The reflective process among undergraduate dental students: the impact of age, gender, learning styles, learning approaches and the dental environment

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The Reflective Process among Undergraduate Dental Students: the Impact of Age, Gender, Learning styles, Learning Approaches and the Dental Environment

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Declaration

This thesis contains no material that has been accepted for the award of any other degree or diploma in any university. To the best of the candidate's knowledge and belief, the thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

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Abstract

Aim:

To investigate the effect of age, gender, socioeconomic status, academic achievement, learning styles, learning approaches, and the learning environment on the reflective process.

Methods:

All dental undergraduate students studying at King AbdulAziz University Faculty of Dentistry (KAUFD) agreed to participate on three occasions of approximately six month intervals between February 2008 and June 2009 (QMREC2007/67). Four previously validated structured questionnaires including demographic details were used to determine students' learning style (Felder and Soloman, http://www.ncsu.edu/felder-public/ILSpage.html [ILS]), approach to learning and studying (Entwistle, http://www.ed.ac.uk/etl [ALSI]), reflection (Sobral, 2005 [RLS]) and perception of their educational environment as determined by the Dundee Ready Educational Environment Method (Roff et al. 2005, [DREEM]). Multiple linear regression was used to investigate the independent effects on the questionnaires.

Results:

A total of 624 students (F=347, M=277) were included in the analysis. ILS assessed the undergraduate learning styles: 20.7% active learners, 47.9% sensing, 68.2% visual and 18.1% sequential learners. Sudents adopted different approaches simultaneously. The mean overall DREEM score was (112.76, SD19.54) indicating a more positive view of their environment. Fifty eight percent were ample in their ability to reflect. Females, older students, and from higher socioeconomic background reflect more. In the final student learning model, reflection was positively associated with a deep approach, organised/effort approach, academic self perception and perception of learning, whilst a surface approach was negatively associated with reflection. Students with higher academic achievement were able to

reflect and adopt an organised/effort approach, whilst students with lower grades had low reflective scores and adopt a surface approach.

Conclusion:

KAUFD dental students demonstrate sensing and visual learning styles. An effective learning environment that facilitates reflection results in the development of self directed learners. Self directed students take control over their own learning and are able to employ strategies such as a deep and organised approach to studying that can influence and optimise their learning and academic performance.

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May God bless you.

Chapter 1   Introduction

1.1. Definition of Learning:

Learning theories can serve as a structure to guide development and evaluation of dental education programmes and practice (Mann, 2002). Learning in health care is defined as the cognitive processes whereby an individual acquires the professional and ethical values, biomedical, behavioural and clinical knowledge, and the reasoning and psychomotor skills necessary for professional competence (Falk-Nilsson et al., 2002). Teaching is defined as a means of facilitating and supporting learning (Falk-Nilsson et al., 2002).

Learning is usually considered in two perspectives: Firstly, the cognitive perspective which examines the process occurring in the learner's thinking and memory, and is defined as the ways in which humans reason, understand, diagnose, solve problems and engage in mental processes associated with critical thinking (Mann, 2002, Hendricson et al., 2006). This includes learners characteristics such as preferred learning styles, how they approach their learning, and reflecting on what one has learned (Boyd, 2002, Hutchinson, 2003). In order to develop reflective practice, students are required to develop the necessary skills for 'self directed' learning which underlies many of the characteristics needed for the development of critical thinking skills that are necessary for the practice of dentistry (Hendricson et al., 2006).

The second is the social and environmental perspective, in which learning is affected by the environment and the learner's interaction with that environment (Maudsley and Strivens, 2000, Henzi et al., 2005). An ideal academic environment can be defined as one that best prepares students for their future professional career and contributes towards their personal development as learners as well as their social well-being (Divaris et al., 2008). Individuals are constantly interacting

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dynamically with their educational environment, such as their teachers, colleagues, other health care professionals, and patients. The responsibility of a teaching institution is to create a high-quality environment for students that continually assesses their needs and promotes the development "self directed" learning, which will facilitate the development of the critical skills that are necessary for lifelong learning and continuous professional development (Mann, 2002).

There are a number of factors affecting an academic dental institute such as cultural, social, economic and motivational (Falk-Nilsson et al., 2002). Educational goals and principles may be similar between different cultures but the actual methodology and implementation must be tailored to fit different social needs (Falk-Nilsson et al., 2002, Pulido et al., 2006). Socio-economic status, gender, and race may also influence learning and the motivation to learn. Also economic circumstances may play a role in how students learn: economic motivation may lead to superficial learning, and the outcome may be the same for students' who are only exam orientated (Falk-Nilsson et al., 2002).

The challenge for dental educators is to find a balance within students' learning characteristics and their perception of the learning environment that facilitates the following (Maudsley and Strivens, 2000):

- Acquisition of knowledge by adopting the necessary styles and approaches that enhance the ability of students' reflective processes.
- Motivation and willingness of the students to update this knowledge by acquiring the necessary skills for lifelong learning and continuous professional development

1.2. Dental Education and KAUFD:

There is a need to review the learning and teaching provided for undergraduate dental students in the Middle East. This has been brought on by the effects of globalisation on the region and specifically on education. The dentist has a more proactive public health care role, in which he / she is expected to assess and manage a multitude of oral pathologies (i.e., oral physicians, with expanded focus beyond the teeth and supporting structures) and have knowledge regarding sophisticated scientific concepts (Hendricson and Cohen, 2001, Pulido et al., 2006). There is also a challenge in developing countries to advance and maintain their training programmes that would match the oral health needs and the infrastructure of the country. This places pressure on dental education programs to impose a large quantity of information on their students and at the same time stress the importance of continuing education and professional development in order to face the technological and scientific advances occurring around the world (Pulido et al., 2006). These and other factors have lead to new insights on learning and teaching methodologies (Hendricson and Cohen, 2001, Hendricson et al., 2006).

The establishment of the Faculty of Dentistry and its four departments and divisions at King Abdulaziz University (KAUFD) was approved by Royal Decree in 1985. The Faculty of Dentistry is organized into four departments and 16 divisions (KAUFD, 2005). KAUFD is one of twelve faculties in the main university campus and the Faculty of Dentistry buildings are part of the Medical School campus and adjacent to the hospital thus providing an excellent learning environment.

The following mission statement was adopted by KAUFD on September 2008: "The Faculty of Dentistry at King Abdulaziz University is a governmental institution whose mission is to dedicate its resources to excellence in education, research, patient care, and contribution to the improvement of oral health across the Kingdom of

Saudi Arabia." Inherent in this mission are methods of instruction, research, extended education, and public service designed to improve the oral health care in the Kingdom of Saudi Arabia. The complete mission statement and goals are shown in Appendix A. The school follows the traditions and examples of Islamic teaching. There are two campuses, one for males and another for females, thus teaching is separate for the genders. The education methodology adopted by the Faculty of Dentistry aims to develop competent graduates to the level of clinical care and critical thinking which will render them lifelong learners. Teaching and learning methods consist of lectures, laboratory training, and clinical sessions (KAUFD, 2005).

The duration of dental training at KAUFD is six years with a final year of internship; the first year consists of Islamic studies, Chemistry, Physics, Biology and English language. The second and third years cover the basic sciences and pre-clinical subjects. The basic medical science courses are provided by the Faculty of Medicine. The number of lectures decline as the clinical training takes up more hours towards the graduation. The fourth and fifth years are clinically based. During the sixth year, comprehensive care clinics are introduced and the main objective of this course is to ascertain that each student has acquired clinical judgment, skills, and the right attitude necessary to deliver high quality general dental care for patients. They learn how to manage cases and provide whole patient care rather than concentrate on specific clinical requirements, and a final exam is taken. Then the graduated dentists have a final year where they practice dental procedures in a sheltered learning environment during their internship year (KAUFD, 2005). The complete distribution of the academic plan is illustrated in Appendix A.

Following the establishment of the School of Dentistry in Jeddah, Saudi Arabia 20 years ago, little attention has been paid to how the students perceive their learning environment and whether that environment is conducive to their learning. In

addition, what are the learning styles and learning approaches that the students are using to cope with the curriculum. Assessing the learning environment and understanding how undergraduate students learn will help academics facilitate learning and plan a curriculum that will achieve optimum learning outcomes (Hendricson and Cohen, 2001, Falk-Nilsson et al., 2002, Hendricson et al., 2006). Culture strongly influences the way students adapt to educational methods and their attitudes towards learning and the educational environment. Although regional and cultural differences exist between undergraduate dental students in the United Kingdom and in Saudi Arabia, what is important is that the educational methods in both dental schools are based on sound educational theory and philosophy. Students at KAUFD manage male as well as female patients, but have little or no contact with each other during their academic studies. While in the United Kingdom, the male and female students are together during lectures and clinical teaching.

The teaching in KAUFD is teacher centred with little participation of the students, while at The Barts and London School of Medicine and Dentistry the teaching is student centred utilising a competency based curriculum.

During 2004-2005 a DentEd Site visitation under the auspices of Association of Dental Education in Europe (ADEE) was organised. DentEd was a Thematic Network Project achieving convergence in standards of output of European dental education (DentEd, 2007). The first phase of DentEd was focused heavily on peer visitations to dental schools as the major driving force of change through a positive peer assessment following a visit protocol. The aim of the visit for KAUFD was to gain global recognition and be a leader in dental education in the Middle East. A self assessment report was prepared in advance of the visit which evaluated all components of the dental curriculum. The visitor's report was positive and praised the KAUFD but there were some concerns about the curriculum and learning processes. Some of the recommendations included; 1) Curriculum issues to change

from a lecture-teacher based curriculum to one that is student centred. 2) Decongestion of the curriculum with horizontal and vertical integration, and 3) Incorporation of reflective learning into the curriculum as there were limited opportunities for the students to undertake reflective learning practices. The report commented that there was a minimal uptake of continuing professional development especially in the area of education principles of teaching and learning by the faculty (DentEd Site Report, 2006).

It is important to communicate globally about desired outcomes of the dental education programs, which is based on the exchange of ideas and discussions concerning best practices that will lead to efficient and effective learning outcomes for dental students (Falk-Nilsson et al., 2002). There are a number of associations that work to develop and incorporate new ideas about learning and teaching in dental education. Some of the associations are presented below:

1. The Association for Dental Education in Europe (ADEE) founded in 1975 as an independent European organisation representing academic dentistry and the community of dental educators. Since then, ADEE has played an important role by enhancing the quality of education, advancing the professional development of dental educators and supporting research in education and training of oral health personnel. ADEE is committed to the advancement of the highest level of health care for all people of Europe through its mission statements that promote the advancement and foster convergence towards high standards of dental education and disseminate knowledge and understanding on dental education (ADEE, 2009).

2. The American Dental Education Association (ADEA) promotes good educational practices related to dentistry and are reflected in the Association's core values of promoting and improving excellence in all aspects of dental education (ADEA, 2009).

3. The International Federation of Dental Educators and Association's (IFDEA) is a global community of dental educators (ADEA and ADEE) who have recently joined together to improve oral health worldwide by sharing knowledge and raising standards. IFDEA will serve as an axis of information, best practices, exchange programmes, news and professional development for the many regional dental education associations, academic dental institutions and individual dental educators worldwide (IFDEA, 2009).

4. The Association for the Study of Medical Education (ASME) seeks to improve the quality of medical education by bringing together individuals and organisations with interests and responsibilities in medical and healthcare education (ASME, 2009).

Chapter 2 Literature Review

2.1. Learning Styles

2.1.1. Introduction:

It has been recognised that student learning differs from one individual to another and is influenced by the students' response to different factors in the learning environment (Paul et al., 1994). The more academics understand these differences, the better chance they have of meeting the various needs of all their students and improving the quality of learning (Felder and Brent, 2005, Hawk and Shah, 2007). Learning styles is the term given for these individual differences between students; it is the manner in which students receive and process information (Coffield et al., 2004, Felder and Brent, 2005, Hall and Moseley, 2005). There has been an increased interest in the research concerning students' learning styles during the last thirty to forty years in several fields such as engineering and medicine, primarily to improve learning and teaching (Coffield et al., 2004).

2.1.2. Background of Learning Styles:

The concept of learning styles has its roots in the study of cognitive style, or the processing of information. Learning styles are defined as "characteristic cognitive, affective, and psychological behaviours that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (Keefe, 1979). Learning styles are apparent in the way individuals approach educational events and are shaped by an individual's previous experiences and the context in which learning takes place (such as in the home, school, and society) (Keefe, 1979, Valiente, 2008).

The research in the area of learning styles has been conducted in several domains, including medicine and health care training, management, industry, and vocational training (Coffield et al., 2004, Felder and Brent, 2005, Hall and Moseley, 2005). Hall

and Moseley reviewed the extensive literature on learning styles, they categorised learning styles into a range of families according to what extent the developers of the learning style models appear to believe that learning styles are fixed (Coffield et al., 2004, Hall and Moseley, 2005). At one end of the spectrum, there are theorists that suggests that a preferred learning style develops early in life and tends to remain relatively fixed and constant throughout life (Gregorc, 1979). But according to Hall and Moseley, these learners will be hesitant to move beyond "their comfort zone" to develop new skills and enhance their learning (2005). Examples of these theories are; Gregorc's Mind Styles Model and Style Delineator (GSD), Dunn and Dunn model and Instruments of Learning Styles, and Myers-Briggs Type Indicator (MBTI) (Coffield et al., 2004, Hall and Moseley, 2005).

At the opposite end of the spectrum, are those developers that perceive learning styles as changing over time depending on a specific learning task and the learning environment (Coffield et al., 2004, Hall and Moseley, 2005). The developers of these types of learning style models believe that students have a differential preference for learning, which changes to some extent from situation to situation depending on the context and / or environment, but there is a long-term stability with time (flexible stable) (Coffield et al., 2004, Hall and Moseley, 2005). Examples of these theories are; Kolb's Learning Style Inventory (LSI), Honey and Mumford's Learning Styles Questionnaire (LSQ), and Felder and Silverman's Index of Learning Styles (ILS) (Kolb, 1984, Coffield et al., 2004, Felder and Brent, 2005).

2.1.3. Inventories of Learning Styles:

Numerous learning style inventories have been presented over the past thirty years by many researchers in this field (Coffield et al., 2004). The learning style inventories are based upon information–processing models that basically aim to describe an individual's preferred intellectual approach to assimilating information

(Snelgrove, 2004). Table 2.1 represents just some of the instruments that are used to assess learning styles according to a classification of stable or flexible stable learning styles (Coffield et al., 2004).

Table 2.1: Instruments that are used to assess learning styles according to Stable or Flexible Stable Learning Style

Stable Learning Styles	Flexible Stable Learning Styles
Apter's Motivational Style Profile (MSP) (1998)	Kolb's Learning Style Inventory (LSI) (1984)
Dunn and Dunn model and Instruments of Learning Styles (1992)	Felder and Silverman's Index of Learning Styles (ILS) (1988)
Gregorc's Mind Styles Model and Style Delineator (GSD) (1982)	Allison and Hayes: Cognitive Styles Index (CSI) (1988)
Myers-Briggs Type Indicator (MBTI) (1998)	Honey and Mumford's Learning Styles Questionnaire (LSQ) (1992)
Riding's Cognitive Style Analysis (CSA) (1991)	Herrmann's Brain Dominance Instrument (HBD) (1996)
Sternberg's Thinking Style Inventory (TSI) (2001)	Jackson's Learning Style Profiler (LSP) (2002)

Coffield and colleagues critically reviewed the most commonly used learning styles inventories, and examined 13 out of the 71 separate models (Coffield et al., 2004). In their review a number of problems within the research field were identified. First of all, there was an overlap among the concepts used, but no direct or easy comparability between the different approaches, this is partly due to researchers working in isolation from one another. Sternberg (2001) has argued "the literature has failed to provide any common conceptual framework and language for researchers to communicate with each other or with psychologists at large". Secondly, Coffield and colleagues (2004) suggested that there is a conflict of interest because some of the leading developers of learning style instruments have conducted the research into the psychometric properties of their own tests, which they then are simultaneously offering for sale in the marketplace. The third dilemma was that the review showed that some of the most widely used and best known instruments have psychometric weaknesses in terms of their validity.

Due to the conflicting results from more than 30 years of research, no consensus has been reached about the most effective instrument for measuring learning styles in educational research (Coffield et al., 2004). When choosing an appropriate questionnaire, an instrument developed within an educational setting and available free of charge should be selected to avoid a conflict of interest and financial issues that may result.

In this study, the Index of Learning style (ILS) was chosen for assessing the dental undergraduate student learning styles (Felder and Silverman, 1988, Felder, 1993). The ILS has several advantages over more commonly known instruments such as Kolb's Learning Style Inventory (LSI) and the Myers-Briggs Type Indicator (MBTI), including brevity, ease of administration (Zywno, 2003), assessment of multiple learning style dimensions, and successful use on both paper and computer formats. The ILS is available at no cost to instructors or students who wish to use it for classroom instruction or research, and it can be licensed by non–educational organisations (Felder and Spurlin, 2005, Felder, 2007) .

2.1.4. Development of the Index of Learning Styles (ILS):

In 1988, Felder and Silverman developed a learning style model designed to assess students' learning style differences among engineering students and to provide a basis for engineering instructors to formulate a teaching approach that addresses the learning needs of all students. Felder defines learning styles as "the characteristic strength and preferences in the ways individuals take in and process information" (Felder and Silverman, 1988, Hawk and Shah, 2007). The Index of Learning Styles (ILS) was developed in 1991 by Richard Felder and Barbara Soloman at North Carolina State University to assess preferences on the four scales of the Felder – Silverman model. The validity and reliability of the ILS has been established across multiple fields and on a range of students such as

engineering, and medicine (Zywno, 2003, Cook, 2005, Felder and Brent, 2005, Felder and Spurlin, 2005, Cook and Smith, 2006, Graf et al., 2007, Litzinger et al., 2007).

The ILS consists of four scales, each with 11 items: sensing-intuitive, visual-verbal, active-reflective, and sequential-global. Felder and Spurlin (2005) summarise the four scales as follows:

- Active / Reflective: active learners prefer doing things, learn by trying things out, and enjoy working in groups, while reflective learners prefer working alone or with one or two familiar partners and learn by thinking things through.

