doing well in school. Evident from qualitative findings, many of these students could see the importance of learning. As an example, the students shared that it was good to learn about things around them to gain knowledge so that they would have knowledge at their finger tips. The students also understood the importance of education for their future. It is encouraging to know that while these students were not...
spontaneously attracted to their learning, they could still study in a relatively autonomous manner which according to the Self-Determination Theory (Deci & Ryan, 2000) is adaptive for learning outcomes and personal well-being.

It is heartening to know the students' intrinsic reasons for learning. On intrinsic regulation, some of the students shared that they learnt because they were "interested" in their learning, wanted to gain knowledge for "self-satisfaction" and that learning was "fun and enjoyable". In accordance with the Self-Determination Theory (Deci & Ryan, 2000), such intrinsic regulation is adaptive and foretells self-maintaining, self-sustaining and lifelong learning.

Focused-group discussions have provided us with the reasons on what students are motivated by when learning, directly from the students’ frame of reference. From the perspective of the teacher, what are the students generally motivated by?

5.2.1.5 Motivational profiles of the current sample of students from Singapore – From the perspective of the teacher

Information provided by the teacher triangulate to a certain extent, but not fully, with the information obtained from descriptive statistics, cluster analysis and focused-group discussions with the students.

According to the teacher, the students were “highly-driven” when learning. She described the students as being “very autonomous” and believed that the majority of the students went beyond mere grades when learning. She cited examples of students approaching her for assistance with their assignments or asking her when they could submit their completed work, way before the deadlines for submission. On the basis of these
observable facets of the behaviours, the teacher assessed high level of autonomous motivation in her group of students.

The teacher further made a distinction between the higher ability students and the average students. According to her assessment, the higher ability students were less concerned about grades but the weaker students were more concerned about grades because they had difficulties understanding concepts. Elaborating her point with a task she assigned during the intervention, the teacher explained that most of the higher ability students opted for the more challenging tasks with the monochotomous leaf and the leaf from a “strange” habitat while most of the weaker students opted for the less challenging task with the dichotomous leaf.

As discussed in the paragraph above, the teacher described the students as “highly-driven”. To this point, her description triangulates with the findings from descriptive statistics, cluster analysis and focused-group discussions which established that as a whole, the students were motivated relative to being amotivated when learning.

However, while the teacher was able to observe the outward behaviours of the students, she was unable to read the inner experiences of the students and decipher what went on intra-psychically when the students partook in learning activities.

As an example, the teacher felt that the students were “autonomous” in learning. To a certain extent, her assessment lay in line with descriptive statistics which established a higher score for identified regulation, relative to the other motivational regulations; and also a slight positive value for Relative Autonomy Index (RAI). However, descriptive statistics, cluster analysis and qualitative data obtained from the students’ frame of reference revealed more diverse reasons for students’ motivational regulations. As evident from descriptive statistics and qualitative findings from the focused-group discussions, the students were rather
controlled in their motivational regulations. They were externally regulated with grades, future career options and compliance constantly on their minds and also introjectedly regulated with failure and anxiety avoidance, and ego enhancement as their goals. With reference to the teacher's assessment that her students were "autonomous" learners because they approached her for assistance with their assignments or asked her when they could submit their completed work, way before the deadlines, the researcher cannot discount the possibility that the students had done so because of their concerns over their grades and meeting expectations in the examinations.

Regrettably, there was insufficient quantitative information to verify the point that "higher ability students were less concerned about grades but the weaker students were more concerned about grades because they had difficulties understanding concepts". From the focused-group discussions, the researcher was of the impression that the students were in general, very much exam-focused and mark-conscious, whether it was for failure and anxiety avoidance or ego enhancement, though some of the students could also cite identified and intrinsic reasons for their learning.

It is possible that the "weaker students" who were "more concerned about grades because they had difficulties understanding concepts" were from the "Unmotivated" group characterised by high amotivation and moderate external regulation. From the Self-Determination Theory (Deci & Ryan, 2000), the researcher understands that students who are amotivated are likely not to value the learning activity, not feel competent to complete the learning activity or not expecting their efforts to reap desired outcomes. This "Unmotivated" group of students are particularly of concern because firstly, they formed slightly more than 30% of the student sample population in this study and secondly, the "Unmotivated" profile was least adaptive in terms of the psychological learning outcomes. When following the propositions as expounded by the Self-Determination Theory and if teachers understand that
intra-psychically, the students did not value the learning activity, not feel competent to complete the learning activity or not expecting their efforts to reap desired outcomes, then, teachers could help by paying more attention to the psychological needs of autonomy, competence and relatedness of this group of students, in particular, in the area of competence.

The difference in perspectives presents a very important learning point for the researcher. Informatively, what educators observe from the outward behaviours of the students may just be the tip of the iceberg. What educators observe from the surface may well be, the surface. Herein lays the value of an exploratory research on understanding the motivational profiles of a sample of students from Singapore. Without objective statistics and qualitative data with its nuance from the students’ frame of reference, the researcher would not be able to have a full understanding of what goes on inside the minds of the students and understand how their inner learning experiences had been.

Although the qualitative data obtained from the interview with the teacher does not triangulate fully with the other sets of data, the data from the interview presents the perspective of the teacher and complements the findings from the quantitative method and the qualitative focused-group discussion. It surfaces a possible gap between the person and the social environment and verifies the value of these exploratory research questions on understanding the motivational profiles of students in Singapore.

5.2.1.6 Motivational profiles of the current sample of students from Singapore – The picture that has emerged

What are the motivational profiles of this sample of students from Singapore? Using a combination of the quantitative (descriptive statistics and cluster analysis) and qualitative
(focused-group discussions with students and interview with teacher) methods, this study has established the following findings:

- As a collective group, the students were motivated relative to being amotivated when learning.
- As a whole, they experienced a higher degree of identified regulation, followed by controlled motivational regulations (external regulation and introjected regulation) and to a lesser degree, intrinsic regulation with their learning experiences.
- When the students' motivational regulations were examined using the Relative Autonomy Index (RAI), descriptive statistics showed that the students' motivational regulation (RAI) was slightly tilted towards more autonomous motivational regulation.
- Informatively, the students who participated in this study were not homogeneous and differed in the types and degrees to which their motivations were regulated. When the motivational regulations were analysed using cluster analysis, three clusters of students with distinctive motivational profiles emerged. One cluster was labelled "Unmotivated" as it was characterised by high amotivation and moderate external regulation. The second cluster was labelled "Moderate-autonomous" as it was characterised by moderate autonomous motivational regulations. The third cluster was labelled "Highly-motivated" as it was characterised by high controlled (introjected) and high autonomous (identified and intrinsic) motivational regulations.
- Importantly, the "Highly-motivated" cluster was found to be most adaptive. The "Unmotivated" cluster was found to be least adaptive. Interestingly, the "Moderate-autonomous" cluster did not differ much from the "Highly-motivated" cluster in terms of psychological learning outcomes. It seems that it is the quality of the motivation, that is, more autonomous motivational regulations that matter, not so much the magnitude of the motivational regulations.
• The students, although not spontaneously attracted to their learning, could still study in a relatively autonomous manner. This is because the students were able to personally endorsed and internalise the importance of learning. Evident from the students' sharing, they wanted to learn about things around them to gain knowledge so that they would have knowledge at their fingertips when they needed to use the knowledge.

In comparison, Lim's (2010) study on students from an elite junior college in Singapore found the students to be more externally regulated than autonomously (identified and intrinsic) regulated and least amotivated in their learning of Mathematics.

Liu et al.'s (2009) findings on the motivational profiles of secondary school students in Singapore were more similar to the findings of the current study. In Liu et al. (2009), the secondary school students also reported highest score in identified regulation. However, the students were more intrinsically regulated than externally and introjectedly regulated. They were least amotivated. Liu et al. (2009) further found that a large majority of the students clustered in the "high self-determined / high controlled" group characterised by high autonomous and high controlled motivational regulations. Interestingly, there was a "high self-determined / low controlled" cluster in the sample, characterised by extremely high intrinsic and identified motivational regulations and extremely low external regulation and amotivation. Compared with the combined (high self-determined and high controlled) cluster, the autonomous (high self-determined and low controlled) cluster was more adaptive.

The fact that these three local student samples (current study; Lim, 2010; Liu et al., 2009) revealed different motivational profiles suggest that motivational profiles could be context-sensitive (Ratelle et al., 2007). Ratelle and her colleagues suggested that if
motivational profiles are context-sensitive, the environment could be modified and improved to make it more sensitive to students’ needs.

Elsewhere in the world, studies (for example, Shih, 2008; Pisarik, 2009; Anderman & Midgley, 1997) have shown students to experience more controlled than autonomous motivational regulations in academic learning.

Shih's (2008) study on Taiwanese eighth graders found the students to score lowest in intrinsic motivation. Instead of intrinsic interest, Taiwanese students appeared to be motivated to engage in schoolwork by internalising the values of school-related behaviours and hence, identically regulated when learning. The researcher explained that due to the very selective and competitive Taiwanese educational system, junior high school students had to compete with their peers to gain admission to good schools. Such practices might have led the students to focus more on competition rather than enjoyment inherent in the learning activities. Nevertheless, the students were able to identify with the value of their learning.

Pisarik's (2009) study on American college students found the students to experience high levels of external and identified regulations, moderate level of introjected regulation, moderately low level of intrinsic motivation and very low level of amotivation. The study also found that to a large degree, the students’ motivation for attending college was vocationally related (external rewards such as money or prestige or to avoid low paying and low prestige jobs). Also found was that the high levels of burnout experienced by students were related to high levels of external regulation and relatively low levels of intrinsic regulation.

Anderman and Midgley's (1997) study on American fifth and sixth graders showed that as students progressed through school, their extrinsic motivation increased and intrinsic motivation decreased. The researchers explained the shift to students’ perceptions of a more extrinsically-oriented class structure later in their schooling years.
The findings from this study and the local studies reviewed (Lim, 2010; Liu et al., 2009) did give us a clearer understanding on the motivational profiles of students in Singapore. We now have a better perspective on how their learning experiences had been. Curiously so, from the students’ frame of reference, what facilitated their more controlled motivational regulations and behaviours?

5.2.2 The Environment Makes the Person

Focused-group discussions provided some insights into what facilitated the students’ more controlled motivational regulations and thus, their behaviours. To be explicit, the environmental systems that are facilitating the students’ more controlled motivational regulations and behaviours are:

5.2.2.1 The Microsystem – School and Family

5.2.2.2 The Exosystem – Educational Policies and the Examination System

5.2.2.3 The Macrosystem – Societal Beliefs, Values and Attitudes

In section 5.2.2.1, the researcher will discuss school and family practices that facilitated the students' more controlled motivational regulations and behaviours. In section 5.2.2.2, the researcher will elaborate on issues relating to the educational policies and the examination system and in section 5.2.2.3, the societal beliefs, values and attitudes that facilitated the behaviours.
5.2.2.1 The Microsystem – School and Family

Qualitative focused-group discussions surfaced systemic structure that facilitated the controlled motivational regulations.

At the microsystem level of analysis, "expectation of significant others" and "classroom practices" surfaced as reasons that are facilitating the more controlled motivational regulations.

*Expectation of significant others*

Student KY shared, "...people around us will expect us to do well...when others expect you to do well, you need to have high expectations of yourself..." She further elaborated that it was the parental expectations that especially had significant bearings on her motivation to learn.

Indeed, Asian parents, in particular the Chinese, are reputed to have high educational expectations for their children (Hao & Bonstead-Bruns, 1998; Okagaki & Frensch, 1998; Li, 2001). For comparison, Hao and Bonstead-Bruns (1998) examined the educational expectations of Chinese, Filipino, Korean, Mexican, Black and White parents and discovered that immigrant Chinese and Korean parents had higher educational expectations than did parents of the other groups. The Chinese parents, in particular, had the highest expectations for achievement and the effort required to succeed in education.