- Sensing / Intuitive: sensing style describes students who like facts, data, and experiments, and who are practical, and work well with details; on the other hand intuitive learners are oriented toward theories and underlying concepts.

- Visual / Verbal: visual representations of presented material, such as pictures, diagrams, and flow charts are the preferred learning methods for visual learners, while verbal learners favour written and spoken explanations.

- Sequential / Global: the sequential style describes students that prefer linear thinking and learn in incremental steps, while global learners are strong integrators making discoveries and connections to see the overall picture.

Felder and Silverman (1988) further discuss various teaching approaches that are useful for the different learning preferences that emerge from using the ILS inventory:

- Active learners benefit from carrying out learning activities particularly in groups.

- Reflective learners like to take notes in lectures and benefit from working alone.

- Sensory learners can benefit from solving problems, and working in real life situations.

- Intuitive learners like theories and mathematical models and are innovative problem solvers.

- Visual learners benefit from diagrams, flow charts, demonstrations, or pictures.

- Verbal learners learn best from lectures, discussing information, and explaining to themselves.

- Sequential learners work through analysing on a step-by-step basis.

- Global learners need to see the whole picture before they can see how the steps or parts fit in together (Felder and Silverman, 1988, Hawk and Shah, 2007).

Felder and Spurlin (2005) suggest that learning style preferences are expected to influence students' tendencies to incline towards certain fields of study. They reviewed a large number of studies on undergraduate engineering students in different institutions, and on non-native English speakers, there was a large similarity in the profiles of engineering students at different institutions and at the same institutions in different years. Their findings concluded that engineering students were consistently more active, sensing, visual, and sequential (Felder and Spurlin, 2005). The ILS scores have also been shown to discriminate college students with different majors and college students from faculty (Zywno, 2003). Students who choose to major in abstract fields such as mathematics or physics might be expected to be predominantly intuitive, while students who choose a more practical field as civil engineering or nursing would likely be more sensing (Felder and Spurlin, 2005).

2.1.5. Implications for Learning Styles:

One learning style is neither preferable nor inferior to another, but is simply a difference in students' characteristic strengths and weaknesses (Felder and Brent, 2005). Learning styles should not be used to label individual students for the purpose of implementing specific curriculums, career choices, or to draw conclusions on their future academic accomplishments (Coffield et al., 2004, Litzinger et al., 2007).

Students process information in different ways and therefore investigating the learning style of students can be beneficial to both academics and students. When academics are aware of the diversity of learning styles within their classes they can design learning activities that address the learning needs of all their students, thus providing a more effective learning environment (Hall and Moseley, 2005, Litzinger et al., 2007). Academics can accomplish this by applying a variety of teaching methods, thus learners are exposed to both familiar and unfamiliar ways of learning that will help them excel (Hawk and Shah, 2007).

Also when students become aware of their individual learning styles, it can provide them with insights into their learning strengths and weaknesses, and can empower and transform them as learners, (Felder and Spurlin, 2005). In addition, the students' knowledge of his / her learning styles can be used to increase their self-awareness, self-confidence, and motivation thus taking control over their learning and getting the most out of their learning experience (Laight, 2004).

2.1.6. Association of ILS and Other Variables:

A host of environmental and personal variables can affect individual's learning styles, resulting in diversity among a student population within any discipline (Paul et al., 1994, Joy and Kolb, 2009). Only a handful of researchers have investigated the correlation of learning styles with variables such as age, socioeconomic status,

culture, and academic achievement. Studies on cultural differences in learning styles on students studying international business, have suggested that greater variations in learning preferences are likely to co-exist in culturally diverse cohorts (De Vita, 2001). While another cross-cultural study using the ILS inventory conducted on computer engineering students from the United States and students from the United Arab Emirates found no such cultural differences (Zualkernan, 2005).

2.1.7. Association between ILS and Academic Achievement:

Van Zwanenberg et al (2000) suggest that the ILS is best used to allow individuals to compare the strengths of their relative learning preferences rather than offering comparisons with other individuals academically, basing this on their lack of success in predicting academic performance from ILS scores. Felder also agrees with this argument, he believes that learning styles should never be used to predict academic performance or draw inferences about capabilities of students. He also states that learning styles reflect the preferences of students' and do not indicate strengths or weaknesses of a certain category or dimension as mentioned earlier (Felder and Spurlin, 2005). A study using the Felder-Soloman ILS conducted on Malaysian students at an educational institute found no significant relationship between learning styles and academic achievement (Mohamed and Mohamed, 2005).

Kolb claims that matching the teaching style to the students style will lead to improved learning thus improved academic scores (Kolb, 1984). There is conflicting evidence for his hypothesis, and extensive research evaluating the studies conducted on higher education students learning styles as measured by Kolb's LSI and academic achievement found no evidence to support his claim that "matching the styles" leads to improved academic achievement (Coffield et al., 2004).

2.1.8. Association of ILS and Gender:

Litzinger and colleagues investigated possible gender differences using the Felder-Soloman Index of Learning styles (ILS) between engineering students and they demonstrated that female engineering students tended to be more sequential, sensing, and less visual than the male students (Litzinger et al., 2005). A study conducted on Chinese college students using the ILS questionnaire found that in general, female students are significantly more intuitive and global and less visual than male students (Ku and Shen, 2009). While another study conducted on orthodontic residents in the United States found no such gender differences (Hughes et al., 2009). In addition, studies conducted on distant learners at a Malaysian educational institute found no gender differences among their students as well (Mohamed and Mohamed, 2005).

2.1.9. Summary:

Medical and dental education research is deficient in studies on learning styles of their students. Academics are encouraged to design course work and student activities that are suitable for all learning styles regardless of the students' personal preferences (Coffield et al., 2004, Felder and Brent, 2005, Hawk and Shah, 2007). The use of learning style instruments such as the ILS allows students and faculty to consider and seek out more carefully the factors and activities that are conducive to a more effective learning (Hawk and Shah, 2007). Knowledge of one's learning styles can also be used to increase self-awareness about one's strengths and weaknesses as learners; therefore students become more independent learners and seek a meaningful understanding to what they are learning. In other words, all the advantages claimed for a deep approach to learning, reflection, and metacognition (being aware of one's own thought and learning processes) can be

gained by encouraging learners to become aware of their own learning and that of others (Coffield et al., 2004).

2.2. Approach to Learning and Studying

2.2.1. Introduction:

The purpose of higher education extends beyond the scope of acquisition of knowledge; it involves the recognition of the demands of the workplace and current society. Graduates need to acquire ways of thinking that will enable them to acquire "lifelong" learning skills that will suffice for the rapidly changing times. This depends on the students' ability to guide their own learning and seek understanding of new concepts and ideas. This concept is called the approach to learning and studying. The approaches to learning and studying are not synonymous with learning styles models, such as the Kolb model or the Felder-Silverman model, which are characteristic strengths and preferences in the way people learn (Coffield et al., 2004, Marshall and Case, 2005).

2.2.2. Background of Approach to Learning and Studying Theory:

Since the 1970's there has been much research into learning and teaching which has led to theories on students' intellectual development, and conception of their learning and teaching, which is described as approaches to learning and studying (Marton and Saljo, 1976). Adult students' learning was investigated by the pioneering work of Marton and Säljo in Sweden (1976), (the Gothenburg School). Phenomenography is the term originated by this study, it was based on the idea that an understanding of the phenomenon of learning should be sought through examining the learners' experiences and should involve the actual context and situation where learning takes place (Marton et al., 1997b). Students were asked to read an academic article then answer questions related to that article, furthermore

they were individually interviewed to look for emerging themes. The students' responses depended on how they decided to deal with the task, and two patterns emerged. Some actively engaged themselves with the topic and reached a thorough understanding of the author's meaning, whilst others tried to remember the answers to the questions but could not explain what the author meant. The latter were students who adopted a surface approach to the task at hand, while the former adopted a deep approach to learning and studying. Surface learners use rote learning in an attempt to reproduce facts, rather than the desire to understand, thus leading to restricted learning. These students are motivated extrinsically, created by the demands of an institutional system such as an overloaded curriculum, methods of assessment, and fear of failure. On the other hand, students adopting a deep approach are motivated intrinsically with the intention to understand and relate the information to previous knowledge and personal experience. This approach involves monitoring the development of one's own understanding (self-regulated learning) (Biggs, 1976, Marton and Saljo, 1976, Ramsden and Entwistle, 1981, Entwistle and Ramsden, 1983, Entwistle et al., 2001) and tends to promote academic success (Van Rossum and Schenk, 1984, Gibbs, 1994, Norton and Dickens, 1995).

Further investigations by Biggs (1979, 1989, 2001), Pask (1976, 1988), Entwistle and colleagues (1983, 2000, 2001) on students' approach to learning and studying suggested a need for an additional third approach called the achieving or strategic approach. It describes how students organise their studying methods using good time-management to achieve high academic grades. Students using this approach are motivated by the academic content and the demands of the assessment system as well as their aim to understand. Although students with strategic approach will try to achieve higher grades by any means, using either a surface or deep approach, it has been suggested that it is more useful to combine a strategic approach with a

deep rather than a surface approach, to succeed professionally (Entwistle and Ramsden, 1983, Lonka et al., 2004).

2.2.3. Association of Approach of Learning and Studying with the Learning Environment:

One of the desired outcomes of learning in general, is that students approach their studies with the aim of relating new knowledge to their own previous knowledge rather than superficial rote learning. Entwistle stated that "the task of investigating the approach to learning in each course is clearly impractical, but encouraging academic staff to think about how to assess assignments and examination answers is one way of ensuring that personal understanding is given due weight within the assessment procedure" (Ramsden and Entwistle, 1981, Entwistle, 2000). Learning approaches are influenced by the learning environment created by the characteristics of the teaching and the departments. More precisely, it is the students' perception of this environment that determines the approach to learning and studying that students' adopt (Newble and Entwistle, 1986, Struyven et al., 2006). Bowden and Marton (1998) suggest that by changing the students' learning environment the majority of students can adopt the desired approach. Biggs (2001) stresses that teaching and assessment methods can encourage a surface approach when they are not aligned to the aims of teaching and learning. Also an overloaded curriculum and inappropriate assessment questions may force students to adopt a surface approach (Ramsden, 1997).

The Curriculum should provide opportunities for students to participate in activities which encourage and enhance the development of a deep approach (Newble and Entwistle, 1986). A deep approach to learning and studying has been shown to be associated with long-term success in undergraduate education (Svensson, 1977). To promote a deep approach to learning, teachers should identify student-centred

activities (Zhang, 2000) such as reflective learning, problem based learning (Kember et al., 1997, Haith-Cooper, 2000), and assessment procedures that are directed towards understanding rather than replicating information. Research into student learning has identified four features of a learning environment which could encourage a deep approach to learning (Biggs, 1989):

a. Motivational context: which relates to establishing a positive learning environment associated with motivation.

b. Learner activity: this involves developing methods to enhance reflection and reflective learning.

c. Interaction with others: with peers either in tutorials or student groups.

d. A well-structured knowledge base: integration of the curriculum into wholes that are related to each other, rather than isolated bits and pieces of information.

2.2.4. Inventories for Identifying the Approach to Learning and Studying:

The research on student approach to learning began with interviews and has led to the development of inventories to assess the students' learning approaches. It was found that students were somewhat consistent in their approach to everyday studying, and this consistency or stability allowed inventories to be developed that indicate general ways of studying at the time the inventory was completed (Entwistle and Ramsden, 1983). Assessing the students' approach to learning and studying can be used as a diagnostic tool for lecturers and students to discuss their approaches to learning and how they might be developed over time, relating their approaches to different assessment procedures (McCune and Entwistle, 2000), as well as providing information about the quality of the teaching environment (Coffield et al., 2004, Lonka et al., 2004). These questionnaire surveys have an advantage of obtaining large sample size of students, but they may also lead to low response

rates and misleading information from students wishing to present themselves in the best light possible. Entwistle, Ramsden and Biggs were the first to design inventories to investigate university students' approaches to learning. A two step method was used in developing these inventories, researchers started with interviews on a large sample of students ranging from 912 students (Biggs, 1976, 1979) to 2208 students (Ramsden and Entwistle, 1981) and then proceeded into constructing the inventories. Table 2.2 illustrates a number of inventories that are used to assess the students' approach to learning.

Table 2.2 : Name of some of the inventories that are used to assess the students' approach to learning, author, and year of development

Inventory	Author	Year
Study Behaviour Questionnaire (SBQ)	Biggs	(1976, 2001)
The Inventory of Learning Processes (ILP)	Schmeck et al	(1977)
The Study Process Questionnaire (SPQ)	Biggs	(1979, 1989)
Lancaster approach to studying Questionnaire (LASQ)	Ramsden and Entwistle	(1981)
The Approach to Learning and Studying Inventory (ALSI)	Entwistle and Ramsden	(1983)
Reflections on Learning Inventory (RoLI)	Meyer	(1991)
Revised Approaches to Studying Inventory (RASI)	Tait and Entwistle	(1996)
Approach to Skills Inventory for Students (ASSIST)	Tait	(1998)
Inventory of Learning Strategies (ILS)	Vermunt and van Rijswijk	(1994)
Approaches to Teaching Inventory (ATI)	Trigwell et al	(2004)
Inventory of General Study Orientations (IGSO)	Mäkinen et al	(2004)

The most widely used questionnaire on student learning in higher education is the Approaches to Learning and Studying Inventory (ALSI) devised by Entwistle and his colleagues (Ramsden and Entwistle, 1981, Entwistle et al., 1979, Entwistle and Ramsden, 1983). Advantages of the ALSI are the ease of administration, it is a short instrument, and has been used to assess the approach to learning and studying of undergraduate medical students. Over the past 20 years, the approach to studying questionnaire / inventory has been extensively validated in a wide

variety of educational settings, for example graduate programs, with differing age, gender, cultural and geographical groups (Ramsden and Entwistle, 1981, Ramsden, 1983, Richardson, 1994b, Richardson et al., 1995, Watkins and Regmi, 1996, Marton et al., 1997a). Furthermore, the ALSI has been widely utilised on a variety of student groups in higher education such as in psychology, arts, and medicine (Newble and Entwistle, 1986, Stiernborg et al., 1997, Entwistle et al., 2001, Lindemann et al., 2001, Mattick et al., 2004, Reid et al., 2007). The inventory provides information about the approaches to learning that are adopted by students in response to the manner in which courses and programmes are delivered (Richardson, 1990). The ALSI has also been used to monitor students' approaches to learning and studying over time (Lindemann et al., 2001, Mattick et al., 2004, Reid et al., 2005, Reid et al., 2007).

The ALSI was developed through a number of pilot versions with factor analysis at each stage to group together variables that were checked for consistency and validity of the inventory (Ramsden and Entwistle, 1981). It has had a number of formulations ranging from 18 to 64 items with some 7 to16 subscales (Richardson et al., 1995).

The short ALSI (18 item inventory) has four subscales: deep (with intention to understand and relating ideas), surface (memorisation without understanding and fragmented knowledge), monitoring (monitoring and adjusting their own learning processes according to the learning task), and organised / effort approach (students organise their studies and use good time management). Table 2.3 illustrates the characteristics of the four different subscales of the ALSI (Entwistle, 1988). This inventory is part of the Enhancing of Teaching and Learning Environments in undergraduate students Questionnaire (ETL) Part 1 Approach to learning and studying, and can be accessed through: (ETL, 2001).

Table 2.3: The characteristics of the subscales measuring the short version of the Approaches to Learning and Studying ALSI (Deep, Surface, Monitoring, and Organised / Effort)

Deep	Surface	Monitoring	Organised / Effort
• Intention to understand • Relating ideas • Use of evidence	• Memorising without understanding • Fragmented knowledge	• Study effectiveness • Monitoring understanding	• Time management • Study organisation • Effort management • Concentration

2.2.5. Difference of Approach to Learning and studying across Disciplines:

Learning approaches do not describe developmental stages through which learners pass, and an approach that a student might adopt can vary from one discipline to another and even from one topic to another (Entwistle and Ramsden, 1983, Lonka and LindblomYlanne, 1996).

Students learn tacitly the norms of their disciplinary culture during their years of study, for example from older students or from faculty members. Different disciplines such as psychology have their own understanding when it comes to shared concepts of theories, methods, techniques, and problems which might affect the approach adopted (Ylijoki, 2000). Previous studies have shown that students undertaking scientific studies or applied sciences are more likely to adopt a surface approach to learning, whilst students in humanities are more inclined to adopt a deep approach to learning (Ramsden and Entwistle, 1981). However, in a recent study conducted on 130 first year medical students using ALSI, it was found that students have a higher mean score for the deep approach and lower mean scores for the surface approach. This indicates that if medical students are interested in understanding the course content, then they are able to relate ideas and monitor their learning and studying skills in a positive manner (Mattick et al., 2004).

2.2.6. Association of Approach of Learning and Studying (ALSI) with Gender and Age:

In earlier phenomenographic studies, basic information such as gender and age of the participants were left out; in fact no information was provided about the students' personal characteristics, and in the original experiment all the participants were women (Richardson, 1994a). Few studies have considered the association between age and gender on students' approaches to learning and studying. As argued by Meyer and Richardson (1989, Mattick et al., 2004, 1994b) and later endorsed by Sadler-Smith and Tsang (1998), "Gender differences constitute potentially important and neglected sources of variation in student learning which, when detected in context, can and should be explicitly managed by academic practitioners". The findings concerning gender differences in approaches to learning are uncertain. Studies in higher education using different inventories and versions of the ALSI identified no mean gender differences on the approaches to studying scales (Clarke, 1986, Miller, 1990, Richardson, 1994b, Wilson et al., 1996, Zeegers, 2001, Duff, 2002) whereas other studies indicated significant group differences based on both age and gender (Watkins and Hattie, 1981, Sadler-Smith, 1996, Zhang, 2000). In one such study, Gledhill and Van Der Merwe (1989) reported that males scored higher on the surface approach and strategic approach while females scored higher on the deep approach. A study involving medical students approach to learning, reported that females have a higher surface approach score than male students (Mattick et al., 2004). The ALSI is a self-reported measure; it relies on the students' self-awareness of their approach to studying and precise demonstration of this, thus gender differences using self-report study inventories tend to occur especially on scales examining affective aspects of study rather than cognitive aspects (Duff, 2002).

Mature students are more likely to adopt a meaning orientation (deep approach) to their studying and less likely to adopt a reproducing (surface approach) orientation (Richardson et al., 1995, Watkins and Regmi, 1996, Sadler-Smith, 1996). Richardson reported that there were no sign of differences between older and younger students in their responses to the 32-item ALSI (1994a).

2.2.7. Association of Approach of Learning and Studying (ALSI) with Students' Socioeconomic status and Culture:

Volet and Jarvela (2000) suggested that general study orientations are affected, at least to some extent, by culturally adopted values and preferences. Cultural background may influence the students' learning approaches and his / her capabilities of adjusting to a learning situation (Lonka et al., 2004). Studies on cultural differences have pointed out that students of Asian background might represent learning as a combination of memorising and understanding (Marton et al., 1997b, Entwistle and Peterson, 2004). Researchers in phenomenological sociology argue that cultural elements such as social norms, attitudes, and values are internalised into the personality and also form the basis of the individuals interests, preferences, and motivation (Volet and Jarvela, 2000, Lonka et al., 2004). The association between learning approaches using Biggs study process questionnaire and socioeconomic status has been investigated by observing students with travel and work experiences in three different cultures, Hong Kong, China, and the United States. It was found that although parents' education levels did not make a difference in the preferred leaning approach among Hong Kong and mainland Chinese students, higher parent education levels was found to be associated with the use of deep approach among students from the United States (Zhang, 2000).

2.2.8. Association of Approach of Learning and Studying (ALSI) with Academic Achievement:

According to Marton and Entwistle, adopting a deep approach to studying will lead to improved understanding, and thereby improved academic performance (Marton and Saljo, 1976, Entwistle et al., 2000). It was found that students adopting a deep approach spent more time studying and passed a greater proportion of their examinations when compared with students who adopted a surface approach to learning and studying (Svensson, 1977). Entwistle and Ramsden (1983) reported a number of significant relationships between subscales of the approach to learning and studying inventory and indices of academic progress for students in Britain and Australia, but claim that the approach to studying inventory was never intended to predict academic performance. Subsequent research on student learning has shown that deep and organised approaches tend to lead to better academic achievement, (Van Rossum and Schenk, 1984, Gibbs, 1994, Norton and Dickens, 1995, Zhang, 2000, Duff et al., 2004), but only when the assessment procedures emphasise and reward personal understanding (Entwistle, 2000). This supports Biggs (1979, 1989) findings, that students who adopted a surface approach scored higher achievement scores when the learning task required a simple recall of facts and not details. Studies conducted on undergraduate and graduate medical students found that the assessment scores correlated positively with the organised and deep approach to studying, and negatively with the surface approach (Arnold and Feighny, 1995, Mattick et al., 2004, Reid et al., 2007).

2.2.9. Summary:

Positive learning outcomes such as deep approach to learning and studying extends beyond university teaching and contributes to development of future graduates who display desirable approaches that enable them to develop the skills

necessary for self-directed learning and studying. It is important that the dental curriculum promotes teaching and assessment methods that encourage students to adopt a deep approach. Inventories that can assess and monitor student approaches to studying will provide a practical evaluation tool for students and teachers alike.

2.3. The Reflective Process:

2.3.1. Introduction:

Enhancing the quality of teaching and learning in higher education is a major concern of educationalists (Biggs et al., 2001). The process of reflection is an integral component for the development of critical thinking and is a distinctive step in the process of self-directed or self regulated learning (Hammond and Collins, 1991, Mezirow, 1996). Reflection and reflective practices are regularly noted in the education literature and are described as essential characteristics of competent health care professionals (Schon, 1983, Boud et al., 1985, Schon, 1987, Moon, 1999, Mann et al., 2009). Evidence of reflection is also becoming part of licensing and revalidation process requirements as stated in the General Dental Council (GDC, 2010). The General Dental Council in The First Five Year guidelines for undergraduate dental education for professional development support the importance of continuing professional education in order to ensure high levels of clinical competence and knowledge (GDC, 2007).

2.3.2. Background of the Reflective Theory:

There are many definitions for reflection in the literature (Mann et al., 2009). As early as 1933, Dewey suggested that critical thinking was associated with making decisions about uncertain or ill-defined problems and is linked to experience. He

suggested that this type of thinking is referred to as reflective thinking. Dewey (1933) characterised reflection as the "hallmark of intelligent action".

Schon (1983) is credited with reviving the concept of reflection previously reported by Dewey. He defined reflection as 'the process of internally examining and exploring an issue of concern, triggered by an experience, which creates and clarifies meaning in term of self, and which results in a changed conceptual perspective".

Further, Boud et al (1985) defined reflection as "a generic term for those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to a new understanding and appreciation".

All the definitions emphasise critical analysis of knowledge and experience in order to achieve a deeper understanding (Mann et al., 2009). Reflection is believed to be an active process of exploration and discovering (Ertmer and Newby, 1996), as well as transforming and integrating new experiences with previous / existing knowledge (Fry et al., 2005).

There are several types of knowledge that are needed to perform the reasoning involved in reflective thinking;

- First, declarative (conceptual) knowledge; which consists of the basic facts and concepts needed as a foundation for higher order thinking (Boyd, 2002).

- The second is procedural knowledge; relating to how strategies work, in other words experiential knowledge (Boyd, 2002).

- The third is metacognitive knowledge: which monitors and controls strategies used in applying declarative and procedural knowledge (Boyd, 2002). Metacognition is defined as " the ability to think about thinking, to be consciously aware of oneself as a problem solver, and to monitor and control one's mental processing" (Bruer, 1997).

For learners to effectively engage in reflection, they must use these concepts together. Employing declarative and procedural knowledge alone without metacognition results in passive learning with superficial level of knowledge (Chambers, 2001, Boyd, 2002, Ashley et al., 2006). When students reflect on both the process and the content of their learning, they are able to take control of their learning (self-regulated) and shift towards a deeper approach to learning and studying (Gibbs, 1994, Moon, 1999, Pee et al., 2000, Sobral, 2000).

The benefit of reflection lies not only with improving students' educational outcomes, but also enhancing the quality of learning and teaching and improving professional development (Sobral, 2000, 2004, Strauss et al., 2003).

It is believed that students can gain competence and confidence using metacognitive knowledge and skills, if they are given opportunities to apply them in a variety of learning environments. Moon (1999) describes ways in which reflection is a part of a learning process, such as when a learner takes a deep approach to learning, or when a learner reformulates his / her current understanding to represent his/her learning in challenging written or oral work.

There has been a translation of reflection and reflective process into courses and programmes for the initial training and continuing education of a wide variety of specialties, particularly in teaching, nursing, and medicine where field experience and academic study need to be closely integrated (Schon, 1987, Boud and Walker, 1998). Creating a culture of reflection requires strategies that encourage self-assessment, recording of log books, and group discussions asking students to analyse and critique ideas (Pee et al., 2000, Mofidi et al., 2003, Strauss et al., 2003, Fry et al., 2005, Mann et al., 2009).

Pee and colleagues (2002) examined twenty six dental students' reflective thinking using a structured activity called "A learning experience" (ALE), which focused on personal experiences of reflection and the role of emotion in reflection. The extent to

which the ALE facilitated valid reflection is unclear (Mann et al., 2009), but it was found that students who completed the exercise demonstrated that they were able to reflect at a deeper and more descriptive level.

Sobral (2000) studied the development of reflective thinking based on course activities designed to foster reflective thinking in medical students, the post-course participants' level of reflection changed as measured by the Reflection in Learning Scale (RLS) while the control group level of reflection did not. Further, those with higher reflection in learning scores had a higher grade point average.

Studies conducted on portfolios to enhance reflection showed that although the use of portfolio's induced reflective thinking, it is not a "key factor" in promoting reflective learning due to practical barriers such as constraints of time and lack of computer access (Beecher et al., 1997, Pearson and Heywood, 2004, Mann et al., 2009). Across all the diverse methods in enhancing the development of reflection and reflective practice, it appears that the most influential are; a supportive environment, accommodation for different learning styles, mentoring, group discussions, and time for reflection (Mann et al., 2009).

2.3.3. Implications for Dentistry:

The General Dental Council (GDC, 2010) guidelines requires practitioners to be competent and reflect on their learning in order to achieve lifelong learning skills and continuous professional development. Therefore dental education should encourage students to adopt a deep approach to learning and train them to establish their own learning goals. In order to achieve this, dental schools need to foster reflection and reflective thinking. Reflective thinking guides students through uncertain and ill-structured problems that they may encounter in the dental clinic (Boyd, 2002).

Dental practice requires both reflection-on-action and reflection-in-action (Schon, 1983, Ertmer and Newby, 1996). Reflection-on-action represents the active process

of making sense of a past experience or situation after it has happened, for the purpose of re-evaluating and seeking an alternative approach for a current and or future thought or action. Reflection-in-action reshapes what we are doing while we are doing it, this type of reflection involves the managing and adjusting the progress of learning while it is taking place, sometimes thinking backward to a previous experience or forward to predict and assess a current situation (Schon, 1987, Sobral, 2005). Dental educators need to be aware that the reflective process is a result of a cycle of action and reflection; consequently students need time for reflection in the dental curriculum (Schon, 1983, Boud et al., 1985, Lee and Caffarella, 1994, Boyd, 2002).

Without reflection, learners may not be capable of recognising conditions when certain strategies can be used and may fail to transfer knowledge and strategies to different tasks (Ertmer and Newby, 1996).

2.3.4. Development of the Reflection in Learning Scale (RLS):

It has been suggested that better knowledge of the students' reflective profile might be beneficial to help students in their quest for self-regulated learning. The assessment of reflection is fairly new, Mann (2009) reviewed the literature on reflection and reflective practice, she reported nine studies that assessed students' reflective process and concluded that reflection can be assessed. Although students do not have the same opportunities as professionals for reflective practice, but failure to assess reflection and reflective thinking may imply to learners lack of real value for this activity. Sobral (2000, 2005) reported the features of a questionnaire that is used to measure the conscious engagement of students in the process of reflection, called the Reflection-in-Learning Scale RLS (Sobral, 2005, Mann et al., 2009).

The Reflection in Learning Scale (RLS) was developed by Sobral (1995, 2000, 2001, 2005). The validity and feasibility of the RLS has been tested a number of times by Sobral (2000, 2001, 2005). It is a self-reported questionnaire that can help establish the students' reflection profile in relation to self-regulated learning. The item-structure of the instrument was generated from multiple sources of information (Sobral, 1995). The RLS is a 14 item scale and the extent of perceived personal efficacy ranges from restricted to maximal ability to reflect. The RLS may encompass important cognitive behaviours involved in the decision making process of initial learning, upgrade of learning and the learners' self-appraisal. Overall, the RLS seems a useful tool in the appraisal of variation amongst medical or dental students in terms of the learning profiles and self-monitoring embedded in their reflection profile (Sobral, 2000, Mann et al., 2009).

2.3.5. Association of the Reflective Process (RLS) with Students Characteristics:

Studies on medical students showed no significant gender or age differences (Sobral, 2005). More studies are needed to assess the relation of reflection with demographic variables such as age, gender and socioeconomic status to gain a better understanding of the different factors that might be associated with the reflective process.

2.3.6. Association of the Reflective Process (RLS) with Academic Achievement:

Reflective learning has been associated with improved educational outcomes (Zimmerman and Schunk, 2001). A study involving medical students found that students who are committed reflectors have a stronger sense of their professional identity and are most certain about their professional choices (Niemi, 1997). Sobral

(2001) reported that the RLS scores are related to academic achievement in subtle ways, he found that high achievers showed a higher RLS scores both at the start and at the end of the term, a greater proportion of positive change in RLS during the term, and stronger perceived personal efficacy in reflection, when compared with their classmates. The finding that greater drops in RLS score tend to be associated with poorer grades seems consistent with the proposed role of reflection in the demonstration of learning.

2.3.7. Association of the Reflective Process (RLS) with the Learning Environment:

The learning environment can have either a supportive or a hindering affect on reflection and reflective thinking (Mann et al., 2009). Mitchell (1994) described a six-item scale of reflection in his survey of the cognitive behaviour of medical students, he reported a positive correlation between reflection and the measures of conceptualisation and positive learning experience. He also suggested that learners who seek an understanding of what they learn obtain a more satisfying and meaningful learning experience. Furthermore, students who reported more activities that are reflective derived greater benefit and enjoyment of their university studies (Sobral, 2000).

2.3.8. Summary:

The reflective process is a powerful tool that can encourage learners to gain new insights and understanding about themselves and their environment (Strauss et al., 2003), it can also facilitate their development personally and professionally (Mofidi et al., 2003). The reflective thinking aspect of critical thinking is crucial to the dental student's developing sound clinical judgement, yet it is not regularly employed within dental education, but if used it will likely lead to deeper approach to learning along

with development of critical thinking that will facilitate lifelong learning and professional practice (Pee et al., 2000, Boyd, 2002).

2.4. The Learning Environment:

2.4.1. Introduction:

The importance of the educational environment has been highlighted in recognition of the challenging mandates of professional education (Genn, 2001a). The students' perception of their educational environment influences their response to teaching, their learning styles and approaches (Ramsden and Entwistle, 1981, Pimparyon et al., 2000, Genn, 2001b). The quality of the educational environment also reflects the quality of the curriculum (Roff, 2005).

2.4.2. Background of the Learning Environment in Dentistry:

An ideal dental educational environment should enable students to acquire the necessary theoretical and clinical competencies that contribute towards their professional development as well as their social and emotional well-being (Zamzuri et al., 2004, Divaris et al., 2008). Achieving such goals requires institutions with environments that assist in fostering competent dentists. Measuring an educational environment can be difficult, especially a dental environment that consists of a multitude of settings such as, the curriculum, lecture rooms, phantom laboratories, dental clinics, and assessments. This array of settings is further complicated by a variety of social factors, such as colleagues, lecturers/tutors, clinicians, from different departments, and administrators (Dunne et al., 2006). When students enter a new institution or school, they may respond differently to these settings, therefore evaluating the student's perception of an educational environment may assist in identifying areas of strength and weaknesses within an environment to provide administrators with information on target areas for improvement (Pimparyon et al.,

2000, Henzi et al., 2005) and enhance students' learning experience (Roff, 2005) as well.

Students achieve the greatest success when they learn in a system that consists of well-defined, attainable goals and objectives. Even the best teaching will be compromised if the students do not understand the purpose of a lesson or what the instructor expects of them (Rovin and Packer, 1971, Chapnick and Chapnick, 1999). The student's perception of their faculty and their fellow students is also important and considered as "major determinants of their motivation and strongly influencing the level and direction of their efforts in learning" (Sanazaro, 1966). Successful instructors can create a learning environment that enables students to trust them and thus creating an emotional tone by listening and answering their students' questions accurately and politely (Chapnick and Chapnick, 1999).

2.4.3. Assessing the Educational Environment:

Identifying the students' perception of their learning environment and investigating the dynamic interplay between the students and their learning environment opens new pathways for understanding student learning in higher education (Marshall, 1978, Henzi et al., 2005).

A number of survey instruments have been developed to assess student's perception of their learning experience and overall environment within higher education. Table 2.4 illustrates some of the instruments that are used to assess the learning / teaching environment of health professions (Schwartz and Loten, 2004, Henzi et al., 2005, Roff, 2005).

Table 2.4: Name of instruments, author, and year for instruments used to assess the teaching / learning environment of health professions

Instrument	Author	Year
The Attitudes Toward Social Issues in Medicine (ATSIM)	Parlow and Rothman	(1974)
The Cognitive Behaviour Survey (CBS)	Mitchell	(1994)
The Dundee Ready Education Environment Measure (DREEM)	Roff	(1997)
The Clinical Post Conference Environment Survey (CPCLES)	Letizia and Jennrich	(1998)
The Clinical Learning Environment Inventory (CLEI) in nursing education	Chan	(2002)
Clinical Education Instructional Quality Questionnaire (ClinEdIQ)	Henzi	(2006)
Medical School Learning Environment Survey (MSLES)	Stewart et al	(2006)

Most of these inventories are culturally-specific to the region for which they were developed. The advantage of the Dundee Ready Education Environment Measure (DREEM) is that it is an internationally validated and the only non-culturally–specific inventory that can provide educators with a diagnostic tool to measure students' perception of their learning and teaching climate (Roff et al., 1997, Pimparyon et al., 2000, Al-Hazmi et al., 2004a, Mayya and Roff, 2004, Zamzuri et al., 2004, Roff, 2005).

2.4.4. Development of the DREEM Inventory:

The DREEM inventory is specific to the environment of medical and health related fields (Roff et al., 1997). The DREEM questionnaire was developed at the Dundee University Medical School, utilising a form of grounded theory and a Delphi panel of more than one hundred health professions educators from around the world to generate criteria of desirable educational climates for health profession education that would permit effective educational strategies (Roff et al., 1997). This resulted in the 50-item DREEM inventory, which is useful in the assessment of the quality of an educational environment, particularly the learning and teaching climate (Roff, 2005). It consists of five subscales or domains covering students' perception of learning,

teachers, atmosphere, academic and social issues. McAleer and Roff (2001) provide score descriptors as an approximate guide to interpreting the subscales (Appendix B). The DREEM inventory has been validated and is used in many countries to assess health care students' perception of their environment and has been translated into several languages including Spanish, Dutch, Chinese and Arabic (Al-Hazmi et al., 2004a, Mayya and Roff, 2004, Zamzuri et al., 2004, Roff, 2005, Miles and Leinster, 2007). DREEM can be applied to generate a profile of particular institution's strengths and weaknesses, also used for comparative studies both within an institution and between institutions (Till, 2004). It can also be used to assess a correlation with academic grades and serve as a predictive tool for identifying students who are likely to become academic achievers (Pimparyon et al., 2000, Mayya and Roff, 2004).