Okagaki and Frensch (1998) provided further support to the claim. Okagaki and Frensch (1998) examined the relations between parenting and the school performance of fourth and fifth grade students in 75 Asian-American, 109 Latino and 91 European-American families and found that Asian-American parents had higher expectations for their children's educational attainment than the other two groups of parents. Asian-American parents ideally
wanted their children to obtain a graduate or professional degree and the minimum educational attainment they set for their children was college graduation. Asian-American parents also reported being less satisfied with grades of Bs and Cs than were the other groups of parents. Asian parents, in particular the Chinese, place a heavy emphasis on academic achievement.

To a great extent, high educational expectations among the Chinese parents can be said to be an expression of the historical values held by the Chinese society and has its roots in Confucian philosophies (Li, 2001). Li’s (2001) qualitative study on Chinese immigrants in Canada illuminated the deeply-ingrained Confucian value held by Chinese parents. According to Li (2001), Confucianism shaped the belief of the parents who regarded education as the most important thing in one's life and because of the influence of imperial examination system during the feudal society, they associated academic achievement with higher social status. Also, Confucianism preaches filial piety and Chinese children are taught to honour their families. If they do badly in their studies, they would lose face and bring dishonour to themselves and to their families.

While some Chinese parents see high educational expectation as a source of motivation for their children and undeniably, propel their children to academic excellence, from the Self-Determination Theory point of view, it presents a somewhat external locus of causality and the learning behaviours are not self-determined. To this end, the students experience somewhat controlled motivational regulation when striving to meet the expectations of their significant others.

Classroom practices

Classroom practices that foster more controlled motivational regulations are aplenty. Two points are more salient from the focused-group discussions: The emphasis on learning
what is in the syllabus for the purpose of tackling examinations, and grading of class assignments.

What teachers say and do in class convey the teachers' values and priorities and have a strong influence over what students do. As student FI shared, "[She has] The habit of teaching what is in the syllabus." Her classmate student QE continued, "And telling the students to look at the learning objectives so that they don't have to waste so much time studying things that would not be tested". Student JW echoed, "...she will be like 'This part is not tested, so it is ok if you do not know it". In another conversation, student PY pointed out that "If she tells us like 'this is tested' or 'that is not tested', the way we study will be based on the fact that this is tested in the examination..." As evident from the students' sharing, what teachers say in class has a bearing on students' motivational regulation and effort. The teachers' value on learning what will be tested, and priority on the examinations rub off the students and over time, become the students' inner voice. Also, many teachers do not have the practice of helping students make the links between what they have learnt to real life applications and thus, the concepts remain largely possible items that may appear in the examinations.

Constant grading of class assignments also has the effect of fostering more controlled motivational regulations. Constant grading puts pressure on the students to provide standard model answers in order to score. While marks allow teachers and students to gauge the extent of the students' learning, they also have the effect of encouraging regurgitation of memorised information and restricting exploration and growth. As student KY shared, "When they grade everything, they make it very stressful for us because we need to complete it and score well...I have friends like last year, they get the past year worksheet of their seniors so they just copy all the answers so they get A."
Many of our classroom practices have their roots in the high-stakes examinations. Boud (2010) argued that assessment has the most powerful influence on what teachers and students do. Assessment drives the school curriculum, classroom pedagogical and instructional approaches and frames what students do.

In the classrooms, teachers often commit a large amount of class time preparing the students for the examinations. This is because students have to be "trained" so that their scores go up. For example, scores can be made to increase by narrowing the curriculum. Even if the content is in the curriculum, teachers might drop the areas that are unlikely to appear in the test. In effect, teachers are often teaching to the test, spending a large amount of time drilling the students in contents that will be tested and training them in answering techniques that will help the students score in the test instead of explaining overarching concepts or promoting complex reasoning and problem-solving (Amrein & Berliner, 2003).

In addition, when the stakes are high, teachers often take greater control of the learning experiences of the students, giving prescribed notes, worksheets and model answers. Teachers no longer encourage the students to explore the concepts and subjects that interest them and hence, denying the students opportunities to direct their own learning (Amrein & Berliner, 2003). Apparently, attaching stakes to tests has the consequence of obstructing students' paths to becoming self-directed and lifelong learners (Sheldon & Biddle, 1998).

5.2.2.2 The Exosystem – Educational Polices and the Examination System

Content analysis of transcripts derived from focused-group discussions points to the educational policies and examination system that are facilitating the students controlled motivational regulations.
As student QE shared when asked if she was mostly motivated by marks and examinations, "That's how the system works!" To be in this system means that one has to play by the rules of this system and that involves going through high-stakes assessments such as the Primary School Leaving Examination (PSLE) and for this group of Integrated-Programme students interviewed, the next high-stakes assessment will be the 'A' Levels examinations.

To the students, the 'A' Levels examinations are particularly high-stakes because the results determine the courses they can take in the universities and thereafter their social status and material well-being in life. Leading to the high-stakes examinations are the school examinations. School examinations are also in the mind of the students interviewed, high-stakes because they determine the subject combinations the students are allowed to take at the Junior College level. Also, the students' performance in the school examinations determine whether they are allowed to be promoted to the next level of education or to be retained at the current level for the purpose of reinforcement of content knowledge. Informatively, from the students' sharing, class assessments are also rather high-stakes. Most of the class assessments are graded and contribute a percentage to the overall school examination scores. As student QE shared, "...everything would be very scary because if you get it wrong, you will lose mark and your overall is affected."

It appears to the researcher that these students from Singapore are constantly being assessed and are overwhelmed by the endless number of assessments. As what student KY shared, "...no matter what you do, you are still thinking of the examinations in the long run. You know that you have to face this exam at this period of time, your learning is still to prepare you for that...". It seems to the researcher that education in Singapore is about preparing and managing endless number of assessments and students are kept constantly on
their toes trying to attain certain scores for their assessments for which they attach their human worth.

Indeed, meritocracy dominates the Singapore education landscape (Prakash, 2013). The Singapore education system places great emphasis on academic performance and in grading students and granting their admissions to special programmes and universities. Academic grades are considered objective measures of the students' abilities and efforts, regardless of their social background. From the rigorous examination selections, the system aims to identify and groom bright young students for positions of leadership. In the Singapore society, having good academic credentials is seen as a very important factor for career prospects in the job market, and economic and social status. The competition to get into special education programmes is so stiff that many parents take to investing a large amount of their financial resources to help their children stay competitive. This practice among parents is so pervasive that some have called Singapore the "Tuition Nation" (Toh, 2008).

Proponents of high-stakes assessment argue for improved basic literacy and greater accountability (New York State Education Department, 2004). Advocates of high-stakes assessment assume that rewards and consequences attached to high-stakes tests will "motivate the unmotivated" to learn. Equally strong in argument is the negative impact high-stakes assessment has on students' motivation and learning. Opponents of high-stakes assessment have argued that when rewards and consequences are attached to performance in tests, students become less intrinsically motivated to learn.

Grolnick and Ryan (1987) examined the controlling use of a test in an elementary school setting. In the controlling condition, students were told to learn specific text passages because they would be tested and graded. In the informational condition, students were told that they would be tested, but the purpose of the test was only to identify what was learnt. It
was found that the controlling use of the test resulted in less depth of processing and less conceptual integration. Students in the noncontrolling, informational condition reported higher levels of conceptual learning and more interest and enjoyment for the material.

High-stakes assessment has also been found to affect emotions negatively. Wheelock, Bebell and Haney (2000) investigated the degree to which external tests motivated students to learn by examining the self-portraits of students in testing situations. Students described themselves as anxious, angry, bored, pessimistic and withdrawn from high-stakes tests.

To summarise this section, the examination system can be a double-edged sword. While it presents a strong driving force towards achievement and excellence, it can also be a strong binding force that restricts learning, exploration and growth.

At this juncture, perhaps we need to take a step back to reflect what education should be about. Is it about managing examinations after examinations? Would it be wiser to prepare our students for the test of life or for a life of tests?

5.2.2.3 The Macrosystem – Societal Beliefs, Values and Attitudes

At the macrosystem level of analysis, societal beliefs, values and attitudes facilitated the controlled motivational regulations. Specific to the Singapore society, Confucianism, kiasuism and compliance are some of the societal beliefs, values and attitudes that permeate the different levels of the ecological systems and influence the students' motivational regulations.

Confucianism and Kiasuism

As discussed earlier, in the Singapore society with a majority Chinese population, Confucianism shapes the belief of many people who regard education achievement as very
important and a passport to better life. Confucian principles also emphasise filial piety and children are taught family obligation and the need to honour the family (Li, 2001).

Deeply-rooted in the Singapore society is the concept of "face". There are two aspects to "face" - "lian" (face) and "mianzi" (image) (Hu, 1944). "Lian" is maintained by following societal norms. "Mianzi" is maintained through success in education or career. According to Hu (1944), the notion of face is also a concern of the family. Thus, a student must avoid poor performance as this results in not only a loss of individual face but also a loss of family face (Stevenson & Lee, 1996). The pressure to maintain "lian" by conforming to social expectations and to increase "mianzi" through better education or career accomplishment has created a highly competitive spirit. This competitive spirit has been given a label "kiasuism".

"Kiasu" means “afraid to lose” (Hwang, Ang, & Francesco, 2002). It reflects a desire to get ahead of others. It reveals itself through hard work by individuals to stay on top of the situation. The extensiveness of this attitude among students in Singapore is evidenced by the Advisory Council of Youths' (1989) report which concluded that "kiasu" attitude underlies Singapore students' approach toward education, work and other aspects of their lives.

This excerpt from the transcript though repeated best illuminates the points discussed above.

KY:   ...we are xxxxx (name of school) girls and xxxxx (name of school) girls…

PY:   We are all perfectionists in one way or another.

KY:   Ya, and we can’t lose. So even if it is just examinations within the school, we can’t allow ourselves to do badly.
I mean because we all came in with relative high PSLE score, and to be frank, people around us will expect us to do well based on the fact that you are a xxxxx (name of school) girl. Naturally, when others expect you to do well, you need to have high expectations of yourself.

Interviewer: Who are the ones who expect you to do well?

KY: Parents and possibly yourself because you have been doing well for the past period of time, you can’t allow yourself to suddenly become the worst out of the whole bunch…so you would want to continue to do well even when you know that now the academic standard has upped a level, things are tougher now but you would still want to do well.

"Kiasuism" also manifests itself in the form of convenient attitude or pragmatism among the students. Student JR shared, "...for anything that does not affect our overall score, we don't really take much notice of it" and hence the convenient or pragmatic approach to do things that are "easiest, least tedious and fastest to score".

Compliance

The compliant mindset is also pervasive through the ecological systems. Data gathered from focused-group discussions suggests that teachers and students alike, have been socialised to follow instructions and not to ask too many questions. Student FI's comment illustrates this mindset among the students, "...we just learn to accept whatever is in the syllabus. We don't really question, like why is it here because from primary 1 to now, we don't really have the kind of mindset, like to question constantly, about what we are doing." The teacher, Mrs T's comment also gives some insights into the compliant mindset among the adults, "... when we have staff meeting and sometimes, the rationale for certain things are not explained, then I will be wondering...we are supposed to explain the rationale to the kids
when the assignments are important and urgent and they have no choice but how come the adults are not using the same kind of language. As adults, when you want adults to do things, it is better to give a rationale rather than saying that's the way we have been doing it."

The compliant mindset could be to a large extent the result of power distance between the teacher and school management, and in the context of the classroom, the students and the teacher. Hofstede (1980) found that predominantly Chinese societies, particularly Taiwan, Hong Kong and Singapore, had large power distance scores. Frijida and Mesquita (1994) reported that in contrast to people in North America, Australia and many parts of Europe, Asian societies, especially those that are predominantly Chinese, gave high priority to respect for authority and respect for authority influenced learning behaviours of Asians. This high respect for authority may cause the student to consider raising questions before those in power to be inappropriate. This is because the act of questioning may imply a challenge to the knowledge and authority of the one in power. Also, there is an Asian saying that goes "The stake that sticks up gets hammered down". In contrast, such a notion would probably be less of an issue among students from many Western countries, where power distances are generally smaller (Hofstede, 1980).