2.4.5. Association of the Environment (DREEM) with Learning Approaches:

Research by Ramsen and Entwistle (1983, 1997) suggests that the learning environment influences the students approach to studying, and that effective learning is a unique combination of the learning environment and the students preferred orientation towards learning. The interaction between the learner and the learning environment has been a target of recent research; a study on nursing students in Thailand assessed the association between DREEM, learning approaches and academic achievement. It was found that there is a low correlation between dimensions of the short ALSI questionnaire and DREEM with grade point average (GPA), but this study included only female students and this may lead to false results since this does not represent all the student population (Pimparyon et al., 2000). Another study on health care students in Oman, found that students' perception of their learning environment influenced the selection of their learning approach which in turn affects their academic performance (Roff, 2005). The exact

nature of the relation between student's perception of his/her environment and the approach to learning and studying is complex, but might be explained by the fact that if health care students are satisfied with their educational environment, they will then adopt the necessary approaches that will lead to understanding and self-regulated learning.

2.4.6. Association of the Environment (DREEM) with Gender and Culture:

In the assessment of British medical students using the DREEM inventory, it was found that female students had a more positive perception of their environment, teachers, and atmosphere than their male counterparts (Dunne et al., 2006). Results from a Spanish study found that females were more positive towards the quality of teaching and the general climate of the school, but less satisfied with their social life (Roff et al., 1997). Results obtained from Nigerian and Nepalese students showed a similar distribution, as well as significant differences between academic years (Roff, 2005). A study conducted on three Middle Eastern (Gulf region) medical schools found that there were statistically significant gender differences, females were less satisfied with their educational environment than male students. These results were compared with a Dundee University medical school and there were fewer gender differences among the Dundee cohort, and those that did occur were opposite to the Gulf cohort (Al-Hazmi et al., 2004a, 2004b). This could be due to difference in the curriculum, teaching methods and cultural differences (Dunne et al., 2006). While two other studies conducted on medical students in the United Kingdom showed no such gender differences (Miles and Leinster, 2007, Whittle et al., 2007).

2.4.7. Association of the Environment (DREEM) with Academic Achievement:

It was claimed that DREEM can be used as a predictive tool for identifying the academic outcomes of particular individuals and subgroups (Roff, 2005). Studies on health care students in China and India have found that DREEM scores were positively associated with academic grades as defined by students' GPA's. Further research is still needed to assess whether DREEM is a reliable tool for predicting academic success in professional health care students (Mayya and Roff, 2004, Roff, 2005).

2.4.8. Summary:

Students' perception of their educational environment has been shown to have a significant impact on their behaviour, learning approaches, academic progress and sense of well-being (Pimparyon et al., 2000, Genn, 2001b). Students' perception of their educational environment has received little attention by dental educators, and in dental schools course evaluations are mainly used to identify strengths and weaknesses of courses but fail to address other important issues relating to learning and the overall environment within the school (Henzi et al., 2005). Identifying areas of concern from dental students' perspective can provide dental educators with a road map that will help guide changes and policies (Henzi et al., 2005).

2.5. Lifelong Learning and Continuous Professional Development:

The concept of lifelong learning was first proposed in 1972 by UNESCO, "recognising lifelong education as involving a fundamental transformation of society, so that the whole society becomes a learning resource for each individual" (Cropley and Dave, 1978, Cropley and Knapper, 1983). By 2001 it became a universal slogan that appeared in government position papers, university mission statements and advertising literature for educational products and services. In dentistry the General Dental Council has also adopted the term lifelong learning for the introduction of mandatory continuous professional development (CPD) (GDC, 2010). CPD has become the means that professions can demonstrate willingness for their members to remain up to date in the skills and knowledge required to practice their profession ethically and responsibly (Grace, 2001).

The term "lifelong learning" includes all formal and informal learning, whether intentional or not, which occurs at any time across the individual's lifespan (Candy, 1995). Lifelong learning can fall into a number of categories which include workplace-based learning, continuing professional education, further formal study and self-directed learning (Candy, 1995). It is the role of educators, at all levels of formal learning, to help individuals develop the skills and motivation necessary to learn throughout their lifetime and provide an environment in which this can be done most effectively (Knapper and Cropley, 2000, Knapper, 2001).

Candy suggested that some teaching approaches can encourage lifelong learning skills such as, teaching methods that encourage students to engage in self-directed and peer-assisted learning including reflective practice and critical self-awareness, and methods which make use of resource-based and problem-based learning (Candy, 1995). Thus students' ability to reflect on their learning will foster the necessary skills for lifelong learning and continuing professional development.

2.6. Theoretical Framework

Reflection in the application of learning strategies are often listed in the course objectives and in the General Dental Council (GDC) guidelines for students and professionals in the dental and health care professions (GDC, 2007, GDC, 2010). Reflection is also a termed as an important part of the learning process, but there is little understanding of how to determine if the students are actually reflecting on their learning. Also the factors associated with the learning processes such as learning style and approaches to learning and studying are rarely addressed in dental education, and how they are associated with the learning outcomes. The general hypothesis of my study proposes the association of the reflective process with learning styles, learning approaches, the dental environment, age, gender, socioeconomic status, and the academic achievement of the students.

In order to achieve the aims and objectives of our study and to simplify the complexity of student learning and the interactions involved, a model was developed which will provide a framework for understanding the concepts that follow.

Most of the factors that influence student learning are categorised into three components as seen in Figure 2.1:

1. The dental educational environment (represented by the different teaching and social characteristics).

2. Students' learning characteristics as represented by students' preferred learning styles and the different approaches to learning and studying.

3. Students' learning outcomes which is represented by the students' academic achievement and his / her ability to reflect in learning. The reflective process will facilitate the development of self-regulated learning, which is necessary for lifelong learning and continuous professional development (Ashley et al., 2006).

Teaching and departmental characteristics produce a variety of learning environments or contexts which may cause students to vary their learning styles and approaches to learning in response to the pressures of the educational environment. The learning environment is perceived differently from one student to another, some students may be highly motivated to engage in the learning process, while others have lower levels of engagement in the same environment. These differences may be reflected by differences in students' age, gender, socioeconomic status, ethnicity, different learning styles and use of different learning approaches (Newble and Entwistle, 1986).

Whatever the style or approach adopted by the student, it is reflected on the student's learning processes and subsequently on their learning outcomes (Entwistle, 1988). A good educational environment will encourage self directed learning, encourage a deep approach to learning and studying and discourage simple rote learning as signified by higher academic achievements. Consequently learners will take control of their own learning, moving from dependent to independent learners by identifying their learning needs and selecting quality learning activities (Ertmer and Newby, 1996). This will enhance their ability to reflect on their learning experiences, thus enabling the practice of self-regulated learning. And this in turn will increase the student's capability to engage in the process of lifelong learning and continuous professional development which will enhance their professional career.

Figure 2. 1: Factors that influence student learning

Teaching and social characteristics: curriculum, tutors, clinical instructors and colleagues

1. Educational Environment

Age, Gender, Ethnicity, and Socioeconomic Status

2. Student Learning Characteristics

Learning Styles

Approaches to Learning and Studying

3. Students' Learning Outcomes

Reflective Process

Academic Achievement

Lifelong Learning & Continuous Professional Development

2.7. Aims and Objectives:

2.7.1. Aim and Objectives of the Pilot study:

To test the feasibility and the ease of application of the Index of Learning styles (ILS), Approach to learning and Studying Inventory (ALSI), Reflection in Learning and Studying (RLS), and the Dundee Ready Education Environment Method (DREEM) on the undergraduate dental students at the Barts and the London School of Medicine and Dentistry.

Objectives:

a. To identify the undergraduate dental students learning styles using the ILS.

b. To describe the undergraduate students' orientation to study as measured by ALSI.

c. To identify the students' perception of their learning environment using DREEM.

d. To identify the reflective process of the undergraduate students as measured by RLS.

e. To study the various factors that might affect the students' learning styles, approaches to learning and studying, reflective process, and perception of their environment such as age, gender, ethnicity, socioeconomic status, academic achievement, and year of study.

2.7.2. Aims and Objectives of the Main Study:

The curriculum at the King Abdul-Aziz University Faculty of Dentistry (KAUFD), is mainly a traditional curriculum with teacher centred learning.

Aim 1:

The first aim is to investigate if the learning styles and the learning approaches that the students adopt affect their academic achievement, regardless of the influence of the curriculum.

Objectives:

a. To establish the learning styles of the KAUFD undergraduate students from year one through six using the Felder-Solomon Index of learning style (ILS).

b. To determine if there are gender-related patterns in learning style preference.

c. To study the various factors which might affect the students' learning styles such as age, socioeconomic status, and year of study.

d. To describe the undergraduate students' orientation to study as measured by Entwistle's short version of the Approach to Learning and Studying inventory (ALSI).

e. To study the various factors that might affect the students' approach to learning and studying such as age, gender, socioeconomic status, and year of study.

f. To correlate the learning styles and approaches to learning with the summative and formative assessments as measured by students' academic achievement.

Aim 2:

Effective learning for students is partly achieved by an educational climate that promotes reflective learning and satisfaction for the students. If we can identify the factors that affect the learning environment and how they are perceived by students we can obtain a guideline for modifying or enhancing these factors.

The second aim is to investigate the factors that influence the student's perception of their learning environment.

Objectives:

a. To identify the student perception of his/her learning environment using the Dundee Ready Education Environment Measure (DREEM).

b. To study the various factors that might affect the student's perception of their environment such as age, gender, socioeconomic status, and year of study.

c. To correlate the student's perception of their environment with their summative and formative assessments as measured by their academic achievements at the end of the year.

Aim 3:

University education is about developing creative and independent thinkers and to ensure that the students are equipped with professional skills that will help them in preparation for a high quality professional career. Reflection is one of these skills and it is an important learning outcome. It is also a process that student will use throughout their career for lifelong learning and continuous professional development.

The third aim is to assess the student's ability to reflect in learning and investigate the different factors that affect the reflective process.

Objectives:

a. To identify the reflective process of the undergraduate students from year one through six at KAUFD as measured by Sobral's Reflection-in-Learning scale (RLS).

b. To study the various factors that might affect the student's reflective process such as learning styles, approaches, perception of the environment, age, gender, socioeconomic status, and year of study.

c. To correlate the reflective process as measured by RLS to learning and knowledge acquisition with summative and formative assessments as measured by student's academic achievement.

2.8. Null Hypothesis:

1. The reflective process of the undergraduate students of KAUFD is not related to age, gender, socioeconomic status, learning styles, learning approaches, and the learning environment.

2. The reflective process does not change for the undergraduate students for any of the academic year cohorts from year one through six, and is not related to the student's academic achievement.

3. Academic achievement is not affected by the student's learning styles as measured by ILS, approach to learning and studying as measured by ALSI, and the student's perception of his / her environment as measured by DREEM and subscales.

Chapter 3   Methodology

3.1. Introduction:

In this chapter, sample size for the pilot and the main study, research design, sample selection, consent and confidentiality, data collection and instruments, and statistical analysis are described in detail.

3.2. Ethical Approval:

The pilot study was conducted on third and fourth year undergraduate dental students at the Institute of Dentistry at Barts and The London School of Medicine and Dentistry (QMUL), to investigate the feasibility of the inventories. Approval from the Queen Mary Research Ethics Committee was obtained on August 28th 2007 (reference number: QMREC2007/39) (Appendix A). The main study was conducted on first to sixth year undergraduate students at King AbdulAziz University Faculty of Dentistry (KAUFD) in Jeddah, Saudi Arabia. Approval for the main study was received on November 21st 2007 from Queen Mary Research Ethics Committee (reference number: QMREC2007/67) (Appendix A).

3.3. Sample Size:

This descriptive study was designed to assess dental undergraduate students' learning styles, approaches, reflective process, and perception of their learning and teaching environment. The pilot study was limited by the availability of third and fourth year students who were willing to participate at QMUL. This was equivalent to 10% of the main study sample of 600 students at KAUFD. A total of 624 students from first to sixth year at KAUFD were asked to participate in the study, representing the total student body for academic year 2007/08.

3.4. Research Design and Sample Selection:

The pilot and main study are both longitudinal quantitative studies.

Pilot study: A circular email was distributed to students explaining the relevant information about the study as well as the aims and procedures for the research project (Appendix A). The questionnaires were distributed to third and fourth year undergraduate dental students at QMUL during scheduled teaching sessions during September (2007) (academic year 2007/08) (group A) (n=142: F=76, M=66). The second data collection was completed during July (2008) and included only the third year cohort (group B) (academic year 2007/08) (n=61: F=39, M=22), while the third data collection was conducted during November (2008) on third year cohort as well (group C) (academic year 2008/09) (n=44: F=25, M=19). The fourth year cohort completed the second data collection during March (2009) (group C) (n=24: F= 9, M= 15). The follow up of the third and fourth year cohorts was conducted to further investigate the learning styles, approaches, reflective process and environment of the QMUL cohort and provide data to compare with the main study. Table 3.1 describes the flow of data collection for the third and fourth year cohorts for the QMUL pilot study.

Main Study: A circular email was distributed to students explaining all the relevant information regarding the research project (Appendix A). All students at KAUFD for academic year (2007/08) from first to sixth year were asked to participate during February/March 2008 (group A) (n=497: F=275, M=222). The second data collection was completed during October/November 2008 (academic year 2008/09) on second to sixth year students (group B) (n=482: F=276, M=206). The third data collection was conducted during May/June 2009 (academic year 2008/09) on second to sixth year students also (group C) (n=446: F=239, M=206).

During the second data collection the first, third, and fifth year cohorts were asked to answer the learning approaches and reflective process questionnaire in addition to

the learning styles, since these year cohorts are considered to be transition stages for the dental school in addition to the feasibility and practicality in carrying out the questionnaire. The first year cohort it is regarded as a transition period from high school into university life, whereas the third year is considered to be transition period from pre-clinical to the clinical studies. While during the fifth year, the students progress to a more clinical year. The overall response rate for each academic year cohort is found in Appendix A. Table 3.2 describes the flow of data collection for the different year cohorts and groups for the main study at KAUFD.

Table 3.1: Gant chart for data collection for the QMUL pilot study

Measurement/ Academic Year Cohort/ Group	Year 3	Year 3 ⟶ Year 4		Year 4 ⟶ Year 5	
	Academic Year 07/08	Academic Year 08/09		Academic Year 07/08	Academic Year 08/09
	September 2007	July 2008	November 2008	September 2007	March 2008
	A	**B**	**C**	**A**	**C**
1.ILS*	√	√	√	√	√
2. ALSI**	√	√	√	√	
3. RLS***	√	√	√	√	√
4. Academic Achievement	√ (BDS Part 1)		√ (BDS Part 3)	√ (BDS Part 3)	
5. DREEM***	√	√	√	√	√
Total Num. Of Inventories	4	4	4	4	3
Total Baseline Number of Students	126 (f=76,m=50)	61 (f=39,m=22)	45(f=26,m=19)	41(f=17,m=24)	23(f=8,m=15)

*ILS: Index of Learning Styles
**ALSI: Approaches to Learning and studying questionnaire
***RLS: Reflection in Learning Scale
****DREEM: Dundee Ready Education Environment Method

Group A: baseline data collected September 07/08; year cohort 3 and 4 (all questionnaires)
Group B: July 07/08; year cohort 3 only (all questionnaires)
Group C: November 08/09; year cohort 3 only (all questionnaires)
Group C: March 09/10; year cohort 4 only (all questionnaire except ALSI)

Table 3.2: Gant chart for data collection for the KAUFD main study

Measurement/ Academic Year	Year 1 → Year 2			Year 2 → Year 3			Year 3 → Year 4			Year 4 → Year 5			Year 5 → Year 6			Year 6	
Year Cohort	07/08	08/09		07/08	08/09		07/08	08/09		07/08	08/09		07/08	08/09		07/08	08/09
Group	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	
Time of Year		B	E		B	E		B	E		B	E		B	E		
1.ILS*	√	√		√	√		√	√		√	√		√	√	√	√	
2. ALSI**	√	√		√			√	√		√			√	√	√	√	Not applicable
3. RLS***	√	√	√	√		√	√	√	√	√		√	√	√	√	√	
4. Academic Achievement	√		√	√		√	√		√	√		√	√		√	√	
5. DREEM****	√		√	√		√	√		√	√		√	√		√	√	
Total Num. Of Inventories	4	3	2	4	1	2	4	3	2	4	1	2	4	3	4	4	
Total Number Students Seen in Each Group	83(f 44,m 39)	118 (f 61, m 57)	85(f 40, m 45)	103(f 50, m 53)	104 (f 64, m 40)	105(f 56,m 49)	83(f 49, m 34)	85(f 52,f 33)	92(f 57,m 35)	83(f 42,m 41)	85(f 47, m 38)	80(f 38, m 42)	86(f 50,m 36)	90(f 51, m 39)	84(f 48, m 36)	59(f 39,m 20)	

*ILS: Index of Learning Styles
**ALSI: Approaches to Learning and studying questionnaire
***RLS: Reflection in Learning Scale
****DREEM: Dundee Ready Education Environment Method
B: beginning of the academic year
E: end of the academic year

Group A: Baseline data: collected March 2007/08 (all year cohorts all questionnaires)
Group B: Beginning of year: Oct/November 2008/09; RLS, ALSI (for year cohorts 1, 3, and 5), ILS (all year cohorts)
Group C: End of year: May/June 2008/09; DREEM (all year cohorts), RLS (all year cohorts), ILS and ALSI (year cohort 5 only)

3.5. Consent and Confidentiality:

The students consented to participate in the study by answering the questionnaire, as submission of the completed questionnaire implies consent to participate in the study, as was explained in the circular email (Appendix A). All precautions were taken to ensure confidentiality of each student's identity and computer number. The students were assured that all the information obtained from the study would be handled anonymously and that only the investigators would have access to the data.

3.6. Data Collection:

Pilot study: The questionnaires were distributed to third and fourth year dental undergraduate students at QMUL during scheduled teaching sessions during September 2007, July 2008, November 2008, and March 2009.

Main study: The questionnaires were distributed to all students at KAUFD from academic year one to six during scheduled teaching sessions during February/March 2008, October/November 2009, and May/June 2009.

3.7. Data Instruments and Questionnaires

3.7.1. Demographic Data:

The first part of the comprised of the demographic questionnaire which was made up of six sections;

1. Demographic information, such as identification number,

2. Name (optional),

3. Age,

4. Gender,

5. Year of study,

6. Ethnicity and father/mother/guardian's occupation was obtained.

The information sheet and demographic data collection for the pilot and main study is shown in Appendix B. For the Saudi students additional data was obtained which included; father/mother/guardian's education, monthly income, and type of housing (villa/flat, owned/rented). The ethnicity grouping was only used in the pilot study and the grouping criteria was obtained from the University and College Admission Services (UCAS, 2007), which is an organisation for managing applications to higher education courses in the United Kingdom .

The socioeconomic status for the parents/guardian was obtained using the Standard Occupational Classification (SOC 2000) which is used by Higher Education Statistics Agency (HESA) (HESA, 2007). This was also applied to the Saudi students because there is no system for classification of occupations in Saudi Arabia, the occupation guide for the Saudi students is shown in Appendix B. SOC was first published in 1990 to replace the Classification of Occupations 1980 (CO1980) and the Classification of Occupations and Dictionary Titles (CODT). SOC 1990 has been revised and updated (SOC2000), with nine major occupation groups. In this study a software programme was used to assist with the coding of SOC 2000. This was developed by the Institute for Employment Research and accessed through (Cascot Coding Software, 2007) .

The academic achievements of the students were obtained from their records, for the QMUL students the BDS Part 1: sections A and B for the academic year 20005/06, and BDS Part 3: sections A and B for academic year 2007/08 records were obtained. For the KAUFD students their final grades for academic year 2007/08 and academic year 2008/09 was also obtained.

3.7.2. Four structured questionnaires:

The second part of the questionnaire comprised the four structured questionnaires:

3.7.2.1. The Felder- Soloman Index of Learning Styles (ILS): Has been used in many settings to help identify students learning styles, such as research relating to learning styles in engineering students, advanced learning technologies, web-based learning systems, medicine and orthodontic residents (Felder, 1993, Felder and Spurlin, 2005, Cook, 2005).

The Index of Learning Style (ILS) is an inventory that is used to assess students learning styles and consists of four styles with two dimensions for each:

- Active / Reflective
- Sensing / Intuitive
- Visual / Verbal
- Sequential / Global

The ILS inventory is made up of 44 questions, 11 for each style with either a negative or a positive value answer. The scoring is then completed on a separate sheet where a "1" is given to each answer whether negative or positive and then added up for each learning style and a difference between the negative and positive columns are calculated. The total will either take a positive value or negative value according to the larger value to determine the learning dimension. Once completed the four learning styles are plotted on a scale ranging from (-1 to -11) or (1 to 11).

If the score is:

- 1 - 3 (-1 to -3): the student is balanced on the two dimensions of that scale.
- 5-7 (-5 to -7): the student has a moderate preference for one of the dimensions of the scale,
- 9-11 (-9 to -11): the student has a very strong preference for one of the dimensions of the scale.

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Scores ranging from 5 to 11 or (-5 to -11) were considered to be a preference for a certain learning style for statistical purposes.

For example, in the active / reflective learning scale if the score is -5 to -11 then the style is active, but if the score is 5 to 11 then the style is reflective. The ILS inventory, scoring guide, are shown in Appendix B.

3.7.2.2. The Approach to Learning and Studying Inventory (ALSI): The inventory is part of the Enhancing of Teaching and Learning Environments Questionnaire (ETL) Part 1, Approach to learning and studying Inventory (ETL, 2001). ALSI has been used in a variety of educational settings such as graduate programs, with differing age, gender, cultural and geographical groups (Ramsden and Entwistle, 1981, Ramsden, 1983, Richardson, 1994b, Richardson et al., 1995, Watkins and Regmi, 1996, Marton et al., 1997a).

The ALSI is the short form 18-item questionnaire with 4 learning approaches: deep, surface, monitoring, and organised / effort. Students are asked to read each item and respond using a 5-point Likert scale, indicating the degree to which they felt that the statement was true, 5= agree, 4= agree somewhat, 3=unsure, 2=disagree somewhat, 1=disagree. The scores for each answer are added for the total ALSI score and the subscales (deep, surface, monitoring, and organised / effort approaches) are formed by adding together certain responses on the items in that subscale. The ALSI inventory and scoring guide are found in Appendix B

3.7.2.3. The Reflection in Learning Scale (RLS): Is a 14-item self-reported questionnaire, featuring a 7-point response scale ranging from 1 to 7, with 1 = never and 7 = always. The RLS score ranges from 14-98. The numbers for items 1 through 14 are added up to obtain a total RLS score ranging from 14 to 98. The last part of the RLS is **Item 15**, which is a self-assessment question on personal efficacy for the students' ability to reflect on learning, the extent of perceived personal efficacy to reflect ranging from restricted to maximal. (Sobral, 2000).

For statistical purposes and ease of comparison between the final calculated score (for items 1 -14) and item 15, the final score was further divided into 4 sub-scales representing the self-assessment question **Item 15** scales:

   a. Restricted: score of 14-34

   b. Partial: score of 35-55

   c. Ample: score of 56-76

   d. Maximal: score of 77-98

Overall, the RLS seems to assess the variation among medical and dental students reflective profile. The RLS questionnaire is shown in Appendix B.

3.7.4. The Dundee Ready Educational Environment Measure (DREEM): This inventory consists of 50-items relating to the students' educational environment. Each statement is measured using a 5-point Likert scale ranging from: 0 = strongly disagree, 1 = disagree, 2 = uncertain, 3 = agree, and 4 = strongly agree.

However nine of the 50-item inventory (4, 8, 9, 17, 25, 35, 39, 48, and 50) are negative statements and are scored in reverse. Distribution of the DREEM questionnaire, subscales, and score guide are found in Appendix B.

The 50-items are then added up and a total DREEM score is obtained with a maximum score of 200 indicating an ideal educational environment. The overall score can be interpreted as follows (McAleer and Roff, 2001, Roff, 2005):

- 0-50 = very poor,
- 51-100 = plenty of problems,
- 101-150 = a more positive than negative environment,
- 151-200 = excellent or ideal environment.

The DREEM inventory is further divided into five subscales (McAleer and Roff, 2001):

- Students' perception of learning (12 items, maximum score 48)
- Students' perception of teachers (11 items, maximum score 44)
- Students' academic self-perception (8 items, maximum score 32)
- Students' perception of atmosphere (12 items, maximum score 48)
- Students' social self-perception (7 items, maximum score 28)

The DREEM inventory can be used to pinpoint more specific strength and weaknesses in an environment. Items that have a mean score of 3 or more are real positive points while items with mean values of 2 or less should be examined more closely as they indicate problem areas. Items with a mean of 2-3 are aspects of the climate that could be enhanced (McAleer and Roff, 2001).

The advantage of the Dundee Ready Education Environment Measure (DREEM) is that it can provide educators with a diagnostic tool to measure students' perception of their learning and teaching climate (Roff et al., 1997, Pimparyon et al., 2000, Mayya and Roff, 2004, Al-Hazmi et al., 2004b, Zamzuri et al., 2004).

3.8. Statistical Analysis:

The raw data from the questionnaires were converted into scaled scores and entered into SPSS v 16 for Windows, for statistical analysis. The first phase in the statistical analysis involved data cleaning and consistency setting.

The response rate and descriptive statistics of the four questionnaires, including the demographic statistics of the sample and description of the outcome variable in terms of measures of central tendency and variance (mean and SD) were obtained. The univarient associations of the four questionnaires were investigated. Paired sample t-tests were used to compare the mean scores for the matched groups and independent sample t-tests for binary predictors. One–way analysis of variance (ANOVA) was used to explore the categorical variables, and for predictors which analysis of variance showed that they could also be considered as numerical variables (for example academic achievement and year) regression analysis was used.

To investigate the independent effects on the four questionnaires, multiple linear regression was used. Where the one-way ANOVA showed that it would be more sensible to recombine the categorical variables into a binary form for these regressions these were used in the final models. For example parent occupation (managers and professional occupations against the other occupations) and education (less than high school against university and higher education). The summary and design of the statistical analysis used in the pilot and main study is found in Table 3.3.

Table 3.3: List of variables and statistical analysis used for the pilot and main study

Aims	Variables	Test
1. Learning Styles: 1.1. To identify the undergraduate dental students learning styles using ILS.	ILS (Questions 1- 44) dependent continuous variables	Descriptive statistics
1.2. Does the learning style change as the student moves from one year to the other, and is there a change between the academic years	1. ILS and academic years group A 2. ILS and academic years group B 3. ILS and academic years group C 4. Year: independent, categorical	Paired T-test for changes within the academic years Independent t-test for changes between academic years
1.3. Is there a gender-related pattern in learning style preference?	1. Learning styles: dependent, continuous variable 2. Gender: independent, categorical	Independent T-tests
1.4. Is there an age-related pattern in learning style preference?	1. Learning styles: dependent, continuous variable 2. Age: independent, categorical	Multiple linear regression
1.5. Is there a correlation between the different learning styles and SES?	1. Learning styles: dependent, continuous variable 2. 3. SES: independent, categorical (4 categories). In Saudi study: (parents education and occupation)	ANOVA Multiple linear regression
1.6. To correlate the learning styles with academic achievement.	1. Learning styles: dependent, continuous variable 2. Academic achievement: independent, categorical variable	ANOVA

Continued from Table 3.3

Aims	Variables	Test
2. Approach to Learning 2.1. To describe approaches of the undergraduate students as measured by ALSI.	ALSI: Questions 1 - 18	Descriptive statistics
2.2. Does ALSI change as the student moves from one year to the other, and is there a change between the academic years	1. ALSI and academic years group A 2. ALSI and academic years group B 3. ALSI and academic years group C 4. Year: independent, categorical	Paired T-test for changes within the academic years Independent t-test for changes between academic years
2.3. Is there a gender-related pattern in learning approach preference?	1. Learning approach: dependent, continuous variable (calculated as mean) 2. Gender: independent, categorical	Independent t-tests
2.4. Is there an age-related pattern in learning approach preference?	1. Learning approach: dependent, continuous variable (calculated as mean) 2. Age: independent, categorical	Multiple linear regression
2.5. Is there a correlation between the different learning approaches and SES?	1. Learning approach: dependent, continuous variable (calculated as mean) 2. 3. SES: independent, categorical (4 categories). In Saudi study: (parents education and occupation)	ANOVA Multiple linear regression
2.6. To correlate the learning approaches with academic achievement.	1. Learning approach: dependent, continuous variable (calculated as mean) 2. Academic achievement: independent, categorical variable	ANOVA

Continued from Table 3.3

Aims	Variables	Test
3. Sobral's RLS: 3.1 To identify the reflective process of the undergraduate students as measured by RLS.	Questions 1 - 14 then put on a scale Question 15: subjects rated their personal efficacy in the reflective process.	Descriptive statistics
3.2. Does the reflective process change as the student moves from one year to the other, and is there a change between the academic years	1. RLS groups A, B and C 2. Year: independent, categorical	Paired T-test for changes within the academic years Independent t-test for changes between academic years
3.3. Is there a gender-related pattern in the reflective process?	1. Reflection: dependent, continuous variable 2. Gender: independent, categorical	ANOVA
3.4. Is there an age-related pattern in the reflective process?	1. Reflection: dependent, continuous variable 2. Age: independent, categorical	Multiple linear regression
3.5. Is there a correlation between the reflective process and SES?	1. Reflection: dependent, continuous variable 2. SES: independent, categorical	ANOVA Multiple linear regression
3.6. Is there a correlation between the reflective process and academic achievement of students?	1. Reflection: dependent, continuous variable 2. Academic achievement: independent, categorical variable	ANOVA

Continued from Table 3.3

Aims	Variables	Test

4. DREEM:
4.1. To identify the students' perception of their learning environment using DREEM.
	Questions 1 - 50
	and the 5 subscales:
	   1. Perceptions of learning
	   2. Perceptions of teachers
	   3. Academic self-perception
	   4. Perceptions of atmosphere
	   5. Social self-perceptions
		Descriptive statistics

4.2. Do the DREEM score change as the student moves from one year to the other, and is there a change between the academic years	1. DREEM and the 5 subscales group A and C only 2. Year: independent, categorical	Paired T-test for changes within the academic years Independent t-test for changes between academic years
4.3. Does gender affect the overall DREEM score and the 5 subscales?	1. DREEM and 5 subscales: dependent, continuous variable 2. Gender: independent, categorical	ANOVA
4.4. Does age affect the overall DREEM score and the 5 subscales?	1. DREEM and 5 subscales: dependent, continuous variable 2. Age: independent, categorical	Multiple linear regression
4.5. Is there a correlation between the DREEM score and 5 subscales and SES?	1. DREEM and 5 subscales: dependent, continuous variable 2. SES: independent, categorical	ANOVA Multiple linear regression
4.6. To correlate the DREEM score and 5 subscales with academic achievement.	1. DREEM and 5 subscales: dependent, continuous variable 2. Academic achievement: independent, categorical variable	ANOVA

Continued from Table 3.3

Aims	Variables	Test
5. The Null Hypothesis: 5.1. To correlate reflection, with gender, age, socioeconomic status, students learning styles, approaches, and students' perception of the environment and the different DREEM subscales	1. Reflection: dependent, continuous variable 2. Gender: independent, categorical 3. Age: independent, categorical 5. SES: independent, categorical (4 categories). 6. Learning styles: independent, continuous variable 7. Learning approach: independent, continuous variable (calculated as mean) 8. DREEM: independent, continuous variable and the 5 DREEM subscales: dependent, continuous variable	Independent t-test Multiple linear regression ANOVA Multiple linear regression Multiple linear regression
5.2. To correlate reflection, with year and academic achievement	1. Reflection: dependent, continuous variable 2. Year: independent, categorical 3. Academic achievement: independent, categorical variable	ANOVA
5.3. To correlate students' knowledge as measured by summative and formative assessments (academic achievement) with the students' learning styles, approaches, and the perception of the environment.	1. Academic achievement: dependent, categorical variable 2. Reflection 3. Learning styles 4. Learning approach 5. DREEM and Subscales	Multiple linear regression

Chapter 4 Results and Discussion for the Pilot Study (QMUL)

4.1. Introduction:

In this section, findings from the pilot study conducted on third and fourth year dental undergraduate students at Barts and The London School of medicine and Dentistry Queen Mary University of London (QMUL) are presented.

4.2. Collection of Data:

Data collection was conducted during September (2007) (academic year 07/08) on third and fourth year cohorts (group A) (n=142: F=76, M=66). The second data collection was completed during July (2008) (academic year 07/08) on the third year cohort only (group B) (n=61: F=39, M=22), 42 of whom were also in group A. The third collection of data was during November (2008) (academic year 08/09) on the third year cohort (group C) (n=44: F=25, M=19). For the fourth year cohort a second data collection was completed during March 2009 (group C) (n=24: F= 9, M= 15). The collection of data is illustrated in Table 3.1 in the Methodology section. There were a large number of students that did not provide information on their identification numbers, ethnicity, and parents' occupation; therefore there was a number of missing data concerning academic achievement, ethnicity, and socioeconomic status. For statistical purposes ethnicity and socioeconomic status were categorised into groups. For ethnicity, the groups are; Asian ethnicity (Asian Bangladesh, Asian Indian and Asian Pakistani), other ethnic groups (Asian Chinese, Black African, mixed others, mixed-white-Asian, Asian other, other and missing) and Whites. The socioeconomic status groups are 1; Managers, Senior officials, professional occupations. 2; Associate professionals, technical, administrative, secretarial. 3; Skilled trade occupations, personal service

occupations, sales and customer services. 4; Process and plant operatives and elementary occupations and missing. Distribution of the demographic data is shown in Table 4.1.

Table 4. 1: Distribution of demographic data (gender, age, ethnicity, and socioeconomic status) and academic achievement for dental students by academic year cohort

Demographic Data		Year Cohort 3	Year Cohort 4	Total	Percentage
Gender	Male	50	24	74	44.3%
	Female	76	17	93	55.7%
	Total	126	41	167	100%
Age Group	19-21 years old	65	22	87	52.1%
	22-26 years old	48	17	65	38.9%
	≥ 27 years old	11	2	13	7.8%
	Missing	2	0	2	1.2%
	Total	126	41	167	100%
Academic Achievement	Fail: ≤ 44%	2	0	2	1.2%
	Borderline: 45-49%	3	0	3	1.8%
	Pass: 50-59%	23	3	26	15.6%
	Merit :60-69%	33	18	51	30.5%
	Distinction:≥ 70 %	14	17	31	18.6%
	Missing	51	3	54	32.3%
	Total	126	41	167	100%
Ethnic Origin	1. Asian*	60	20	80	48%
	2. Others**	45	11	56	33.5%
	3. White	21	10	31	18.5%
	Total	126	41	167	100%
Socioeconomic Status***	1	61	19	80	48%
	2	26	7	33	19.7%
	3	7	2	9	5.3%
	4	7	3	10	6%
	Missing	25	10	35	21%
	Total	126	41	167	100%

*Asian : Asian-Bangladeshi, Asian-Indian, Asian-Pakistani
**Others: Asian-Chinese (n=12), Asian-other (n=20), Black-African (n=3), Mixed-other (n=3), Mixed-white-Asian (n=2), and missing(n=5)
  ***Socioeconomic status: 1:Managers, Senior officials, Professional occupations, 2: Associate professionals, Technicians, Administrative and Secretarial, 3; Skilled trade, Personal service, and Sales/Customer service, and 4; Process/plant machine operatives, elementary, and missing

4.3. Reliability of the Assessment Tools:

The pilot study was conducted on third and fourth year students at The Barts and the London School of Medicine and Dentistry (groups A, B, and C). To evaluate the reliability of the questionnaires, Cronbach's coefficient alpha was used. The reliability of the Index of learning Styles (ILS) was (α=0.81, 0.55, and 0.61) for groups A, B, and C respectively as illustrated in Table 4.2. The Cronbach's alpha for the Approach to Learning and Studying (ALSI) was (α=0.70) for group A and higher for group B (α=0.84), but lower for (α=0.60) for group C (Table 4.2). The reliability for the RLS was high for all three groups (α=0.87, 0.91, and 0.89) as illustrated in Table 4.2. The reliability for the DREEM questionnaire was high as illustrated in Table 4.2, indicating the reliability of the DREEM questionnaire to evaluate students' perception of the educational environment.