Seen through the lens of the Ecological-Systems Perspective, with the concept of the person-in-environment in mind, we can see that many forces influence the motivational regulations of the students and facilitate the more controlled motivational regulations. The forces can be proximal in nature, such as those found within the home and classroom environment, or distal in nature, such as the societal beliefs, values and attitudes which impact the students indirectly, and they intertwine to influence the motivational regulations of the students when learning.
Keeping in mind the concept of person-in-environment, we will now discuss if there is a goodness-of-fit between the motivational regulations of the students and the environmental demands.

5.2.3 The Motivational Assessment

5.2.3.1 Person-In-Environment: The Goodness-Of-Fit

It shall be recalled that the Ecological-Systems Perspective (McMahon, 1996) is used in this study to understand the interplay between the Singapore educational policies, schools, teachers and students. To recapitulate, the Ecological-Systems Perspective integrates the ecological and systems theories. In the ecological theory, Bronfenbrenner (2000) explained the concept of the person-in-environment. He professed that a child is the product of the interaction between he or she and the social environments. In the systems theory, Von Bertalanffy (2001) directed us to view the person and environment as systems. According to Von Bertalanffy (2001), the systems are interconnected and interdependent and are always trying to adapt to one another to achieve a stage of dynamic equilibrium. Germain and Gitterman (1979) enhanced our understanding of the Ecological-Systems Perspective, "Ecology is the science concerned with the relations between living organisms - in this case, human beings and all the elements of their environments. It is concerned with how organisms and environments achieve a goodness-of-fit or adaptive balance and equally important, how and why they sometimes fail to do so."

In summary, the Ecological-Systems Perspective directs us to view (i) the person in environment, (ii) the interactions and transactions that take place among the various parts in the person and environment systems, and (iii) the interactions and transactions that take place at the boundary at which the person and environment interface (McMahon, 1996). According
to the Ecological-Systems Perspective, the interactions and interdependence between the person and environment are seen as crucial for the survival of both. Changes in one system may have positive or negative effects on the other. It is at the boundary where the person and environment meet that most stress or problems occur (McMahon, 1996).

5.2.3.1.1 The goodness-of-fit: Past, present and in the near future

Central to the Ecological-Systems Perspective is the concept of "goodness-of-fit" between the person and the environment. Of interest here is, is there a "goodness-of-fit" between the motivational characteristics of the students in this sample and the larger environment, more specifically, the chronosystem?

The past century saw the people negotiating the industrial economy. In the industrial economy, competitive advantage came from more resources, cheaper labour and better machines (Organisation for Economic Cooperation and Development, 1996). Students today and in the near future face the challenges of the knowledge-based economy. In the knowledge-based economy, people and their ideas are the key sources of wealth and opportunities (Organisation for Economic Cooperation and Development, 1996). The key ingredient to thriving in the knowledge-based economy lies in the people's ability to continuously learn, to explore and experiment, and be creative and innovative when solving problems.

With the shift in the requirements to stay competitive comes the need to equip the young people with new skills and competencies. Importantly, the new skills and competencies should allow them to contribute to economic development under a system where the main asset is knowledge (Ananiadou & Claro, 2009).
The Ministry of Education Singapore was quick to respond to this fast-changing economic landscape. It drew out a framework for developing the 21st Century Competencies (Ministry of Education, 2013). In this framework, it pushed for "self-directed learners who question, reflect, persevere and take responsibility for their own learning" and "are innovative, take calculated risks and strive for excellence" as some of its desired student outcomes. It focused on developing skills, so that the students can continuously learn, acquire their own knowledge and find their own solutions to the challenges that may come their way in the future. This speaks of life-long, life-sustaining and life-fulfilling learning. To be life-long learners, students must first have the intrinsic motivation for learning.

This exploratory study on the students' motivational profiles has found that as a whole, the students could identify with the importance of their learning activities. However, they are also more controlled than intrinsically motivated in their learning. From the cluster analysis, the researcher identified a "Highly-motivated" cluster of students who appeared to experience high autonomous motivational regulations, yet at the same time, also experienced high introjected regulation. Cluster analysis also surfaced an "Unmotivated" cluster with students reporting high amotivation and moderate external regulation.

To phrase it another way, many of our students are not intrinsically motivated to learn or are unable to learn intrinsically. The reasons they expend effort in school are to pass examinations, get good grades, enrol themselves in prestigious courses in the universities, get a good job and earn lots of money. Some work hard in school to meet the expectations of their significant others and not to be a disgrace to themselves and their families. Understandably, if students are too caught up trying to pass examinations or to meet the high expectations of their significant others, it is rather difficult for them to enjoy what they are doing and cultivate a real love for learning - the things that form the basis of a meaningful education and long-term success in the knowledge-based economy.
These findings echo the concern of the former Prime Minister of Singapore Mr Goh Chok Tong, “What is critical however is that we fire in our students a passion for learning, instead of studying for the sake of getting good grades in their examinations. I must say this passion is generally lacking among our students, including many of our most able. Their knowledge will be fragile, no matter how many ‘A’s they get unless they have the desire and aptitude to continue discovering new knowledge well after they leave school” (Goh, 1997).

Hence, the researcher argues that at present, there is a need to work towards a "goodness-of-fit" between the motivational characteristics of this sample of students from Singapore and the larger environment. Thinking systemically, it is critical that we nurture intrinsic motivation and inspire the love for learning in our students. And ironically, so that our young people can thrive in the knowledge-based economy where people and their ideas are the key sources of wealth and opportunities.

The propositions of the Self-Determination Theory may be the solution to our problem.

5.2.3.2 The Self-Determination Theory Recollect

Ryan and Deci (2000a) professed that in its fullest representation, human beings are energetic, curious and self-motivated. At their best, human beings are inspired, strive to learn, extend themselves, master new knowledge and skills and apply what they have learnt responsibly. It is also possible that the human spirit can diminish and be crushed and that human beings sometimes reject growth.

Ryan and Deci (2000a) proposed that human beings have basic psychological needs for autonomy, competence and relatedness. According to Ryan and Deci (2000a), human beings can be most autonomous and self-determined when their basic psychological needs are
met. When their basic psychological needs are met, human beings act out of ingrained, sustained and habitual intrinsic motivation in contrast to acting out of extrinsic motivation when their basic psychological needs are not met. When intrinsically motivated, people are most engaged and do the most creative work. They are autonomous and act out of self-determination (Ryan & Deci, 2000a).

5.2.3.2.1 Motivational regulations and learning behaviours

The Self-Determination Theory (Ryan & Deci, 2000a) is concerned about human motivation. Motivation especially concerns teachers because teachers have to mobilise their students to learn.

Ryan and Deci (2000a) proposed the concept of a continuum of human motivation with amotivation, external regulation, introjected regulation, identified regulation and intrinsic regulation occurring in increasing level of relative autonomy.

Literature shows that people who experience more autonomous regulation have more interest, excitement, confidence (Ryan & Deci, 2000a) which in turn show up as enhanced performance, persistence and creativity (Deci & Ryan, 1991; Sheldon et al., 1997), heightened vitality (Nix, Ryan, Manly, & Deci, 1999) and general well-being (Ryan, Deci, & Grolnick, 1995).

Arguably, extrinsic rewards are at times, appropriate. However, extrinsic rewards have the tendency to make people dependent on the rewards. Our concern here is, when the external motivators are removed, will the behaviours of learning persist? Similarly, introjected regulation often relates to expending more effort. The flipside is, it also relates to feeling more anxiety and coping more poorly with failures (Ryan & Deci, 2000a). Insofar that
our purpose is to promote the love for learning and lifelong learning, then as the literature suggests, we need to provide the conditions to nurture more autonomous motivational regulations in learning.

5.2.3.2.2 The Self-Determination Theory applied

According to Ryan and Deci (2000a), human beings can be proactive and engaged or passive and disengaged, as a function of the social conditions in which they are in. Evidently, social conditions that conduce towards feelings of autonomy, competence and relatedness promote intrinsic motivation (Ryan & Deci, 2000a).

Field studies have shown that teachers who are autonomy-supportive promote greater intrinsic motivation, curiosity and desire for challenge (Deci, Nezlek, & Sheinman, 1981; Ryan & Grolnick, 1986). Specifically, choice, acknowledgement of perspective-taking and providing rationale were found to enhance intrinsic motivation because they allow people a greater feeling of autonomy (Deci & Ryan, 1985). Students whose teachers are controlling and often use tangible rewards, threats, deadlines, directives, pressured evaluation, not only lose initiative but learn less effectively especially when learning requires conceptual and creative processing (Amabile, 1996; Grolnick & Ryan, 1987; Utman, 1997).

In the classrooms, teachers cannot force students to internalise their motivations. Teachers can, however, contribute to the students learning success by providing an environment and facilitating certain behaviours that allow the students to satisfy their needs for competence, relatedness and autonomy thus nurturing more autonomous forms of motivational regulation and inspiring the love for learning. Teachers can be autonomy-supportive. In this study, autonomy-supportive instructional behaviours are operationalised as conveying choice, providing meaningful rationale and acknowledging perspective-taking.
5.3 The Environment

5.3.1 Autonomy-Supportive InstructionalBehaviours: Applications and Challenges

As part of research question 2(i), the researcher evaluated if there was a significant difference in students' perceived teacher autonomy-support before and after the intervention programme.

Paired-samples t test performed on the means of pre-and post-test measures on perceived teacher autonomy-support shows that the students did perceive an increase in teachers' autonomy-support. From the significant result obtained, we infer that the teacher had indeed made the attempt to be autonomy-supportive.

It is encouraging to note that the students were able to discern a difference in the teacher's instructional behaviours, especially since the teacher only went through 4 sessions of training on autonomy-supportive instructional behaviours.

It is important in this study to establish a significant increase in perceived teacher autonomy-support. Wang, Liu, Koh, Tan, and Ee (2011) explained that teachers might report that they had made efforts to be autonomy-supportive and this might even appear true to independent observers but if the students did not interpret the effort positively, their intrinsic motivation would not be enhanced.

5.3.1.1 Autonomy-supportive instructional behaviours: Applications

For parsimony, autonomy-supportive instructional behaviours in this study have been operationalised as conveying choice, acknowledging perspective-taking and providing meaningful rationale (Deci et al., 1994).
Conveying choice, acknowledging perspective-taking and providing meaningful rationale are broad categories for autonomy-supportive instructional behaviours and the translation to observable behaviours are many (Deci et al., 1994; Koestner et al., 1984; Ryan, 1982; Ryan et al., 1983; Reeve & Jang, 2006). Of interest here is: How were autonomy-supportive instructional behaviours of conveying choice, acknowledging perspective-taking and providing meaningful rationale translated into practice in our intervention programme?

From content analysis and for practical implementation in the classroom, choice can be conveyed in the language used such as "you have a choice, which leaf structure do you want to work on", design of school assignments such as giving the students several options and letting them choose the project they are most confident in, in the management of group dynamics such as the option to choose whom they want to work with and providing them with information on different ways to manage group dynamics, option to submit assignments when they are ready to do so based on common consensus and, the list goes on.

Theoretically, when students are offered choices, they are invited to be active participants in a shared endeavour in the learning process. There is a strong emphasis on ownership as students get to choose the task to work on. Choice allows the learners to tap on their cognitive and emotional connections to the task. Learners can draw on their prior knowledge in an area that is meaningful and interesting to them. It also makes the learners feel in charge of the learning process (Stiggins, 1999). In contrast, when learners have no choice, their behaviours are largely externally regulated rather than autonomously regulated.

For practical implementation in the classroom, when acknowledging perspective-taking, teachers can keep the classroom climate open and friendly by being receptive to questions and maintaining a light-hearted classroom atmosphere, see things from students’ point of view and communicate understanding of feelings and concerns, encourage students’
participation in lesson development, and provide the space for students to explore and learn from mistakes, to name a few examples.