Table 4. 2: Cronbach's Alpha Reliability Values for Assessment Tools ILS, ALSI, RLS, and DREEM and number of items in the tools for year cohorts 3 and 4 (group A, B, and C)

Assessment Tool	Group	Cronbach Alpha	Number of items
ILS	A	0.81	44
	B	0.55	
	C	0.61	
ALSI	A	0.70	18
	B	0.84	
	C	0.60	
RLS	A	0.87	15
	B	0.91	
	C	0.89	
DREEM	A	0.91	50
	B	0.93	
	C	0.93	

4.4. Comparative Data of the Assessment Tools Related to Year:

One hundred and sixty seven students from third and fourth year cohorts completed the questionnaires with response rates varying from 75% to 79% for the four different assessment tools.

4.4.1. Comparative Data of Index of Learning Styles (ILS) by Year:

The distribution of learning styles as measured by ILS for third and fourth year cohorts (group A); 22.5% are active learners (65.5% balanced, 12% reflective learners), 43.7% are sensing learners (44.4% balanced, 12% intuitive learners), 44.4% are visual learners (54.2% balanced, 1.4% verbal learners), and 36.6% are sequential learners (57% balanced, 6.3% global learners). A paired-sample t-test was conducted to evaluate the difference in ILS mean scores in those with measures at both time points as illustrated in Table 4.3. There was a significant difference (p=0.006) between groups A and B for the active / reflective score for third year cohort (Table 4.3), although third year students in both groups are balanced but students in group B tend to score more towards the active style. The distribution of ILS for the third and fourth year cohorts groups A, B, and C, paired t-test, independent t-test and radar figures are shown in Appendix C.

Table 4. 3: Mean ILS scores (Active/Reflective, Sensing/Intuitive, Visual/Verbal, and Sequential/Global), 95% confidence interval of mean difference (95% CI), and p-value for paired t-test for year cohort 3 (groups A and B)

Year Cohort	ILS	Group	Number	Mean	95% CI	p-value
3	Active/Reflective	A	43	-0.65	0.47 to 2.55	**0.006**
		B		-2.16		
	Sensing/Intuitive	A	43	-3.23	-1.15 to 1.98	0.592
		B		-3.65		
	Visual/Verbal	A	43	-2.42	-0.29 to 1.92	0.144
		B		-3.23		
	Sequential/Global	A	43	-3.19	-1.61 to 0.77	0.482
		B		-2.77		

The distribution of learning styles is presented in radar charts and these charts will appear quite often throughout the study. These charts represent the distribution of the two dimensions for each of the four learning styles, for example, for the active / reflective learning style, the score for both the third and fourth year cohorts are within the range of -3 to 3 as represented by the blue and red lines, therefore the style is considered balanced. However, if the score was in the -5 to -11 range then the style is active, while scores ranging from 5 to 11 is considered reflective as stated in the key. The Distribution of ILS for third and fourth year cohorts group A and C is shown in Figures 4.1 and 4.2.

Figure 4.1: Distribution of Active/Reflective, Sensing/Intuitive, Visual/Verbal, and Sequential/Global mean scores for year cohort 3 and 4 (group A)

Active/Reflective (A)

Year 3
Year 4

3 to -3: Balanced
-5 to -11: Active
5 to 11: Reflective

Sensing/Intuitive (A)

Year 3
Year 4

3 to -3: Balanced
-5 to -11: Sensing
5 to 11: Intuitive

Visual/Verbal (A)

Year 3
Year 4

3 to -3: Balanced
-5 to -11: Visual
5 to 11: Verbal

Sequential/Global (A)

Year 3
Year 4

3 to -3: Balanced
-5 to -11: Sequential
5 to 11: Global
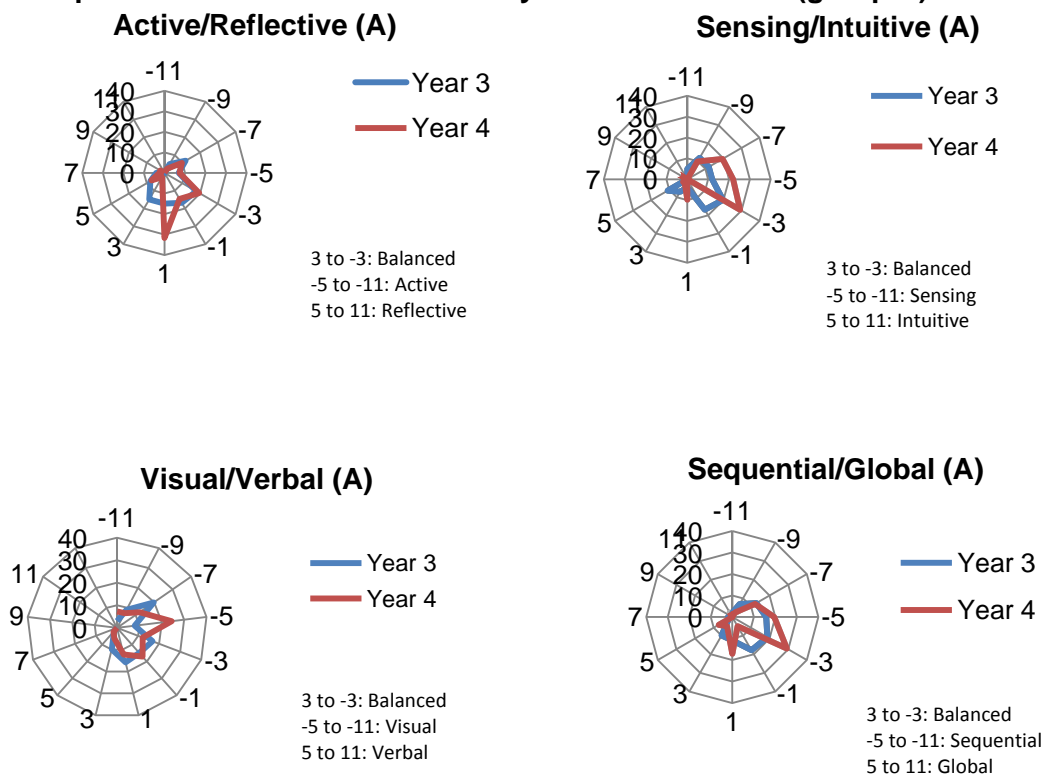
Figure 4.2: Distribution of Active/Reflective, Sensing/Intuitive, Visual/Verbal, and Sequential/Global mean scores for year cohort 3 and 4 (group C)

Active/Reflective (C)

3 to -3: Balanced
-5 to -11: Active
5 to 11: Reflective

Sensing/Intuitive (C)

3 to -3: Balanced
-5 to -11: Sensing
5 to 11: Intuitive

Visual/Verbal (C)

3 to -3: Balanced
-5 to -11: Visual
5 to 11: Verbal

Sequential/Global (C)

3 to -3: Balanced
-5 to -11: Sequential
5 to 11: Global
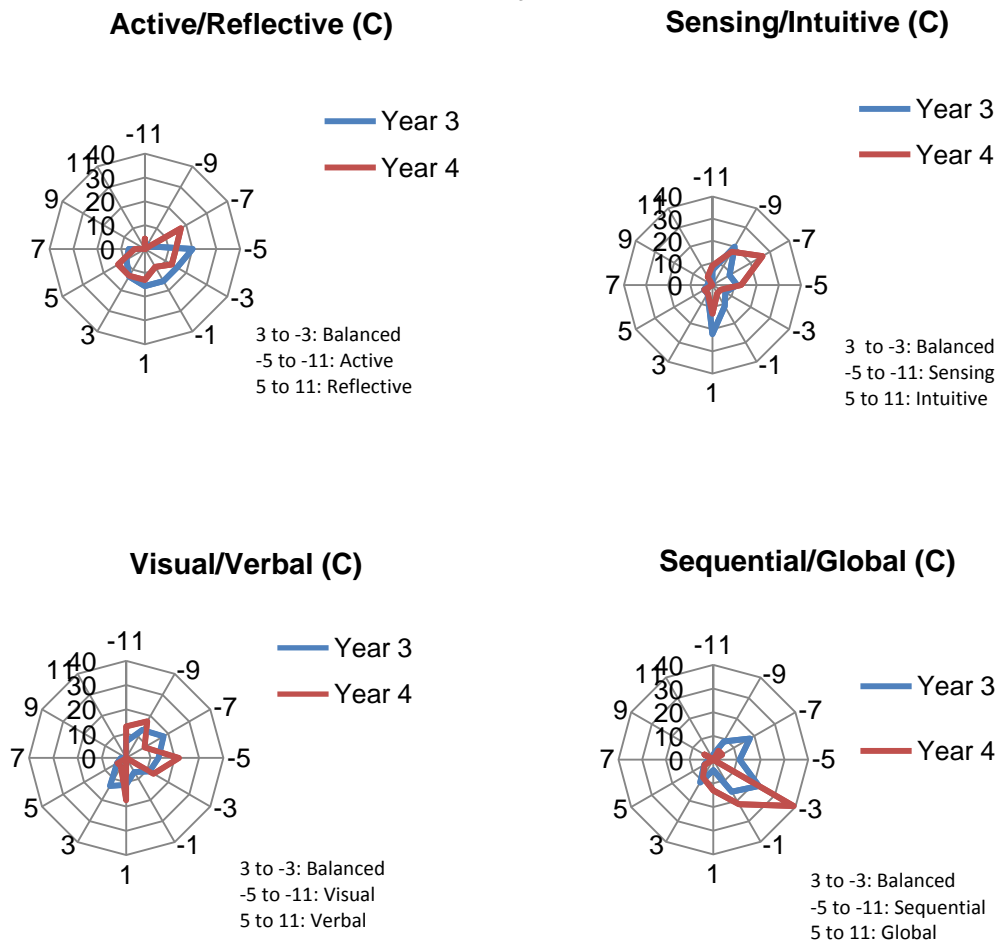
4.4.2. Comparative Data of Approach to Learning and Studying (ALSI) by Year:

The ALSI is categorised into four approaches; deep (6-11 low, 12-23 medium, 24-30 high), surface (4-7 low, 8-15 medium, 16-20 high), monitoring (4-7 low, 8-15 medium, 16-20 high), and organised / effort approach (4-7 low, 8-15 medium, 16-20 high). For the third and fourth year cohorts in group A; 75.5% of students use a deep approach to learning, 65% are surface learners, 41% are monitoring learners and 45% adopt an organised / effort approach. There were highly significant differences between the third and fourth year cohorts for all approaches to learning and studying as illustrated in Table 4.4. Third year students demonstrate higher mean score for the deep, surface, monitoring, and organised / effort approach

(p=0.000). Figure 4.3 illustrates the distribution of ALSI mean scores for third and fourth year cohorts in group A.

Table 4. 4: Mean scores for ALSI (Deep, Surface, Monitoring, and Organised/Effort Approaches), 95% confidence interval of mean differences, and p-value Independent T-tests for year cohorts 3 and 4 (group A)

ALSI	Year Cohort	Number	Mean	95% CI	p-value
Total ALSI	3	90	66.62	20.74 to 26.98	**0.000**
	4	40	42.75		
Deep	3	99	21.42	4.16 to 6.98	**0.000**
	4	40	15.85		
Surface	3	99	13.62	1.79 to 4.28	**0.000**
	4	40	10.58		
Monitoring	3	99	15.94	6.85 to 8.82	**0.000**
	4	40	8.10		
Organised / Effort	3	99	15.69	6.21 to 8.70	**0.000**
	4	40	8.23		

Figure 4.3 :Distribution of the Deep, Surface, Monitoring, and Organised/Effort Approach by high, medium, and low for year cohort 3 and 4 in group A
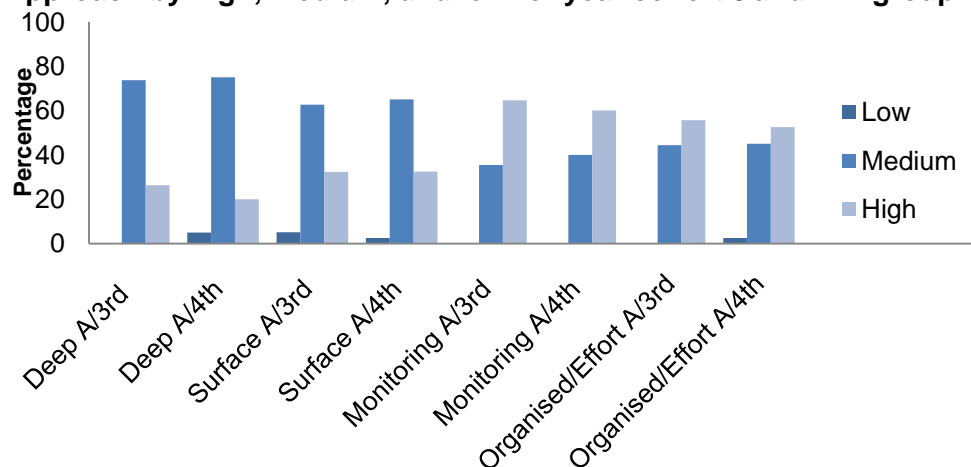
A paired t-test was conducted to evaluate differences in the approach to learning and studying adopted by students as measured by ALSI within the third year cohort as illustrated in Table 4.5. There was a significant difference in the total ALSI score between groups A and C (p=0.025) as illustrated in Table 4.5. There were significant differences for the monitoring approach score over time between group A

and B (p=0.001), as well as group A and C (p=0.003) (Table 4.5). The organised/effort approach was also significantly different over time between groups A and C (p= 0.002) (Table 4.5). Figure 4.4 illustrates the distribution of ALSI for third year cohort (groups A, B and C).

Table 4. 5: ALSI mean difference (groups A-B) and (groups A-C) for the Deep, Surface, Monitoring, and Organised/Effort approach, 95% confidence interval of mean difference (95% CI), and p-value for paired t-test for year cohort 3

Year Cohort	ALSI and Group	Number	Mean	95% CI	p-value
3	Total ALSI (A -B)	44	2.34	-0.91 to 5.59	0.153
	Deep (A -B)	44	-0.14	-1.67 to 1.40	0.858
	Surface (A-B)	44	0.3	-0.91 to 1.50	0.624
	Monitoring (A-B)	44	1.64	0.68 to 2.60	**0.001**
	Organised/Effort (A -B)	44	0.55	-0.42 to 1.51	0.259
3	Total ALSI (A - C)	34	4.60	0.37 to 5.22	**0.025**
	Deep score (A - C)	34	-1.24	-2.49 to -0.02	0.054
	Surface Score (A - C)	34	0.71	-0.49 to 1.90	0.237
	Monitoring Score (A-C)	34	1.47	0.53 to 2.41	**0.003**
	Organised/Effort (A -C)	34	1.35	0.55 to 2.15	**0.002**

Figure 4.4: Distribution of the Deep, Surface, Monitoring, and Organised/Effort Approach by low, medium, and high for year cohort 3 (groups A, B, and C)
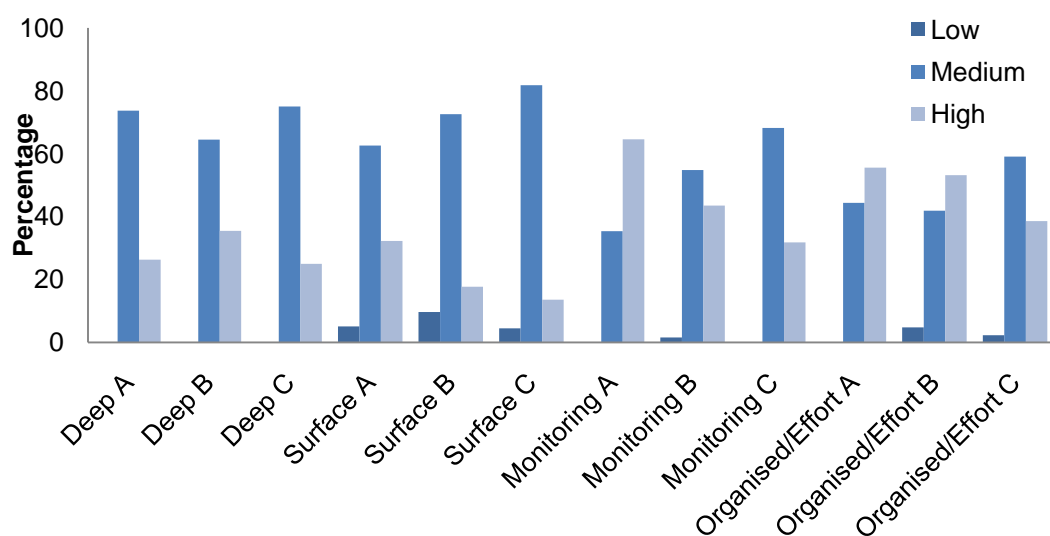
4.4.3. Comparative Data of the Reflection in Learning Scale (RLS) by Year:

An Independent-sample t-test was conducted to compare the RLS score for third and fourth year cohorts; there were no significant differences between the years as illustrated in Table 4.6. A paired t-test and an independent t-test were conducted to evaluate the difference between item 15 for third and fourth year cohorts, there was no significant difference as well. Distribution of the RLS and item 15 paired t-test and independent t-tests are shown in Appendix C.

Table 4. 6: Total RLS mean scores, 95% confidence of interval of difference of means (95% CI), missing numbers, and p-value for independent t-test of for year cohorts 3 and 4 (groups A and C)

RLS (Group)	Year Cohort	Number	Mean	95% CI	p-value
	3	96	59.23		
	Missing	2			
Total RLS (A)	Total	98		-8.37 to 2.04	0.231
	4	38	62.39		
	Missing	3			
	Total	41			
	3	41	59.61		
	Missing	3			
Total RLS (C)	Total	44		-8.55 to 4.86	0.584
	4	22	61.45		
	Missing	2			
	Total	24			

A paired-sample t-test was conducted to evaluate any difference between students in the third and fourth year cohorts and there were no significant changes between the groups with time as illustrated in Table 4.7.

Table 4. 7: Mean RLS differences (group A-B) (group A-C) (groups B-C), 95% confidence interval of mean of differences (95% CI) and p-value for the paired t-test for year cohorts 3 and 4

RLS	Year Cohort	Number	Mean Difference	95% CI	p-value
RLS (A – B)	3	42	1.07	-3.82 to 5.96	0.660
RLS (A –C)	3	33	-1.61	-7.13 to 3.92	0.558
RLS (A –C)	4	20	3.3	-2.71 to 9.31	0.265
RLS (B –C)	3	27	-0.74	-5.25 to 3.77	0.739

For statistical purposes the final scores for the 14 item RLS were added up and categorised into: restricted (14-34), partial (35-55), ample (56-76) and maximal (77-98) levels of reflection. This allowed for more variation in the distribution of students along the scale and also to allow comparison between the total RLS score for students and item 15 in the RLS. The distribution of the RLS scores for third and fourth year cohorts is shown in Appendix C. The last question (Item 15) in the RLS inventory, the subjects rate their personal efficacy in the reflective process into restricted, partial, ample or maximal according to a description for each category. There are no differences between the three groups in terms of the levels of reflection and the majority of students were ample in their ability to reflect (students have self autonomy to reflect under favourable conditions) as measured by Sobral's RLS, distribution of Item 15 for the third and fourth year cohorts is demonstrated in Appendix C.

To distinguish the difference between the actual calculated RLS scale and the students' perception of their ability to reflect as represented by (Item 15) in the RLS questionnaire, the difference between them was calculated into a new variable (RLS

difference). Negative values ranging from -1 to -2 indicate that the students rate their ability to reflect as higher than it actually is, while positive values ranging from 1 to 2 indicate that students assume that their ability to reflect is lower than it actually is, and a zero value indicated no difference between their actual and perceived reflective process. As illustrated in Figure 4.5 and Table 4.8, approximately half of the students (45% to 52%) are in line with their actual reflection scale and their self-perception for the ability to reflect (RLS difference=0). To evaluate the RLS difference between third year students a paired t-test was conducted, there were no significant differences with time. An independent t-test was also performed to compare the RLS difference between third and fourth year cohorts, there were no differences between the years. The t-test results for the RLS difference between third and fourth year cohorts is shown in Appendix C.

Figure 4.5: Bar chart of the RLS difference distribution for year cohort 3 and 4 (groups A, B, and C)
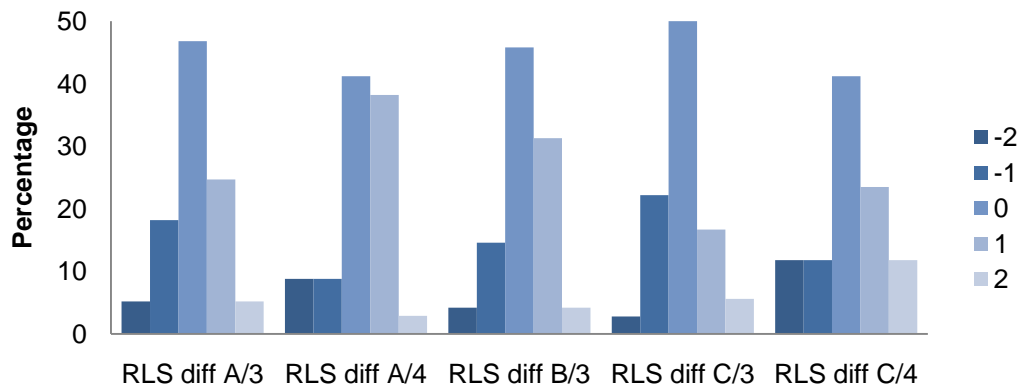
Table 4. 8: RLS Difference for year cohort 3 in groups A, B, and C

Year Cohort	RLS Diff.	RLS difference A		RLS difference B		RLS difference C	
		Number	Percent	Number	Percent	Number	Percent
3	-2	4	5.20%	2	4.20%	1	2.80%
	-1	14	18.20%	7	14.60%	8	22.20%
	0	36	46.80%	22	45.80%	19	52.80%
	1	19	24.70%	15	31.30%	6	16.70%
	2	4	5.20%	2	4.20%	2	5.60%
	Total	77	100%	48	100%	36	100%

4.4.4. Comparative Data of the Dundee Ready Educational Environment

Measure (DREEM) by Year:

The DREEM inventory measures the students' perception of their educational environment, scores less than 100 represent an environment with plenty of problems, scores up to 150 indicate an educational environment moving in the right direction, while scores of more than 150 indicate an excellent environment. The total DREEM and subscales mean scores and independent t-tests for the third and fourth year students (groups A) are shown in Table 4.9, there were no significant differences between the year cohorts and the mean score for the third and fourth year cohorts indicate a more positive environment (M=126.90 and M=122.74 respectively). The distribution of the 50-item DREEM scores are shown in Appendix C.

Table 4. 9: DREEM and Subscales mean scores, 95% confidence interval of difference of means (95% CI) and p-values for independent t-test for year cohort 3 and 4 (group A)

DREEM & Subscales	Year Cohort	Number	Mean	95 % CI	p-value
Total DREEM	3	97	126.91	-3.31 to 11.64	0.609
	4	42	122.74		
Perception of Learning	3	97	30.30	-.215 to 3.70	0.699
	4	42	28.52		
Perception of Teachers	3	97	27.85	-155 to 3.92	0.658
	4	42	25.80		
Academic Self-Perception	3	97	21.00	-1.65 to 1.55	0.479
	4	42	21.05		
Perceptions of Atmosphere	3	97	29.86	-2.12 to 2.49	0.996
	4	42	29.67		
Social Self-Perception	3	97	17.91	-1.07 to 1.57	0.148
	4	42	17.71		

A paired-sample t-test was conducted to evaluate any difference within the third year cohorts with time as shown in Table 4.10. There are highly significant differences (p=0.000) between groups A and B, and groups A and C for the DREEM total mean score (Table 4.10). There were also significant differences between groups A and B and groups A and C for the perception of learning (p=0.000), perception of teachers (p=0.014 and p=0.002), academic self-perception (p=0.024 and p=0.020), and perception of atmosphere (p=0.001 and p=0.004) (Table 4.10). This indicates that the third year cohort as a group, with time have an overall decrease in all aspects of their educational environment except for the social aspect. There were no significant differences between the groups for the second (group B) and third occasion (group C) the students participated and there were no changes with time for the fourth year cohort. The paired t-test results for the fourth year cohort are demonstrated in Appendix C.

Table 4. 10: Mean differences between (groups A-B) (group A-C), and (group B-C), 95% confidence interval of the difference of the means (95% CI) and p-values for paired t-test for DREEM and subscales for year cohort 3

Year Cohort	DREEM & Subscales (Group)	Number	Mean Differences	95% CI	p-value
3	Total DREEM(A-B)	42	10.83	6.69 to 14.99	**0.000**
	Perception of Learning(A-B)	42	4.10	2.72 to 5.47	**0.000**
	Perception of Teachers(A-B)	42	1.86	0.39 to 3.32	**0.014**
	Academic Self-Perception(A-B)	42	1.36	0.19 to 2.53	**0.024**
	Perceptions of Atmosphere(A-B)	42	2.91	1.33 to 4.48	**0.001**
	Social Self-Perception (A-B)	42	0.95	-0.127 to 2.03	0.082
3	Total DREEM (A-C)	33	11.3	4.90 to 15.10	**0.000**
	Perception of Learning(A-C)	33	3.71	1.66 to 5.13	**0.000**
	Perception of Teachers (A-C)	33	2.12	0.80 to 3.26	**0.002**
	Students' Academic Perception(A-C)	33	1.61	0.21 to 2.27	**0.020**
	Perceptions of Atmosphere(A-C)	33	2.85	0.85 to 4.24	**0.004**
	Social Self-Perception(A-C)	33	-2.94	-0.21 to 1.8	0.119
3	Total DREEM (B –C)	27	2.15	-5.51 to 9.80	0.569
	Perception of Learning(B-C)	27	-0.52	-2.88 to 1.84	0.655
	Perception of Teachers(B-C)	27	1.22	-0.82 to 3.27	0.230
	Academic Self-Perception(B-C)	27	1.00	-0.54 to 2.54	0.192
	Perceptions of Atmosphere(B-C)	27	1.22	-0.12 to 2.56	0.072
	Social Self-Perception(B-C)	27	-4.74	-14.81 to 5.33	0.342

The DREEM inventory can be used to pinpoint more specific strength and weaknesses in the environment. In this study, items with a mean score of 3 or more are positive points while items with mean values of 2 or less should be examined more closely as they indicate problem areas. Items with a mean of 2 - 3 are aspects that could be enhanced. Table 4.11 illustrates the weak and strong items of the learning environment as considered by the third and fourth year cohorts in group A. For example, item 3 (There is a good support system for students who get stressed), item 9 (The teachers are authoritarian), item 12 (The school is well timetabled), and item 25 (The teaching over-emphasised factual learning) are items that have been given a score lower than 2 by third and fourth year cohorts in group A.

Items 2 (The teachers are knowledgeable), 15 (I have good friends in this school), item 16 (The teaching helps to develop my competence), and 19 (My social life is good) reflect a strong environment for both third and fourth year cohorts. Two additional items related to social self-perception: item 33 (I feel comfortable in class socially) and item 46 (My accommodation is pleasant) were scored higher than 3 by the fourth year cohort. The third and fourth year group B had similar weak items as group A, in addition to items 17 (Cheating is a problem in this school), 24 (The teaching time is put to good use), and 25 (The teaching over-emphasised factual learning). For group C, items 9, 12, and 25 also have a score lower than 2 and this is noted for both third and fourth year cohorts.

Table 4. 11: Weaknesses (items ≤2) and Strength (items ≥3) of the Learning Environment DREEM items for year cohorts 3 and 4 (groups A, B, and C)

DREEM (Group A)	Year Cohorts 3		4	
Items with Score less than 2:	Mean	SD	Mean	SD
Item 3:There is a good support system for students who get stressed	1.86	1.02	1.69	1.12
Item 9:The teachers are authoritarian	1.71	1.07	1.81	1.02
Item 12:The school is well timetabled	1.60	1.19	1.51	1.25
Item 14: I am rarely bored on this course			1.88	1.20
Item 50: The students irritate the teachers			1.79	1.10
Items with Score of 3 or more:				
Item 2: The teachers are knowledgeable	3.23	0.59	3.12	0.59
Item 15: I have good friends in this school	3.24	0.08	3.31	0.78
Item 16: The teaching helps to develop my competence	3.13	0.62	3.05	0.66
Item 19: My social life is good	3.11	0.74	3.14	0.78
Item 33: I feel comfortable in class socially			3.11	0.85
Item 46: My accommodation is pleasant			3.13	1.16
DREEM (Group B)				
Items with Score less than 2:				
Item 3: There is a good support system for students who get stressed	1.88	1.12		
Item 9: The teachers are authoritarian	1.61	0.92		
Item 12: The school is well timetabled	1.27	1.07		
Item 17: Cheating is a problem in this school	1.78	1.15		
Item 24: The teaching time is put to good use	1.89	1.08		
Item 25: The teaching over-emphasised factual learning	1.69	0.91		
Items with Score of 3 or more:				
Item 15: I have good friends in this school	3.11	0.78		
DREEM (Group C)				
Items with Score less than 2:				
Item 9 The teachers are authoritarian	1.80	0.93		
Item 12 The school is well timetabled	1.45	1.13	1.71	1.04
Item 25 The teaching over-emphasised factual learning	1.86	0.91		
Items with Score of 3 or more:				
Item 2 The teachers are knowledgeable	3.05	0.58	3.25	0.44
Item 16 The teaching helps to develop my competence			3.12	0.45
Item 18 The teachers have good communications skills with patients			3.12	0.45

4.5. Comparative Data of the Assessment Tools Related to Gender:

4.5.1. Comparative Data of the Index of Learning Styles (ILS) by Gender:

Where learning styles were considered there were gender differences found among the groups. An independent t-test was conducted to compare the ILS mean scores for females and males in groups A, B, and C, and has shown that for the active / reflective learning style for the third year cohort in group C, females tend to score more on the balanced side, and this was also seen in the fourth year female cohort (p=0.024). For the sensing / intuitive score for groups A and C, there was a significant difference (p=0.007, p=0.009) between the genders with females scoring more towards the sensing style, and this was seen in third (p=0.005) and fourth year cohorts (p=0.011) as well. There was also significant difference for the visual / verbal score for students in group A (p=0.009) and group C (p=0.037) with males scoring more towards the visual style. Figures 4.6 and 4.7 demonstrate the distribution of learning styles using radar charts (as mentioned in page 87) according to gender for groups A and C. The distribution for the ILS mean scores according to gender for third and fourth year cohorts is illustrated in Appendix C.

Figure 4.6: Active/Reflective, Sensitive/Intuitive, Visual/Verbal, and Sequential/Global mean scores for Females and Males year cohorts 3 and 4 (group A)

Active/Reflective (A)

3 to -3: Balanced
-5 to -11: Active
5 to 11: Reflective

Sensing/Intuitive (A)

3 to -3: Balanced
-5 to -11: Sensing
5 to 11: Intuitive

Visual/Verbal (A)

3 to -3: Balanced
-5 to -11: visual
5 to 11: Verbal

Sequential/Global (A)

3 to -3: Balanced
-5 to -11: Sequential
5 to 11: Global
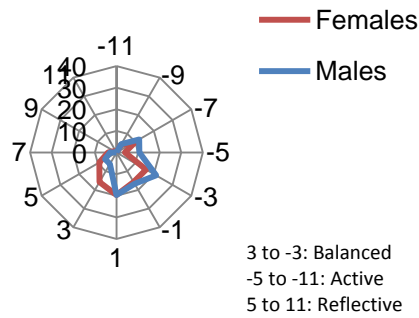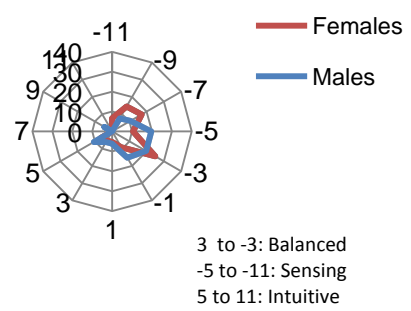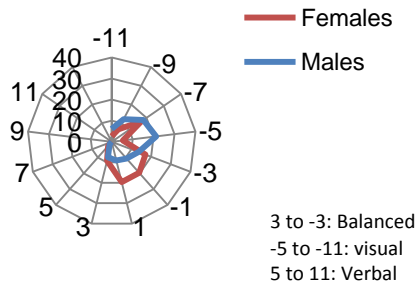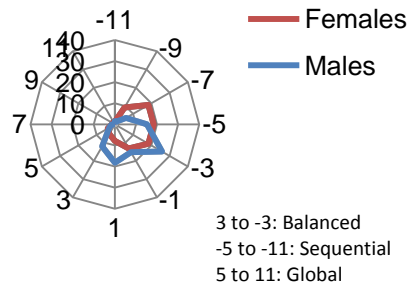
Figure 4.7: Active/Reflective, Sensitive/Intuitive, Visual/Verbal, and Sequential/Global mean scores for Females and Males year cohorts 3 and 4 (group C)
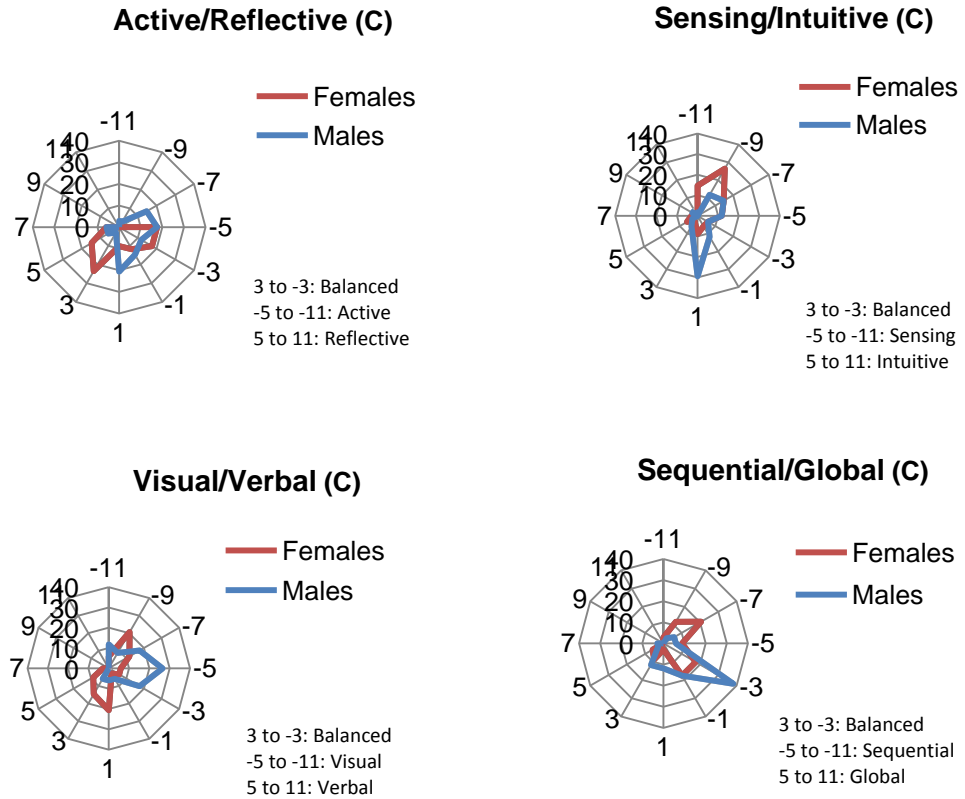
4.5.2. Comparative Data of the Approach to Learning and Studying (ALSI) by Gender:

There are no gender differences between the third and fourth year students for the approach to learning and studying. The mean ALSI scores for third and fourth year females and males is demonstrated in Appendix C.

4.5.3. Comparative Data of the Reflection in Learning Scale (RLS) by Gender:

Independent t-test was conducted to detect differences between genders for the RLS mean scores as illustrated in Table 4.12. There are no significant differences in the RLS for females and males for the third and fourth year cohorts in groups A, B,

and C. The gender distribution for RLS item 15 is shown in Appendix C. There are

no significant differences between genders and item 15 for third and fourth year

cohorts groups A, B, and C.