In the realm of counselling, acknowledging perspective-taking has the effect of validating the feelings, opinions and experiences of the students which helps the students to feel heard and respected (Ditter, 2009). Validation further allows the teacher to build trust, credibility, respect and strengthen his or her alliance with the students. Validating the students' feelings, opinions and experiences does not necessarily mean that the teacher agrees with those feelings or opinions, it is a way to build alliance with the students. Students learn when they listen but they do not listen unless they feel heard (Ditter, 2009). In a similar vein, students do not think well or perform when they feel invalidated or threatened. Hence, it is important that the teachers build rapport with the students with an encouraging word or tone of voice, or a hand on the shoulder. These small gestures may seem trivial but the impact on learning is great.

According to deCharms (1968), conveying choice and acknowledging perspective-taking enhance the sense of self-initiation of being an origin and thus, providing satisfaction for the need for autonomy.

5.3.1.2 Autonomy-supportive instructional behaviours: Challenges

Apparently, sharing by teacher and students alike suggest that "providing meaningful rationale" may be a challenge for teachers in the Singapore society.

One possible reason is the large power distance between the teacher deemed as a person in authority, and the students. In large power distance societies, people both consciously and unconsciously accept that they have to maintain at their rightful places in
society (Samovar & Porter, 1991). They have high respect for authority and believe that the actions of authorities should not be challenged (Lustig & Koester, 1993). Obedience is expected from members of lower power and a directive style of instruction even produces greater satisfaction among people of lower power (Hofstede, 1980).

Hofstede (2008) discussed the manifestation of power distance in the classrooms. In large power distance situations, teachers are treated with respect and students may have to stand up when a teacher enters the room. During lessons, there is a strict order with the teacher initiating all communication. Students in class speak up only when invited to. Students generally do not doubt the teacher’s view and tend to conform to her preferences and expectations. In such a system, the quality of an individual’s learning is very much dependent on the excellence of his or her teachers. In contrast, in small power distance situations, teachers treat their students as equal and vice-versa. The educational process is student-centred with a premium on students’ initiatives and students are expected to find their own intellectual paths. Students make uninvited interventions in class and are encouraged to ask questions when they do not understand something. Thus, in the context of Singapore, it should not be surprising to find a situation where providing meaningful rationale is not a common practice and thus perpetuating the cycle of one does not say and the other does not ask, though there is a strong yearning for some meaning to what they are doing.

Reflectively, providing meaningful rationale and helping the students to construct meaning out of what they are doing do have adaptive advantage. Meaning gives value and worth to the learning task. Meaning gives a sense of purpose. Without purpose, people lose their intrinsic motivation to do what they are doing. It is these meanings that become internalised and integrated in an environment that provides support for the basic psychological needs (Deci & Ryan, 2000).
On the construct for meaning, Thomas and Swaine (1928) said, "It is not important whether or not the interpretation is correct. If men define situation as real, they are real in their consequences." Indeed, meanings allow people to produce various realities that constitute the sensory world. As these realities are related to how people construct meanings, reality becomes an interpretation of various definitional options (Liu, 2000). To conclude, it helps for the teacher to provide meaningful rationale, or support the students in their construction of meaning as meaning gives purpose to learning.

If "providing rationale" is not the norm and common practice in Singapore, teachers who would like to take on the Self-Determination Theory approach to motivating students in their classrooms may need to consciously make the effort to provide meaningful rationales in their classroom instructions.

The researcher, being a classroom teacher herself, does understand that it is not possible to provide rationale for all instructions at all times. However, for activities that require much time and effort or when the tasks that the students have to do are "important and urgent and the students have no choice", it would help greatly for the students to see some meaning in what they are doing. Admittedly, sometimes, we teachers do not know why certain things are to be done in a certain way or how certain concepts are linked to real life application. When faced with such a situation, teachers can gather students' responses on why they think certain things are done in a certain way or how they think certain concepts are linked to real life application. From the collective wisdom of the teacher and the students, perhaps the class as a whole can make meanings out of what they are doing. In this way, students take ownership of their own learning and that can be empowering for the students.

As discussed earlier in chapter 2, the three social conditions of conveying choice, providing meaningful rationale and acknowledging the students' perspective appear to work
synergistically and each influences the amount of internalisation of a motivational regulation (Deci et al., 1994). According to Deci et al. (1994), when social conditions (2 or 3) supported self-determination, there was more internalisation than when social condition (0 or 1) did not support self-determination. Also, social conditions (2 or 3) that were supportive of self-determination promoted integration while social conditions (0 or 1) that were non-supportive of self-determination promoted introjection.

These findings from Deci et al. (1994) may be useful in helping us to interpret the findings for research questions 2(i) and 2(ii).

5.3.2 Effects of Perceived Teacher Autonomy-Support on Motivational Regulation and Learning Outcomes

Existing literature suggests a positive relationship between teachers' autonomy-support and students' learning outcomes.

For example, Reeve, Jang, Carrell, Joen, and Barch (2004) investigated the effect of teacher autonomy-support on classroom engagement of American high school students. Their study found teacher autonomy-support to have positive effect on classroom engagement. Firstly, there was significant mean difference between the pre-and post-test measures on students' classroom engagement. Secondly, teacher autonomy-support predicted student classroom engagement even after controlling for influence of teachers’ prior autonomy-support and students’ prior engagement. Thirdly, the more teachers used autonomy-supportive instructional behaviours, the more engagement their students showed. Reeve and his colleagues concluded that when teachers supported students’ interests, communicated with non-controlling and informational language, promoted valuing for the uninteresting
aspects of school work, acknowledged and accepted students’ negative affect as a valid reaction to requests and assignments, students would show a positive engagement response.

Teacher autonomy-support has also been shown to influence students' motivation in learning organic chemistry. In a study conducted by Black and Deci (2000), students' grade orientation significantly decreased after attending a semester of lessons taught by instructors trained in autonomy-supportive instructional behaviours. Black and Deci (2000) suggested that the decrease in grade orientation might have been due to a more student-centred way of teaching organic chemistry which might have prompted a relatively greater focus on learning than grades. Also found from the study is that students’ perceptions of teacher's autonomy-support explained significant increase in the relative autonomy of students’ self-regulation for studying and an enhanced adjustment, as indicated by significant increases in perceived competence and interest/enjoyment and a significant decrease in anxiety.

Similar findings for a positive relationship between teachers' autonomy-support and students’ educational outcomes can be found in Vansteenkiste et. al (2004), Garcia and Pintrich (1991), Young (2005), to name a few examples.

It was from the abovementioned bases that the researcher of this study formulated research questions 2(i) and 2(ii).

To recapitulate, research questions 2(i) and 2(ii) are as follows:

2(i) Are there significant differences in students' perceived teacher autonomy-support, motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme?
2(ii) Are there significant differences amongst the clusters in terms of motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort before and after the intervention programme?

5.3.2.1 Effects of Perceived Teacher Autonomy-Support on Psychological Learning

Outcomes - Student Sample As a Whole

In an earlier section, the researcher had discussed the effect of the intervention programme on perceived teacher autonomy-support. In this section, the researcher will discuss the effect of the intervention programme on motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort.

Paired-samples \( t \) tests performed on the student sample as a whole revealed a positive significant difference between the means of pre-self-efficacy and post-self-efficacy. For effort, the mean for post-effort was significantly lower than the mean for pre-effort.

Paired-samples \( t \) tests conducted on the pre-and post-test measures of motivational regulation (RAI), intrinsic task value, use of cognitive strategies, self-regulation and enjoyment were not significant. However, the post-test measures for these variables registered an increase after the intervention programme albeit not statistically significant.

It is encouraging to know that in this study, the students had a significant increase in their self-efficacy. This finding is congruent with finding from Black and Deci (2000) who reported that teacher autonomy-support related to an increase in self-efficacy in university students learning organic chemistry. Miserandino (1996) also reported an increase in the self-efficacy of grade 3 and 4 students in a suburban elementary school outside Rochester, New York, when their basic psychological needs were met.
Bandura (1996) suggested that students with high self-efficacy, that is, those who believe in their ability to succeed in learning, are more likely to tackle difficult tasks than to avoid them. In turn, students with successful experiences often have a strong sense of fulfilment which in turn boosts their self-efficacy. According to Bandura (1996), such people may also blame themselves for not putting in enough effort if they fall short of their personal goals.

For the significant decrease in effort, it is probable that like what Bandura (1996) had said, the students were falling short in some aspects of their personal goals and thus perceived a lack of effort. It is also probable that alike the students in Black and Deci's (2000) study, the more student-centred way of instructional behaviours required less written work and rigorous drills and practices, and that might have caused the students to feel that they were putting in less effort in their studies. As student JR shared, "I hope she gives more forced work as in written work. I think for stuff that really needs a lot of reinforcing, it will be better for me....last year, her notes were set of worksheets so we are supposed to go home and find out ourselves..." This comment could perhaps shed some light into the students' perceived lack of effort.

Post-test measures of motivational regulation (RAI), intrinsic task value, use of cognitive strategies, self-regulation and enjoyment registered an increase after the intervention programme albeit not statistically significant.

The researcher's bold speculations are these:

At the personal level of analysis, the students were in the first place, although identically regulated when learning, also experiencing higher controlled motivational regulations (external and introjected) relative to intrinsic motivational regulation. At the microsystem level of analysis, despite deliberated effort at being autonomy-supportive, the teacher who carried out the intervention had challenges incorporating the autonomy-
supportive instructional behaviour of "providing meaningful rationale". As we understand from an earlier discussion on Deci et al. (1994), the social conditions of conveying choice, acknowledging perspective-taking and providing meaningful rationale worked synergistically. An absence of any of the social conditions would affect the process of internalisation and the autonomy-supportive instructional behaviours would at best, promote introjection. At the exosystem level of analysis, examinations both at the national and school levels were very high-stakes and constituted both real and perceived threats to the students' well-being. At the macrosystem level of analysis, there exist societal beliefs and attitudes that were deeply entrenched such as Confucianism and Kiasuism, and failure to meet the expectations of self, parents and relatives were very detrimental to the personal well-being.

Reiterating what Miserandino (1996) said on motivational regulation, they "come from different sources in the social context". Of course, this list of factors is not exhaustive. Importantly, they interplayed with synergistic effect and this could have undermined the five-week of more intense intervention of incorporating autonomy-supportive instructional behaviours to render the effect non-significant on most of the learning outcomes. Perhaps, a longer period of intervention may be needed for the intervention programme to be more effective.

Nevertheless, the positive increases in the post-test measures on the psychological learning outcomes are encouraging and together, they suggest that incorporating autonomy-supportive instructional behaviours in the classroom presents a step in the right direction.

Qualitative data from the focused-group discussions gave the researcher a better understanding on the motivational effect of perceived teacher autonomy-support.

On motivational regulation, perceived teacher autonomy-support promoted more autonomous motivational regulation. With the teacher's de-emphases on grades and studying according to the syllabus for the purpose of tackling examination, and an emphasis on
learning, the students felt that they were more encouraged to explore and read up more for interest as "it makes it less mundane because if...you are just studying for exam, it is not really a motivation...but if you study out of curiosity or for knowledge, it gives us more reasons to study."

On intrinsic task value, perceived teacher autonomy-support worked through encouraging more exploration and learning of things outside the syllabus and with that, the application of knowledge beyond tests and examinations and the realisation on the intrinsic value of what the students were learning.

On the use of cognitive strategies and self-regulation, student reported more engagement in the lessons and more use of cognitive strategies such as visualisation, organisation and synthesis. With the de-emphasis on grading, students shifted their learning strategy from one on tackling examinations to one on "understanding the materials better". Without a score as controlled feedback, students often had to self-regulate on their learning processes.

On enjoyment and effort, students reported more participation and more engagement in the learning. They described the lesson as "fun" and "interesting" and in this sense, perceived teacher autonomy-support did promote more enjoyment in learning. Despite a quantitative significant decrease in effort score, there was evidence of students putting in more effort in their learning. For example, instead of copying answers for scoring sake, there was more effort at trying, at taking initiative and being original. It is probable that students' understanding of effort might be tied to the amount of time they spent on drills and practices.

Noteworthily, some students requested for more structure in the autonomy-support intervention. Perhaps accustomed to the traditional teacher-centred way of teaching and learning, some students reported finding it difficult to adjust and felt unsure and lost when immersed in student-centred activities especially when they were given more autonomy.
Particularly, there were requests for more notes and drills and practices. With the many uncertainties and confusions they had to handle, the students felt insecure in their exploration and certainly did not feel self-efficacious. Understandably, self-efficacy increases only if students know enough and have the necessary skills to make informed choice.

It is important for teachers to realise that while most students like choices and the freedom to explore and learn, there are some students who need more scaffolding as they attempt to adjust to more autonomy in their learning. For this group of students, they would benefit from having more structure to guide them in their learning activities.

In fact, Jang, Reeve, and Deci (2010) had suggested that teacher autonomy-support and structure complement each other. In their study, Jang et al. (2010) investigated the effects of perceived teacher autonomy-support and structure on students’ engagement. They found autonomy-support and structure to correlate positively, autonomy-support and structure to both predict students’ engagement and only autonomy-support to uniquely predict students’ engagement. The findings suggest that to further support students’ engagement in the classroom, teachers need to find ways to administer elements of classroom structure that not only structure the lessons but also support students’ autonomy.

Classroom structure is not analogous with classroom control. Control refers to demands, insistences, sanctions and rigidity. When structure is used in controlling ways, it will be detrimental to, rather than facilitative of, student engagement. When it is used in autonomy-supportive ways, it will be facilitative of engagement (Jang et al., 2010).

In a structured classroom environment, the teacher (i) provides clear, understandable, explicit and detailed directions, (b) offers a course of action to guide students’ learning activity, and (c) offers constructive feedback on how students can achieve valued outcomes (Brophy, 1986; Skinner, 1995; Skinner & Belmont, 1993). From a motivational point of view,
structure supports students' perceived competence, perceived control over valued outcomes and self-regulated learning strategies (Sierens et al., 2009).

In summary, the effects of perceived teacher autonomy-support could best be understood from sharing from the students which provides evidence for the influence of perceived teacher autonomy-support on the students' motivation and psychological learning attributes. Perceived teacher autonomy-support was able to induce a significant positive change in self-efficacy. However, in this study, the effect of perceived teacher autonomy-support was not strong enough to bring about significant positive changes in the other psychological learning outcomes. Nevertheless, this intervention on implementing autonomy-supportive instructional behaviours to promote more autonomous motivational regulation and enhance learning outcomes, presents a step in the right direction. It suggests a way for teachers to motivate their students and inspire the love for learning.

5.3.2.2 Effects of Perceived Teacher Autonomy-Support on Psychological Learning

Outcomes - Student Sample In Each Cluster

Evidently, the three clusters of students with unique motivational profiles responded differently to the intervention programme.

From the descriptive statistics, the "Unmotivated" cluster showed positive increases in the post-test measures on self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort, that is, there were positive increases in all the six psychological learning outcome variables.

The "Moderate-autonomous" cluster showed positive increases in the post-test measures on self-efficacy and intrinsic task value; and decreases in the post-test measures on use of cognitive strategies, self-regulation, enjoyment and effort. That is, two out of six
psychological learning outcome variables showed positive increases, and four out of six psychological learning outcome variables showed a decrease in value.

The "Highly-motivated" cluster showed decreases in the post-test measures on self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort. That is, all six psychological learning outcome variables showed a decrease in value.

At pre-test, the "Unmotivated" cluster was significantly lower than the "Moderate-autonomous" cluster and "Highly-motivated" cluster in self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort, that is, in all the six psychological learning outcome variables. However, at post-test, the "Unmotivated" cluster was only significantly lower than the "Moderate-autonomous" cluster in intrinsic task value, that is, one out of six of the psychological learning outcome variables. Also at post-test, the "Unmotivated" cluster was significantly lower than the "Highly-motivated" cluster in self-efficacy, intrinsic task value, use of cognitive strategies and self-regulation, that is, four out of six of the psychological learning outcome variables.

At pre-test, the "Moderate-autonomous" cluster was significantly lower than the "Highly-motivated" cluster in intrinsic task value. At post-test, there was no significant difference in learning outcomes between the "Moderate-autonomous" and "Highly-motivated" clusters.

From the findings, the "Unmotivated" cluster appeared to respond most positively to the intervention programme and the "Highly-motivated" cluster appeared to be least receptive to the intervention programme.

The finding that autonomy-supportive instructional behaviours could enhance the psychological learning variables of self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort is very encouraging for teachers. The finding
provides evidence to support the notion that autonomy-supportive instructional behaviours could be used to motivate the "unmotivated" (Deci & Ryan, 2000). Indeed, various studies had shown that perceived teacher autonomy-support is negatively associated with amotivation (see for example, Rouse, Ntoumanis, Duda, Jolly, & Williams, 2011).

Interestingly, the "Highly-motivated" cluster showed decreases in all six psychological learning variables. With reference to Lepper et al. (2005) who suggested that it might be quite adaptive for students to be both high in controlled and autonomous motivational regulations as such students seek out activities they find inherently interesting and at the same time pay attention to the extrinsic consequences of these activities, the researcher would like to add that such combination of motivational regulations may be context-sensitive (Ratelle et al., 2007). The researcher understands that post-test measurements were taken rather near to the year-end examinations. Nearer the year-end examinations, the pressure of evaluation might increase and the students might have felt more anxious to perform. The high introjected regulation of this cluster of students might undermine the high identified and intrinsic regulations in learning. Deci et al. (1999) had showed that evaluation and competition pressure undermined intrinsic motivation.

In contrast to the "Highly-motivated" cluster, the "Moderate-autonomous" cluster was characterised by significantly lower external and introjected regulations. While the "Moderate-autonomous" cluster also showed decreases in the post-test measures on use of cognitive strategies, self-regulation, enjoyment and effort, the declines in scores were less for the "Moderate-autonomous" cluster in comparison to the "Highly-motivated" cluster.

When taken together, the findings suggest that the implementation of autonomy-supportive instructional behaviours is advantageous. Evidently, students with different motivational profiles responded differently to the teacher's autonomy-support. In this study,
the findings showed that teacher's autonomy-support could particularly motivate the "unmotivated". It is therefore useful for teachers to first understand the motivational profiles of the students and provide the necessary autonomy-support especially during stressful periods such as examinations. There is, however, a need for more in-depth study to understand why students in the "Highly-motivated" group reacted less favourably to teacher's autonomy-support. Without further information, the researcher can only speculate that it could be due to the confounding effect of exam stress.

5.3.3 Nurture the Person

5.3.3.1 Psychological needs satisfaction - The mediator

To understand the process of intervention and to establish the mediating effect of psychological needs satisfaction, the researcher asked the following research questions:

3(i) Does perceived teacher autonomy-support significantly predict motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

3(ii) Does basic psychological needs satisfaction mediate the relationship between perceived teacher autonomy-support and motivational regulation (RAI), motivational beliefs of self-efficacy and intrinsic task value, use of learning strategies of cognitive strategies and self-regulation, enjoyment and effort?

Using Structural Equation Modelling, the researcher established that perceived teacher autonomy-support significantly predicted motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort in learning, albeit varying degree of correlations.
These findings are consistent with findings from other studies which found perceived teacher autonomy-support to predict basic psychological needs satisfaction (for example, Adie et al., 2008; Alvarez et al., 2009; Markland & Tobin, 2010), motivational regulations (for example, Grolnick & Ryan, 1989; Williams & Deci, 1996; Black & Deci, 2000; Roth et al., 2007; Williams et al., 1998; Williams et al., 1996), self-efficacy (for example, Williams et al., 2005; Williams et al., 2009), intrinsic task value (for example, Greene, Miller, Crowson, Duke, & Akey, 2004), use of cognitive strategies (for example, Young, 2005), self-regulation (for example, Sungur & Gungoren, 2009), enjoyment (for example, Black & Deci, 2000; Mouratidis et al., 2011) and effort (for example, Standage et al., 2006; Ferrer-Caja & Weiss, 2000).

From the Structural Equation Modelling, the researcher also established that basic psychological needs satisfaction mediated the relationship between perceived teacher autonomy-support and motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort in learning. Sobel test analyses confirmed the mediating effect of psychological needs satisfaction.

The finding of basic psychological needs satisfaction as mediator is consistent with findings from other studies based on the Self-Determination Theory (for example, Adie et al., 2008; Jang, Reeve, Ryan, & Kim, 2009).

In the domain of sports, Adie et al. (2008) found basic psychological needs satisfaction to mediate the relationship between coach autonomy-support and athletes’ levels of subjective vitality. In the domain of education, Jang et al. (2009) found basic psychological needs satisfaction to mediate the relationship between teacher autonomy-support and achievement, engagement, intrinsic motivation and proneness to negative effect, even after controlling for parental and cultural influences in a sample of collectivistically oriented 10th-grade students from South Korea. Jang et al. (2009) concluded that students in
collectivistically oriented society also function positively when the social context nurtures their psychological needs, including autonomy.

Together, the findings provide further support for the motivational relevance and universal importance of the three basic psychological needs of autonomy, competence and relatedness.

The researcher further established a good model fit for the proposed model explaining the mechanism through which perceived teacher autonomy-support motivated students to learn and influenced psychological learning outcomes. Although chi-square statistics and Root Mean Squared Error of Approximation (RMSEA) did not establish good model fits, likely because the use of these two fit indices requires a larger sample size, Comparative Fit Index (CFI) registered .98 and Tucker-Lewis Index (TLI) registered .90 suggesting good fits for the proposed model.

With Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) establishing good fits, the researcher put forth the model to explain the mechanism through how perceived teacher autonomy-support influences psychological learning outcomes.
Figure 5.1. A model on motivating students to learn in the classroom

As shown in the model, perceived teacher autonomy-support influences autonomous motivational regulation (RAI), self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort through the satisfaction of basic psychological needs of autonomy, competence and relatedness.

Together, these findings lend support to the Self-Determination Theory which professed that perceived teacher autonomy-support has predictive value over basic psychological needs and psychological learning outcomes, and addressing the basic
psychological needs of autonomy, competence and relatedness is essential for motivating students to learn in the classrooms (Deci & Ryan, 2000).

5.3.3.2 Nurture the person

Ryan and Deci (2000a) defined a psychological need as an energising state that if satisfied conduces towards optimal functioning and well-being but if not satisfied, contributes to pathology and ill-being. From empirical process in the Baconian tradition, Ryan and Deci (2000a) identified three basic psychological needs – autonomy, competence and relatedness which appear essential for facilitating intrinsic motivation.

Ryan and Deci (2000a) professed that satisfaction of the psychological needs is necessary for facilitation of internalisation and integration of behavioural regulations. For a quick recap, internalisation is the process of taking in a value or regulation. Integration is the process by which an individual transforms the regulation into his or her own so that it emanates from his or her sense of self. To integrate a regulation, an individual must first grasp its meaning and then synthesise that meaning with their existing goals and values. Such deep holistic processing is facilitated by the sense of volition from external pressure towards thinking or behaving in a certain way, and the experience of behaviour as effectively enacted (Niemiec & Ryan, 2009). Also, an individual is more likely to internalise and accept as their own the values and practices of those to whom they feel connected (Niemiec & Ryan, 2009). In this sense, the satisfaction of basic psychological needs of autonomy, competence and relatedness allows individuals to actively transform values and practices into their own (Ryan & Deci, 2000a).

Theories and their mechanisms aside, what these mean to the researcher as a classroom teacher is this: Students are first children; young human beings with basic psychological needs that need to be gently nurtured. While this seems like an obvious
statement, very often, in the midst of pushing up the students' grades in school or national examinations for "accountability", to up the school's ranking in the National League Table or for the teachers' own work performance ranking, teachers often lose themselves and forget that students are children with vulnerabilities and basic needs. In a bid to stay ahead of the competition, teachers often mindlessly pile the students with punishing amount of drills and practices especially towards high-stakes examinations and then ruthlessly evaluate the students with grades which convey the message "not good enough, you need to work harder".

To recognise students as young human beings with vulnerabilities and basic needs calls for a change in instructional approaches. Instead of using rewards and punishments, controls and threats to propel students to work harder and to make them constantly running in the rat race and living in fear and inadequacies, why not adopt instructional behaviours which are more light-hearted and nurturing, more specifically to nurture the psychological needs for autonomy, competence and relatedness which literature on Self-Determination Theory says will promote the love for learning, encourage students to initiate their own learning activities and encourage students to be lifelong learners.

5.4 Implications

5.4.1 Recollection of Objective of Study and Motivational Profiles of Students

This educational research study fuelled by the philosophies of Thinking School Learning Nation and Teach Less Learn More has as one of its objectives the investigation and evaluation of a pedagogical practice based on the Self-Determination Theory that is theorised to be able to nurture intrinsic motivation and facilitate the love for learning, with a long term vision to encourage lifelong learning in the students.
The researcher started off the investigative journey examining what the motivational profiles of students in Singapore are. The study found that the students in this sample, as a collective group, experienced relatively higher identified regulation than controlled (external and introjected) regulations or intrinsic regulation in learning. The Relative Autonomy Index (RAI) which indicates the degree of relative autonomy of the motivational regulations was only slightly tilted towards the autonomous end of the motivation continuum. Findings from cluster analysis revealed clusters of students who are "Unmotivated" (high amotivation), "Moderate-autonomous" (moderate in both identified and intrinsic motivational regulations) and "Highly-motivated" (combined high introjected, identified and intrinsic motivational regulations). From the perspective of the Self-Determination Theory, the desired state is intrinsic learning and hence based on the tenet of the Self-Determination Theory, there is a need to promote more autonomous regulation in learning in the Singapore classrooms.

Seeing through the lens of the person-in-environment, the researcher recognises that many factors affect the students' motivational regulation in learning. For one, the student is very much influenced by the culture he or she grows up in. Culture is the product of the values, ideas, perceptions and meaning that a group of people holds. These cultural values shape an individual's perspective of the world, permeate every aspect of daily life and can be deep-seated (O' Hagan, 1999). For example, as surfaced from focused-group discussions, students associate learning and paper qualification with social status and with that, honour to the self and the family. Similar findings are echoed in Kang (2005). From the perspective of the Self-Determination Theory, the above-mentioned culture presents a form of controlled motivational regulation. While it is unrealistic to resist cultural forces, we should at least be aware and recognise that distal environmental factors such as culture influence learning behaviours.
This being an educational research study, the implication would of course be relevant for educational practices in: (i) The microsystem - The classroom and the school, (ii) The exosystem - Educational policy and examination system.

5.4.2 Implication for the Microsystem - School and Classroom Practices

Ryan and Deci (2000a) suggested that by allowing students to learn in their own way (autonomy), by providing them with the tools to succeed (competence), and by defusing or removing authoritarian barrier (relatedness), teachers can give their students an interesting, challenging and intrinsically motivating educational experiences. This study provides empirical support for such claim. In support of the Self-Determination Theory, this study established that basic psychological needs satisfaction predicted psychological learning attributes and mediated the relationship between perceived teacher autonomy-support and psychological learning attributes. Also found, is that perceived teacher autonomy-support predicted and promoted psychological learning outcomes.

Classroom teachers are thus reminded that in their hands are human beings with basic psychological needs that need to be nurtured. Informatively, it is the psychological needs for autonomy, competence and relatedness that are to be nurtured. Therefore, in order to motivate the students to learn, teachers must adopt instructional behaviours that will conduce towards the support for autonomy, competence and relatedness. According to Ryan and Deci (2000a), nurturing these basic psychological needs will lead to well-being and growth, and non-support for these basic psychological needs will lead to ill-being and pathology.

Having a good understanding of the motivational profiles of students might be useful, as students with different motivational profiles responded differently to perceived teacher autonomy-support. Informatively, students with high controlled motivational regulations may be least responsive to perceived teacher autonomy-support, especially in face of pressure.
such as examinations. Instructively, it is during such stressful periods that teachers need to be more autonomy-supportive.

Modelled after studies by Deci et al. (1994), and Reeve and Jang (2006), this intervention study was designed with conveying choice, acknowledging perspective-taking and providing meaningful rationale as instructional behaviours targeted at nurturing the basic psychological needs for autonomy, competence and relatedness. While many of the classroom practices that constitute autonomy-supportive instructional behaviours are not new to most teachers, this study suggests that teachers may need to be mindful and make deliberate and constant effort at being autonomy-supportive.

Peculiar to this study, from both the teacher's and students' feedback, the researcher understands that the incorporation of choice was premeditated and a deliberate effort. This informs the researcher that the incorporation of choice is a possible pedagogical practice and that teacher needs to be mindful of incorporating choice in their instructional behaviours.

The provision of meaningful rationale appears to be a challenge. In the context of the Singapore society, it seems uncommon for people in authority to provide meaningful rationale for their instructions and for those receiving the instructions to expect a reason from the person in authority. Socialised into obedience and compliance, students and teachers alike often resigned to following instructions though inside them, they had many burning questions and yearned for some understanding to the rationale why certain things were done in certain ways. One could not help but reflect on the meaning of an advocate of Teach Less Learn More where teachers are encouraged to "build confidence and capacity in the learners, to encourage curiosity and critical thinking and to ask searching questions, less on following prescribed answers and replicating products" (Ministry of Education, 2011b). Understandably, providing meaningful rationale has the effect of defusing or removing authoritarian barrier and in the same token, enhancing relatedness (Ryan & Deci, 2000a). It calls for people in
authority to be clear of the goals and processes, to be open to questions and discussions and to be ready to review the goals and processes, all in the spirit of learning and excellence. Only then, will they be ready to nurture and guide students who are curious and always asking searching questions. Evidently, the provision of meaningful rationale as autonomy-supportive instructional behaviour needs more deliberate effort and constant practice for it to become second nature.

The provision of classroom structure complements autonomy-support (Jang et al., 2010). Classroom structure supports students' perceived competence, perceived control over valued outcomes and self-regulated learning strategies (Sierens et al., 2009). As cluster analysis suggested that the sample population is not homogeneous, the question is how much structure, to what degree, should classroom teachers provide for which students? Such decision requires wisdom and skilful means to be able to provide sufficient structure to guide thinking and learning yet provide the space for exploration and personal growth.

At the school level, there could be more deliberated and collaborated effort at reducing the frequency of assessments such as spring test, class test, topical test, mock tests, common tests, to list a few. Instead of summative class assignments, schools could have more formative class assignments which emphasise on the process of learning. As evident from this study, with less evaluative grading, students reported less stress and less tension about class assignment, less copying and dependence on model answers, more willingness to explore and experiment with learning such as thinking though materials, managing cognitive impasses and writing based on own understanding. In essence, students become more adventurous and innovative with their learning.
5.4.3 Implication for the Exosystem - Educational Policies and Examination System

There is evidence to suggest that the students' motivation for learning are characterised partly by pressure and fear. From students’ responses, their motivation for learning largely revolved around high-stakes examinations. Apparently, the students associated good paper qualifications with better career options, and thereby higher social status and better material comfort. Consequently, their learning strategies were reduced to studying according to the syllabus, copying model answers from their seniors, going for projects that were "easiest, fastest, less tedious" to score, all for the purpose of increasing their marks in the examinations or for some students, making sure that they would not be retained at the current academic level. In brief, their learning effort was targeted at scoring for examinations and their emotional well-being was tied to how well they performed in the examinations.

From the Self-Determination Theory point of view, such preoccupation with examinations constitutes a controlled form of motivational regulation. It presents an external locus of causality and does not emancipate from the individual's self (Ryan & Deci, 2000a). It is not learning for inherent interest or for enjoyment and is less likely to be able to promote the love for learning and sustain lifelong learning. Learning for examination sake is typically ineffective over the long term and yields many hidden costs (Ryan & Deci, 2000a). Recalling the philosophy of *Teach Less Learn More*, if our goal is to develop lifelong learners who "can think for themselves...find their own solutions to whatever new problems they may face" (Goh, 1997), there is a need to relook at the examination systems in Singapore.

The issues of high-stakes examinations had surfaced during parliamentary discussion. The current Minister for Education Mr Heng Swee Keat had been asked to review the high-stakes examinations as they "add to the stress of students and families and 'to the coffers of
the tuition industry” (Wong, 2011). On the issue of high-stakes examinations, the current Minister for Education had informed the nation that the Ministry of Education Singapore is looking into the issue but that "any review should not be rushed as the consequences will be hard to reverse" and that "examinations well done serve an important purpose... allowing teachers and parents to gauge the extent of students' learning" (Wong, 2011).

One may wonder how high-stakes examinations are relevant to teachers' classroom instructional behaviours. The researcher's response is that it certainly does. High-stakes examinations drive classroom pedagogy and affect students' learning. Thinking systemically from the Ecological-Systems Perspective, systems are interconnected and are always trying to adapt to one another to achieve a state of dynamic equilibrium. When one system changes, the other system adapts and changes, the systems being connected to one another (Von Bertalanffy, 2001). In a similar vein, when one system changes and the other does not, a state of disequilibrium results bringing about a backwash effect forcing the evolving system to remain at its original state so as to maintain the state of equilibrium.

This is exactly what had been observed about the Teach Less Learn More initiative. Tan (2007) pointed out that as long as pedagogical agenda is still subservient to high-stakes assessment pressure, then the Teach Less Learn More is effective only in offering teachers and students a token amount of autonomy to teach and learn and only if such learning conforms to what is tested in examination.

Understanding how teachers are often driven to teach the test especially nearer to examinations, it is thus logical to suggest a reduction in the frequency of examinations, be it internal school examinations or high-stakes national examinations. Such a reduction in the frequency of examinations would reduce the time needed for teachers to prepare the students for the examinations and consequently free classroom time for more meaningful learning
activities. At present, schools offering the Integrated Programme are doing just that by allowing the students deemed "clearly university bound" to skip the 'O' Level examinations and sit for the 'A' Level examinations only at the end of the six years of education. However, the majority of the secondary school students in Singapore have to sit for two high-stakes examinations including the numerous school examinations within the course of their six years of middle and high school education. Notably, even with the reduction in the number of high-stakes examinations, as evident from focused-group discussions, the students were constantly weighed down by the national examinations they had to sit for at the end of their six years of education, and their learning strategies as they confessed were directed at scoring in the national examinations which they deemed extremely high-stakes as the examination results determined their future.

Boud (2007) professed that high-stakes examinations can de-emphasise learning beyond the point of graduation. He opined that assessment should develop students in "the capacity for future learning beyond the present course of study". In the ideal state, assessment should be able to sustain learning in the long run as students employ assessment strategies positively to influence their own continuous learning. Boud (2007) termed such assessment with a long-term view "sustained assessment". He thus recommended a relook at the format for assessment. Tay (2011) suggested that "sustained assessment" could be done through authentic assessment. Incorporating real life problems into high-stakes examinations would certainly drive classroom pedagogy to teach the skills needed to handle such real life problems and students would be able to see the link between what they have learnt and the relevance to real life application.

In summary, the researcher fully agrees that "examinations well done serve an important purpose... allowing teachers and parents to gauge the extent of students' learning"
(Wong, 2011). For recommendation, the Ministry of Education Singapore could consider reviewing the frequency and format of the high-stakes examinations.

5.5 Limitations and Recommendations

The transferability of the findings in the present study is limited by the characteristics of the participants and the design of the study. In this section, the researcher will discuss the limitations pertaining to the sample (ability level, gender, ethnicity and age) and research design (variability issues, comparison issues, measurement issues and social desirable bias) and suggest recommendations for future researches.

5.5.1 Sample

5.5.1.1 Ability Level

As convenience sampling, the participants in this study were ranked in the top 10 percentile in their Primary School Leaving Examination cohort and were placed in the Integrated Programme. They were thus categorised as high-ability learners in the Singapore context. Therefore, care must be taken when generalising the findings to the student population in Singapore.

McCoach and Siegle (2001) had shown that academic high-achievers differed from academic low-achievers in terms of motivation and psychological learning attributes. Specifically, academic high-achievers had significantly more positive motivation / self-regulation, academic self-perception, attitudes towards school, attitudes towards teachers, and goal valuation than academic low-achievers. The study also found that out of the five factors, motivation / self-regulation and academic self-perception contributed 85% of the variance of academic achievement status. The researchers recommended an investigation on whether an intervention programme aimed at increasing students' motivation / self-regulation and
academic self-perception could also improve school performance among the academic low-achievers.

Ng, Kenney-Benson, and Pomerantz (2004) suggested that parental autonomy-support predicted enhanced performance in challenging tasks and better academic grades in low-achieving children from central Illinois, USA. Ng et al. (2004) further suggested that it was the low-achieving students who benefitted more from parental autonomy-support than high-achieving students. To the best of the researcher's knowledge, to date, there is no intervention study based on the Self-Determination Theory which is specifically aimed at increasing motivation of low-achieving students in Singapore.

Hence, to have a complete picture of the motivational regulations and learning issues of Singapore students, the study could be replicated on students from the different academic streams per se such as low-achieving students or on a sample with representative sampling from the different academic streams. Studies focusing on understanding the motivational profiles through examination of the motivational regulations of the students, and the effects of intervention programmes such as the current programme based on the Self-Determination Theory on student samples from different academic streams, or on a student sample as a whole would enrich our understanding on the learning challenges faced by unique groups of students in Singapore and Singapore students as a whole, respectively. This could help educators pinpoint and tailor intervention programmes most useful for the students.

5.5.1.2 Gender

It will be recalled that the student participants in this study were obtained from negotiation with the school principal, and a teacher who agreed to be trained and to implement the autonomy-supportive instructional behaviours in her classrooms. By convenience sampling, the participants were female students.
Gillison, Osborn, Standage, and Skevington (2009) had examined the reasons for introjected regulation amongst male and female mid-adolescence in the United Kingdom and found gender differences with regard to introjected reasons for participation in sport and exercise. Specifically, the introjected reasons provided by boys for participating in sport and exercise were largely related to social factors, such as avoiding social disapproval and attaining ego enhancement. In comparison, for girls, they were more likely to separate sport and exercise from their social lives. For the girls, their introjected reasons more commonly reflected the partial internalisation of a health and fitness rationale.

Block (1983), Ruble (1984), and Boaler (1997) also suggested gender differences in the way female and male students respond to classroom climate. However, in contrast to Gillison et al. (2009), Block (1983) and Ruble (1984) suggested that female students might have greater social needs. More specifically, female students had greater needs for affection and close relationships with adults than male students. Consequently, they might relate better and be inspired more by their teachers. Hence, female students might respond better to personal relationships with teachers than their male counterparts. Male students, in contrast, thrived better in highly stressful and competitive environment (Boaler, 1997). They might cope better with the stress and pressure of evaluation and competition than female students.

The above-mentioned studies suggest that male and female students may differ in their motivational regulations, specific reasons for their motivational regulations, and may respond differently to a teacher’s autonomy-supportive instructional behaviours in different contexts.

Therefore, it would be interesting to replicate the study on male students to understand their motivational regulations, how their teachers’ autonomy-supportive instructional behaviours would be perceived and which, in turn affects their motivational regulations and learning behaviours in the classrooms. It would also be interesting to make a
comparison between the male and female students with regard to their motivational regulations and learning experiences. The facts and figures obtained from such studies would advise educators on how best to relate to male students and female students when motivating them to learn.

5.5.1.3 Ethnicity

By convenience sampling, the participants in this study were mostly ethnic Chinese, except for a few students of mixed-ethnic parentage. As discussed in an earlier section, the Singapore society is made up predominantly of ethnic Chinese. The Chinese made up 74.1% of the population, the Malays made up 13.4% and Indians made up 9.2% of the population (Department of Statistics, 2010). While in the minority, when enumerated, the actual numbers of Malays and Indians in Singapore are quite substantial. Hence, it would be worthwhile to look into the motivational regulations of students from the minority ethnic groups.

Taft (1977) suggested that culture may have an impact on an individual’s ways of dealing with their perceptual world and may influence their cognitions and emotional responses. Indeed, Kang's (2005) qualitative study on educational aspirations of Chinese, Malay and Indian students revealed differences in the way students viewed education and the expectations their families had of them. For the Chinese students, they faced expectations from their families to get into institutions of higher learning with higher prestige, preferably to be enrolled in a course that would get them a job that would bring them material wealth. Similarly, for the Indian students, their families expected them to get into institutions of higher learning with higher prestige as well as obtain jobs of higher social status such as being lawyers. The Malay students, on the other hand, faced less pressure on academic achievement and attainment of job occupation with higher social status. There were more
emphases on making learning meaningful and obtaining jobs of interest and with meaning to their lives.

Insofar that expectations from significant socialising agents such as family differ, one has good reason to suspect that the motivational regulations of Chinese, Malay and Indian students may differ. It will therefore be interesting to also investigate and compare the motivational regulations of students in the different ethnic groups and how the students with different cultural belief systems and values would respond to their teachers’ autonomy-supportive instructional behaviours. Needless to say, the findings obtained would help educators understand what motivate the students (Chinese, Malay and Indian) when learning and how best to harness their inner motivational resources to help the students learn.

5.5.1.4 Age

This study sampled upper secondary students. While an in-depth understanding of the motivational regulations and learning challenges of 15-16 years old students in Singapore has its value, the researcher understands that a more comprehensive picture could be obtained if the study had also sampled and compared the motivational regulations and psychological learning attributes of students in different stages of their academic life such as lower primary students, upper primary students, lower secondary students, junior college students or even a longitudinal research design to follow the sample through the different phases of their academic life.

As discussed in chapter one, the local studies reviewed though fragmented, appear to present a trend – at earlier stages of their academic life, students appeared to have higher degree of autonomous motivation (Liu et al., 2009). As they progressed through the developmental stages of learning, their motivational regulations appeared to become more controlled, as suggested by the findings on motivational orientation of junior college students
(Lim, 2010). Elsewhere in the world, Anderman and Midgley (1997) had also shown that as students progressed through school, their extrinsic motivation increased and intrinsic motivation declined.

In this view, it would be ideal if the study can be replicated over different grade levels or over a longer period of time. If the study covers grade levels from preadolescence to early adulthood, it could help educators identify motivational trends that may change over time. Educators could perhaps pinpoint the point in time when there is a shift in the motivational orientation and the reasons for the shift so that more effort could be expended with the aim to promote the love for learning so as to encourage lifelong learning.

In summary, to allow the transferability of the findings, it would be necessary to extend the research to include a representative sample from schools with distinctively different cultures, different ability levels, gender, ethnicity and age group.

5.5.2 Research Design

5.5.2.1 Variability Issues

One of the limitations of this study is its reliance on responses from students of one teacher. While this usefully controls for teacher effects, it limits the variability in the dimension of teacher autonomy-support and thus, the generalisability of the findings. Future studies could include more teachers in the implementation of autonomy-supportive instructional behaviours in their classrooms as this would add variability and robustness to the research on the effect of teachers' autonomy-support on students' motivational regulations and learning behaviours.
5.5.2.2 Comparison Issues

The current study involves an intervention programme with a one group pretest-posttest design. In this study, the researcher compared pretest and posttest measures of dependent variables and attributed the change to the intervention programme.

Ideally, a control group should have been included for the purpose of comparison. When there is a control group with every possible factor kept the same as the experimental group except for the intervention programme, a comparison could be made and we could confidently attribute the changes in the dependent variables in the experimental group to the intervention (Yegidis, Weinbach, & Morrison-Rodriguez, 1999). Regrettably, the researcher was not able to get a control group for this study as students’ participation in this research project was contingent on their teacher’s participation and the teacher must agree to allow the researcher some of his or her lesson time to conduct the repeated surveys. As the researcher was not able to get a teacher to agree to the participation, the research design did not include a control group. In the interest of allowing causal attribution, should other researchers want to replicate the study, they should consider the use of a control group.

In addition, due to the absence of a control group, it is not possible to preclude all possibilities of effects from extraneous factors such as Hawthorne effect, teachers gave clues or test sensitivity. Nonetheless, it has to be noted that if "Hawthorne effect, teachers gave clues or test sensitivity" had confounded the findings of the intervention programme, all the outcome variables should have registered positive effects. However, these were not the cases for the findings from pre-and post-test comparisons.

Notably, for whole group pre-and post-test comparison, there was a negative effect for effort. For clusters' pre-and post-test comparisons, while cluster 1 reported positive effect for all the learning outcome variables, cluster 2 reported declines in some of the learning outcome variables, namely, use of cognitive strategies, self-regulation, enjoyment and effort;
and cluster 3 reported declines in all of the learning outcome variables, namely self-efficacy, intrinsic task value, use of cognitive strategies, self-regulation, enjoyment and effort. Hence, it is reasonable to suggest that the intervention programme aimed at teacher's autonomy-support had an effect over the learning outcome variables.

5.5.2.3 Measurement Issues

One of the limitations of this study concerns the inter-item reliability of the Identified Regulation and Amotivation subscales. As shown in table 3.2, the cronbach alphas for the Identified Regulation subscale were .64 at pre-test and .57 at post-test, respectively. For the Amotivation subscale, they were .57 at pre-test and .68 at post-test, respectively. The inter-item reliabilities were considered low by Nunnally's (1978) standard. Nunnally (1978) recommended that instruments used in basic research have reliabilities of about .70 or better.

Ideally, a pilot study should have been conducted to establish the validity of the subscales. Items with low loadings could perhaps be rephrased or deleted. However, with the rephrasing or deletion of items, there would be a need for another pilot study. The constraint of time precluded the option of more pilot studies and as a result, the instruments were used in this study without being tested in a pilot study.

To clarify on the use of the scales, the Identified Regulation subscale obtained from the Academic Self-Regulation Questionnaire (Ryan & Connell, 1989) and Amotivation subscale obtained from the Academic Motivation Scale (Vallerand et al., 1992, 1993) had shown good inter-item reliabilities in other studies. For example, Wang et al. (2011) and Chian (2003) reported cronbach alphas above .70 for the Identified Regulation subscale administered to students in Singapore. For the Amotivation subscale, Chian (2003) showed inter-item reliability which was above .70 and Tham (2010) obtained a cronbach alpha of .69.
Nevertheless, it would be worthwhile to consider a pilot study and the use of more rigorous statistical analyses, such as exploratory and confirmatory factor analyses, to ascertain the validity of the subscales.

5.5.2.4 Social Desirable Bias

Self-reported surveys and group discussions present a challenge of possible social desirable bias. This challenge had been anticipated and was addressed by assuring the students of confidentiality of their responses, emphasising that there was no right or wrong answer and affirming their unique contributions as unique individuals. Despite the steps taken to minimise social desirable bias in the self-reported responses, the researcher was mindful that the phenomenon might not have been eradicated totally.

Future studies could consider incorporating a social desirability scale in the self-reported survey and the effect of social desirable bias could be teased out when performing statistical analyses on the data, to correct the responses for distortion.

5.6 Conclusion - A Final Note

This study began with an empirical puzzle. What are the motivational profiles of students in Singapore? How have their learning experiences been? What processes sustain their endeavours in learning? How can educators sustain the students' motivation in learning and promote the love for learning?

This mixed-methods research study has provided empirical evidence on how the students in this sample are experiencing their learning through understanding their motivational regulations. The intervention programme with autonomy-supportive instructional behaviours based on the Self-Determination Theory in motivating students to learn in the classroom has also shed light into the motivational processes and possible
challenges that teachers might face when implementing autonomy-supportive instructional behaviours in their classrooms. The findings suggest that with mindful, deliberated effort, autonomy-supportive instructional behaviours can be effective motivating components in the Singapore classrooms.

Brookfield (2006) once said,

“The most important knowledge teachers need to do good work is a knowledge of how students are experiencing learning and perceiving their teacher’s actions.”

Indeed, this study has provided the researcher with a better understanding on how students are experiencing learning and perceiving their teacher's actions. This study has explored further to examine the effects of perceived teacher's actions on students' learning. With a better understanding on how students are experiencing learning and perceiving their teacher’s actions, the researcher hopes that teachers would be empowered in motivating their students to learn in the classrooms.

With this panoramic lens perspective of the study, the researcher completes the empirical puzzle.
REFERENCE


Jang, H., Reeve, J., & Deci (2010). Engaging students in learning activities: It is not autonomy support or structure but autonomy support and structure. *Journal of Educational Psychology, 102*(3), 588-600.


MY LEARNING EXPERIENCE IN SCIENCE

IMPORTANT DIRECTIONS FOR QUESTIONS THAT REQUIRE YOU TO SHADE YOUR RESPONSES

CORRECT
Use black lead pencil only.
Make heavy black mark that fills the circle completely.
Erase neatly any response you wish to change.

INCORRECT

SECTION A: ABOUT MYSELF

1. Name of School: ____________________________________________
2. Class: ______________________________________________________
3. Date of Birth (DD/MM/YYYY): __________________________________
4. Gender: Female

Please read each of the following sentences carefully and decide to what extent you agree with the statement. Indicate how you feel most of the time about your learning experience in Science class by shading the corresponding number. Please do not leave any statement blank.

SECTION B: MY LEARNING CLIMATE IN SCIENCE CLASS.

1. I feel that my teacher provides me with choices and options.    [ ] [ ] [ ] [ ] [ ] [ ] [ ]
2. I feel understood by my teacher.                                [ ] [ ] [ ] [ ] [ ] [ ] [ ]
3. I am able to be open with my teacher during class.            [ ] [ ] [ ] [ ] [ ] [ ] [ ]
4. My teacher conveyed confidence in my ability to do well in the course. [ ] [ ] [ ] [ ] [ ] [ ] [ ]
5. I feel that my teacher accepts me.                             [ ] [ ] [ ] [ ] [ ] [ ] [ ]
6. My teacher made sure I really understood the goals of the course and what I need to do. [ ] [ ] [ ] [ ] [ ] [ ] [ ]
7. My teacher encouraged me to ask questions.                    [ ] [ ] [ ] [ ] [ ] [ ] [ ]
8. I feel a lot of trust in my teacher.                           [ ] [ ] [ ] [ ] [ ] [ ] [ ]
9. My teacher answers my questions fully and carefully.
10. My teacher listens to how I would like to do things.
11. My teacher handles people’s emotions very well.
12. I felt that my teacher cares about me as a person.
13. I don’t feel very good about the way my teacher talks to me.
14. I feel able to share my feelings with my teacher.
15. My teacher tries to understand how I see things before suggesting a new way to do things.

SECTION C: HOW I FEEL IN SCIENCE CLASS.

1. I do not feel very competent when I am in Science class.
2. I get along with people in Science class.
3. Most days, I feel a sense of accomplishment from Science class.
4. When I am in Science class, I often do not feel very capable.
5. I really like the people in Science class.
6. In Science class, I do not get much of a chance to show how capable I am.
7. I am free to express my ideas and opinions in Science class.
8. My feelings and perspectives are taken into consideration in Science class.
9. There are not many people in Science class that I am close to.
10. I have been able to learn interesting new knowledge in Science class.
11. People in Science class tell me that I am good at what I do.
12. I pretty much keep to myself when I am in Science class.
13. I consider the people in Science class to be my friends.
14. People in Science class care about me.
15. I feel like I can pretty much be myself in Science class.
16. The people in Science class do not seem to like me much.  
17. People in Science class are pretty friendly towards me.

SECTION D: MY REASONS FOR DOING MY WORK IN SCIENCE.

1. because I’ll get into trouble if I don’t.  
2. because I want the teacher to think I’m a good student.  
3. because I want to learn new skills.  
4. because school is fun.  
5. but I really don’t know why.  
6. because that’s what I am supposed to do.  
7. because I would feel bad about myself if I didn’t.  
8. because it is important for me to do well in school.  
9. because I enjoy learning new skills.  
10. but I don’t see why we should have school.  
11. so that the teacher won’t yell at me.  
12. because I want the others to think that I’m good.  
13. because I want to improve in school.  
14. because school is exciting.  
15. but I really feel I’m wasting my time in school.  
16. because that’s the rule.  
17. because it bothers me when I don’t.

SECTION E: HOW I DO MY SCIENCE SCHOOLWORK.

1. I prefer class work that is challenging so I can learn new things.  
2. Compared with other students in this class, I expect to do well.  
3. I am so nervous during a test that I cannot remember facts I have learnt.
4. It is important for me to learn what is being taught in this class.

5. I like what I am learning in this class.

6. I’m certain I can understand the ideas taught in this course.

7. I think I will be able to use what I have learnt in this class in other classes.

8. I expect to do very well in this class.

9. Compared with others in this class, I think I’m a good student.

10. I often choose paper topics I will learn something from even if they require more work.

11. I am sure I can do an excellent job on the problems and tasks assigned for this class.

12. I have an uneasy, upset feeling when I take a test.

13. I think I will receive a good grade in this class.

14. Even when I do poorly on a test, I try to learn from my mistakes.

15. I think that what I am learning in this class is useful or me to know.

16. My study skills are excellent compared with others in this class.

17. I think that what we are learning in this class is interesting.

18. Compared with other students in this class, I think I know a great deal about the subject.

19. I know that I will be able to learn the material for this class.

20. I worry a great deal about tests.

21. Understanding this subject is important to me.

22. When I take a test, I think about how poorly I am doing.

23. When I study for a test, I try to put together the information from class and from the book.

24. When I do homework, I try to remember what the teacher said in class so I can answer the questions correctly.

25. I ask myself questions to make sure I know the material I have been studying.
26. It is hard for me to decide what the main ideas are in what I read.

27. When work is hard, I either give up or study only the easy parts.

28. When I study, I put important ideas into my own words.

29. I always try to understand what the teacher is saying even if it doesn’t make sense.

30. When I study for a test, I try to remember as many facts as I can.

31. When studying, I copy my notes over to help me remember materials.

32. I work on practice exercises and answer end of chapter questions even when I don’t have to.

33. Even when study materials are dull and uninteresting, I keep working until I finish them.

34. When I study for a test, I practise saying the important facts over and over to myself.

35. Before I begin studying, I think about the things I will need to do to learn.

36. I use what I have learnt from old homework assignments and textbook to do new assignments.

37. I often find that I have been reading for class but I don’t know what it is all about.

38. I find that when the teacher is talking, I think of other things and don’t really listen to what is being said.

39. When I am studying a topic, I try to make everything fit together.

40. When I’m reading, I stop once in a while and go over what I have read.

41. When I read materials for this class, I say the words over and over to myself to help me remember.

42. I outline the chapters in my book to help me study.

43. I work hard to get good grade even when I don’t like a class.

44. When reading, I try to connect the things I am reading about with what I already know.
SECTION F: MY FEELINGS FOR SCIENCE.

1. I enjoy doing Science very much. 
   ![Not True At All] [Very True]

2. I put a lot of effort into Science. 
   ![Not True At All] [Very True]

3. Science is fun to do. 
   ![Not True At All] [Very True]

4. I don’t try very hard to do well at Science. 
   ![Not True At All] [Very True]

5. I think Science is boring. 
   ![Not True At All] [Very True]

6. Science does not hold my attention at all. 
   ![Not True At All] [Very True]

7. I try very hard at Science. 
   ![Not True At All] [Very True]

8. I would describe Science as very interesting. 
   ![Not True At All] [Very True]

9. I think Science is quite enjoyable. 
   ![Not True At All] [Very True]

10. It is important for me to do well in Science. 
    ![Not True At All] [Very True]

11. While I do Science work, I think about how much I enjoy it. 
    ![Not True At All] [Very True]

12. I don’t put much energy into Science. 
    ![Not True At All] [Very True]

End of Survey. 
Thank You!
Hello ☺

Thank you for agreeing to be interviewed for the research project “Nurture Intrinsic Motivation, Inspire Students in Learning: A Study on Motivating Students to Learn in the Classroom”.

The information you share will help us understand:

- your learning experiences in your biology class with Mrs T.

Before we carry out the interview, we would like you to know that:

- you can at any time prior to publication withdraw from participation without negative consequences and you can request that your personal data/information be permanently deleted from the database.
- the researchers will use your personal data/information solely for this study.
- the researchers will render your personal data/information anonymous and protect the privacy and confidentiality of your personal data/information.
- while information gained during the study may be published, you will not be identified and your personal data/information will remain confidential.
- the interview will be recorded to help the researchers with their transcription and analysis of data.
- the ethical aspects of the project have been approved by the ethics committee of NIE.

If you have any questions about the research at any point in time, you can contact __________ at telephone number ______________.
Before we commence the interview proper, we would like to understand more about you.

1. What is your name?

2. How old are you?

3. Which ethnic group do you belong to?

4. What subjects are you doing now?

5. Which is your favourite subject?

6. For how long have you known Mrs T?

7. For how long has Mrs T taught you biology?
I understand that at the beginning of the year, you were informed that Mrs T was doing a project with the class using a teaching method that she had learnt.

**Before project**

- Recalling the time before the project, how did Mrs T usually carry out her lesson?
  - How did she communicate her instruction to the class?
  - How did she respond when students had queries/complains about task assigned?
  - How did she respond to students who did not submit their assignments on time?

- How do you find her lesson then?
  - Can you describe an event to explain what you mean?

**During the project**

- Recalling the time during the project, how did Mrs T teach differently?
  - How did she communicate her instruction to the class?
  - How did she respond when students had queries/complains about task assigned?
  - How did she respond to students who did not submit their task assigned on time?

- How do you find her lesson during the project?
  - Can you describe an event to explain what you mean?

- Could you share an aspect of her lesson that you hope she could have done differently?
  - If you were in her position, what would you have done differently?

**Going forward**

- How is your timetable like on self-revision?
  - For which subjects do you spend more time revising?
  - What makes you spend more time on these subjects?

- If you perform equally well in all your subjects, would you have spent more time on doing further reading and research work on biology?
  - What makes you say so?
Annex C

Hello ☺

Thank you for agreeing to participate in the research project “Nurture Intrinsic Motivation, Inspire Students in Learning: A Study on Motivating Students to Learn in the Classroom”.

The information you share will help us understand:

• your experiences in carrying out the intervention in your biology classes.

Before we carry out the interview, we would like you to know that:

• you can at any time prior to publication withdraw from participation without negative consequences and you can request that your personal data/information be permanently deleted from the database.
• the researchers will use your personal data/information solely for this study.
• the researchers will render your personal data/information anonymous and protect the privacy and confidentiality of your personal data/information.
• while information gained during the study may be published, you will not be identified and your personal data/information will remain confidential.
• the interview will be recorded to help the researchers with their transcription and analysis of data.
• the ethical aspects of the project have been approved by the ethics committee of NIE.

If you have any questions about the research at any point in time, you can contact ____________ at telephone number ____________.

I understand the purpose and process of the research project and my involvement in it and voluntarily accept the invitation to participate in the above study.

Name of participant: ____________________________
Signature: _______________________________________
Date: _________________

Before we commence the interview proper, we would like to understand more about you.

How long have you taught biology? ___________ years _______ months

How long have you taught in the xxxxxxxxxx High School? ___________ years _______ months
Teacher’s Motivation

- What made you decide to participate in this project?

Intervention

- Could you describe your lessons before you took part in this project?
- What did you do differently during the project?
  - What made you do these?

Students’ Motivation

- How do you think your students felt about your lessons before the project?
  - What made you think so?
- How do you think your students felt about your lesson during the project?
  - What made you think so?
- How did your students respond when you did that?
  - Before the project, how had they responded in similar situation?

Going forward

- Professionally, how has participating in the project impacted you?
- Were there times when you went back to old ways of doing things?
  - Could you tell me more?
- Would you continue to do what you did during the intervention now that the project is over?
  - What makes you say so?