Table 4. 12: Mean RLS scores, 95% confidence interval of difference of means (95% CI) and p-value for independent t-tests for females and males for year cohorts 3 and 4 (groups A, B, and C)

RLS (Group)	Year Cohort	Gender	Number	Mean	95% CI	p-value
Total RLS (A)	3 , 4	Female	72	59.72	-5.601 to 3.852	0.715
		Male	62	60.6		
Total RLS (B)	3	Female	39	57.33	-13.528 to 2.195	0.154
		Male	21	63.00		
Total RLS(C)	3 , 4	Female	31	60.10	-6.698 to 5.922	0.903
		Male	33	60.48		

4.5.4. Comparative Data of the Dundee Ready Education Environment

Measure (DREEM) by Gender:

An independent-sample t-test was conducted to compare the total DREEM score

and the five DREEM subscales and no significant difference in scores for the third

and fourth year males and females were found. The distribution of the DREEM and

subscales according to gender is demonstrated in Appendix C.

To summarise, the gender differences are only observed for the learning styles,

where females are more sensing than males (p=0.007 and p=0.009), and males

more visual than females (p=0.009) for group A, and for group C (p=0.037).

4.6. Comparative Data of the Assessment Tools Related to Age:

Age was categorised into three categories: category 1: 17-21 year old, 2: 22-26 year old, and 3: older than 27 year of age. The age effect was considered both linearly and by using dummy variables for the age effect. For associations with ILS (active / reflective, visual / verbal, sensing / intuitive, and sequential / global), ALSI (deep, surface, monitoring, and organised / effort), RLS, and DREEM including subscales (perception of learning, perception of teachers, academic self-perception, perception of atmosphere, and social self-perception), the results are shown in Table 4.13. There are significant differences between age and learning styles and perception of the educational environment only. With respect to ILS, there is a statistical significance (p=0.035) (Table 4.13) for the sequential / global score for fourth year cohort in group C, students older than 27 score towards the global style, but there was only one student in group C (age 27-31), and when this student was removed, the difference was no longer significant (p=0.067), but it still demonstrated a trend of older students adopting a more global learning style than younger students.

For DREEM subscales, students in the third year cohort (group A) aged 22-26 and older have a more positive perception of their learning (p=0.028 and p=0.035 respectively) (Table 4.13). While the fourth year cohort (group C) demonstrated that students older than 27 have a negative perception of their learning (p=0.049), academic self-perception (p=0.020), and atmosphere (p=0.039) (Table 4.13), but there was only one student in this group and when the subject was removed there was no significant differences for the fourth year cohort. Older students (older than 27) in the third and fourth year cohorts in group A and third year cohort in group B have a more positive view of their teachers (p=0.046 and p=0.008 respectively) (Table 4.13). Older students in the third year cohort in group A have a more positive view of their social aspect (p=0.049) (Table 4.13). However when the subjects older

than 27 in group A (3 year cohort n=10, 4 year cohort n=6), group B (3 year cohort n=6), and group C (3 year cohort n=3, 4 year cohort n=1) were removed from the analysis, there was no significant differences with age except for the third year cohort (group A), students aged 22-26 years old have a more positive perception of their learning (p=0.021) than younger students (aged 17-21).

Table 4. 13: Multivariate significant associations of ILS and DREEM according to year cohort 3 and 4 (groups A, B, and C) by age groups (coefficient, SE, 95% confidence interval of coefficient, p-value, and R^2)

Assessment Tool	Variable	Year Cohort (Group)	Coefficient	SE	95% CI of coefficient	p-value	R^2
ILS	Sequential/Global •Age 3 vs. 2 and 1	4 (C)	2.62	1.23	0.18 to 5.05	**0.035**	0.031
DREEM	Perception of Learning •Age 2	3 (A)	2.64	1.18	0.29 to 4.99	**0.028**	0.075
	•Age 3		3.94	1.85	0.28 to 7.60	**0.035**	0.075
	Perception of Teachers •Age 3	3 , 4 (A)	3.24	1.61	0.06 to 6.41	**0.046**	0.029
	Social Self Perception •Age 3	3 (A)	2.37	1.19	0.01 to 4.74	**0.049**	0.043
	Perception of Teachers •Age 3	3 (B)	5.62	2.06	1.49 to 9.74	**0.008**	0.118
	Perception of Learning •Age 3	4 (C)	-10.78	5.16	-21.53 to -0.04	**0.049**	0.172
	Academic Self-Perception •Age 3	4 (C)	-10.14	4.04	-18.54 to -1.74	**0.020**	0.233
	Perception of Atmosphere •Age 3	3, 4 (C)	-5.95	2.83	-11.60 to -0.30	**0.039**	0.065

Age 1=19-21 years old, 2: 22-26 years old, 3: ≥27 years

4.7. Comparative Data of the Assessment Tools Related to Ethnicity:

For statistical purposes subjects were placed into three ethnic groups; Asian ethnicity (Asian Bangladesh, Asian Indian and Asian Pakistani), Other ethnic groups (Asian Chinese, Black African, mixed others, mixed-white-Asian, Asian other, other and missing) and White ethnic group.

4.7.1. Comparative Data of the Index of Learning Style (ILS) by Ethnicity:

A statistically significant difference for the sequential / global score for fourth year cohort in group C [F (2, 20) =4.7, p=0.021] was noted as illustrated in Table 4.14. Post-hoc comparisons indicated that the mean global / sequential score for the Asian ethnic group (M=-2.8, SD=3.0) was significantly different from the White group (M=2.6, SD=4.7). The Asian students are balanced in the sequential / global scale but tend to be more sequential, while the White group tend to shift towards the global scale, but there is no actual change in the learning style, students remain balanced. The Other ethnic group (M= -1.00, SD=2.3) did not differ from either the Asian or White groups. Distribution of the ILS mean scores for students in third and fourth year is demonstrated in Appendix C.

Table 4. 14: Sequential/Global learning style (S/G) mean score, 95% confidence interval of difference of mean (95% CI), and p-value for the year cohort 4 (group C) by ethnicity

Ethnicity	Number	S/G Mean Score	95% CI	p-value
Asian	11	-2.82	-4.85 to -0.78	
Other	7	-1.00	-3.14 to 1.14	
White	5	2.60	-3.33 to 8.53	**0.021**
Total	23	-1.09	-2.73 to 0.55	

4.7.2. Comparative Data of the Approach to Learning and Studying (ALSI) by Ethnicity:

The mean ALSI scores for the deep, surface, monitoring, and organised / effort approach by ethnicity for the third year cohort (group A and C) is illustrated in Table 4.15. Statistically significance differences for the surface approach [$F_{(2, 96)}$ = 4.458, p=0.014] for the third year cohort in group A were noted (Table 4.15). There were significant differences for the deep approach [$F_{(2, 41)}$ = 3.801, p=0.031] and monitoring approach [$F_{(2, 41)}$ = 5.733, p= 0.006] for the third year cohort (group C) as well. Post-hoc comparisons indicate that Asian students have a significantly higher mean score for the surface approach than the Other ethnic groups (p=0.017). While students in group C, of Other ethnic origin have a significantly higher mean score for the deep (p= 0.030) and the monitoring approach (p=0.006) than the White ethnic group.

The mean ALSI scores (deep, surface, monitoring, and organised / effort approach) for the fourth year cohort is illustrated in Appendix C.

Table 4. 15: ALSI mean scores by ethnicity, 95% confidence interval of mean differences (95% CI) and p-value for year cohort 3 (group A and C)

Year Cohort (Group)	Ethnicity	ALSI	Number	Mean	95% CI	p-value
3 (A)	Asian		48	66.21	63.72 to 68.70	
	Other	Total ALSI	36	67.56	64.89 to 70.22	0.683
	White		15	65.67	60.85 to 70.48	
	Asian		48	20.90	19.81 to 21.98	
	Other	Deep	36	22.42	21.27 to 23.57	0.112
	White		15	20.73	18.99 to 22.48	
	Asian		48	14.60	13.77 to 15.44	
	Other	Surface	36	12.64	11.67 to 13.60	**0.014**
	White		15	12.80	10.20 to 15.40	
	Asian		48	15.67	14.86 to 16.47	
	Other	Monitoring	36	16.31	15.44 to 17.17	0.555
	White		15	15.93	14.51 to 17.36	
	Asian		48	15.15	14.22 to 16.07	
	Other	Organised / Effort	36	16.19	15.12 to 17.27	0.257
	White		15	16.20	14.58 to 17.82	
3 (C)	Asian		19	61.68	58.69 to 64.68	
	Other	Total ALSI	19	63.95	60.68 to 67.21	0.185
	White		6	58.67	54.38 to 62.95	
	Asian		19	21.05	19.65 to 22.46	
	Other	Deep	19	22.68	20.95 to 24.42	**0.031**
	White		6	18.83	17.61 to 20.06	
	Asian		19	12.95	11.74 to 14.15	
	Other	Surface	19	11.79	10.47 to 13.11	0.381
	White		6	12.00	9.43 to 14.57	
	Asian		19	14.26	13.21 to 15.31	
	Other	Monitoring	19	15.53	14.49 to 16.56	**0.006**
	White		6	12.33	11.06 to 13.60	
	Asian		19	13.63	11.83 to 15.43	
	Other	Organised/Effort	19	14.26	12.87 to 15.65	0.732
	White		6	14.83	9.85 to 19.82	

4.7.3. Comparative Data of the Reflection in Learning Scale (RLS) by Ethnicity:

A one–way analysis of variance (ANOVA) was conducted to explore the impact of ethnicity on the reflective process as measured by the RLS. There are no ethnic differences for the RLS score and RLS item 15. Distribution of the RLS according to ethnicity is illustrated in Appendix C.

4.7.4. Comparative Data of the Dundee Ready Education Environment Measure (DREEM) by Ethnicity:

There was a significant difference between the ethnic groups and the total DREEM score [$F (2, 96) = 3.221$, $p=0.044$] and perception of learning score [$F (2, 96) = 6.76$, $p=0.002$] for the third year cohort in group A (Table 4.16). Post-hoc comparisons indicate that students from Asian ethnicity have a lower total DREEM and perception of learning score than students from Other ethnic groups (Table 4.16). The DREEM and subscales mean scores for the third year in group B, C and fourth year cohort in group C are demonstrated in Appendix C.

Table 4. 16: Mean DREEM and subscales scores (perception of learning, teachers, academic and social self perception) by ethnicity, 95% confidence interval of difference of means (95% CI) and p-values for year cohorts 3 and 4 (group A)

Year Cohort (Group)	Ethnicity	DREEM & Subscales	Number	Mean	95% CI	p-value
3 (A)	Asian		47	121.60	115.45 to127.74	
	Other		35	132.74	125.64 to 139.84	**0.044**
	White		15	129.93	120.51 to 139.36	
	Total	**Total DREEM**	97	126.91	122.72 to 131.09	
4 (A)	Asian		21	123.76	117.83 to 129.69	
	Other		11	118.91	98.37 to 139.45	0.765
	White		10	124.83	111.71 to 137.89	
	Total		42	122.74	116.59 to 128.89	
3 (A)	Asian		47	28.31	26.70 to 29.90	
	Other		35	32.46	30.76 to 34.15	**0.002**
	White		15	31.33	28.54 to 34.12	
	Total	**Perception of Learning**	97	30.27	29.16 to 31.38	
4 (A)	Asian		21	28.67	26.79 to 30.55	
	Other		11	27.55	22.98 to 32.12	0.722
	White		10	29.30	25.89 to 32.71	
	Total		42	28.52	26.97 to 30.08	
3 (A)	Asian		47	26.79	25.36 to 28.21	
	Other		35	29.17	27.16 to 31.19	0.092
	White		15	28.8	27.05 to 30.55	
	Total	**Perception of Teachers**	97	27.96	26.93 to 28.99	
4 (A)	Asian		21	25	23.46 to 26.54	
	Other		11	26.55	21.89 to 31.20	0.586
	White		10	26.7	22.75 to 30.65	
	Total		42	25.81	24.26 to 27.36	
3 (A)	Asian		47	19.87	18.53 to 21.21	
	Other		35	22.03	20.79 to 23.27	0.061
	White		15	21.40	19.54 to 23.26	
	Total	**Academic Self-perception**	97	20.89	20.05 to 21.72	
4 (A)	Asian		21	21.62	20.10 to 23.14	
	Other		11	20.00	15.37 to 24.63	0.671
	White		10	21.00	17.61 to 24.39	
	Total		42	21.05	19.57 to 22.52	
3 (A)	Asian		47	29.09	27.24 to 30.93	
	Other		35	31.17	28.96 to 33.39	0.315
	White		15	29.22	25.89 to 32.51	
	Total	**Perception of Atmosphere**	97	29.86	28.58 to 31.13	
4 (A)	Asian		21	30.14	28.29 to 31.99	
	Other		11	27.91	21.19 to 34.63	0.571
	White		10	30.60	26.71 to 34.49	
	Total		42	29.67	27.69 to 31.64	

Continued from Table 4.16:

Year Cohort (Group)	Ethnicity	DREEM & Subscales	Number	Mean	95% CI	p-value
3 (A)	Asian		47	17.55	16.55 to 18.56	
	Other		35	17.91	16.69 to 19.14	0.291
	White		15	19.2	17.23 to 21.17	
	Total	Social Self-Perception	97	17.94	17.23 to 18.64	
4 (A)	Asian		21	18.33	16.61 to 20.06	
	Other		11	16.91	13.90 to 19.92	0.561
	White		10	17.2	14.70 to 19.70	
	Total		42	17.69	16.48 to 18.90	

To summarise, there are significant ethnic differences for the different assessment tools except for the reflective process as measured by RLS. For learning styles, students from Asian ethnicity score more towards the sequential style, while students from White background score towards a global style. There were significant ethnic differences for the approaches students adopted, it was noted that students from Asian background adopted a surface approach, while students from Other ethnicities adopted a more deep and monitoring approach. With concern to the perception of the educational environment, Asian students have a more negative view of their overall environment and their learning.

4.8. Comparative Data of the Assessment Tools Related to Socioeconomic Status (SES):

For statistical purposes, subjects were placed into four categories for the socioeconomic status;

- 1: Managers, Senior officials, professional occupations.

- 2: Associate professionals, technical, administrative, secretarial.

- 3: Skilled trade occupations, personal service occupations, sales and customer services.

- 4: Process and plant operatives and elementary occupations and missing.

Multiple linear regression was used to assess an association of socioeconomic status with the ILS (active / reflective, visual / verbal, sensitive / intuitive, and sequential / global), ALSI (deep, surface, monitoring, and organised/effort), RLS, and DREEM and subscales (perception of learning, perception of teaching, academic self-perception, perception of atmosphere, and social self-perception) as demonstrated in Table 4.17.

A socioeconomic effect was found for the visual / verbal learning style for third year cohort in groups B (p=0.007) and C (p=0.018), as the socioeconomic status category increases (i.e. lower SES) students learning style tend to shift towards a verbal style (Table 4.17). It was found that third year students in groups A (p=0.012) and C (p=0.042) from a higher socioeconomic background adopt an organised / effort approach to learning (Table 4.17). Higher socioeconomic status is also associated with a higher total RLS score (p=0.011) and a more positive academic perception (p=0.031) as illustrated in Table 4.17.

Table 4. 17: Significant association of ILS, ALSI, RLS, and DREEM by Socioeconomic status for year cohort 3 (groups A, B, and C) (coefficient, SE, 95% confidence interval of coefficient, p-value, and R^2)

Assessment Tools	Variable	Year Cohort (Group)	Coefficient	SE	95% CI of Coefficient	p-value	R^2
ILS	Visual/Verbal SES (per category$^\bullet$)	3 (B)	2.47	0.87	0.72 to 4.24	**0.007**	0.146
	Visual/Verbal SES (per category$^\bullet$)	3 (C)	2.36	0.96	0.42 to 4.29	**0.018**	0.135
ALSI	Organised-Effort SES (per category$^\bullet$)	3 (A)	-0.89	0.35	-1.59 to -0.20	**0.012**	0.074
	Organised-Effort SES (per category$^\bullet$)	3 (C)	-1.42	0.68	-2.79 to -0.06	**0.042**	0.011
RLS	RLS SES (per category$^\bullet$)	3 (A)	-4.52	1.75	-8.00 to -1.04	**0.011**	0.066
DREEM	Student Academic Perception SES (per category$^\bullet$)	3 (B)	-1.65	0.74	-3.14 to -0.16	**0.031**	0.095

$^\bullet$SES category = 1: Managers, Senior officials, professional occupations, 2: Associate professionals, technical, administrative, secretarial, 3: Skilled trade occupations, personal service sales and customer services, and 4: Process and plant operatives and elementary occupations and missing

4.9. Comparative Data of the Assessment Tools Related to Academic Achievement:

There was a number of missing student identification numbers, therefore their grades could not be found resulting in missing academic achievement scores. For analytic purposes, the missing academic grades were assumed to be the mean grades corresponding to third and fourth year cohorts (67.4% Merit). The students' academic achievements were obtained from their records twice during the study; Academic Achievement 1 (BDS part 1: sections A and B for the academic year 2005/06), and Academic Achievement 2 (BDS part 3: sections A and B for the academic year 2007/08).

4.9.1. Comparative Data of the Index of Learning Style (ILS) by Academic Achievement:

The association of students' academic achievement with the active / reflective, sensing / intuitive, visual / verbal and sequential / global as measured by the ILS was explored using ANOVA. The significant associations are presented in Table 4.18, whereas the overall distribution of the ILS mean score according to students' academic achievement is demonstrated in Appendix C.

There is a statistically significant difference for the active / reflective score by academic grades for the third year cohort in group A [F (4, 96) =3.04, p=0.021] and group C [F (3, 41) =3.83, p=0.017], post-hoc comparisons indicated that the mean scores for students with passing grade (M=-3.09, SD=4.1 and M=-3.75, SD=3.01) are significantly different (p=0.021 and p=0.017) (Table 4.18) from students with distinction (M=1.67, SD=2.8 and M=1.3, SD=3.8). Although students are balanced for the active / reflective style but students with passing grades tend to shift towards the active style. It is also noted that students in group A in the fourth year cohort [F (2, 38) = 4.17, p=0.023] with distinction (M=1.12, SD= 2.6) tend to incline towards

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the reflective style more so than students with merit grade (M=-2.24, SD= 4.4) (p=0.023) (Table 4.18).

In addition it was found that, the sequential / global mean score for the third year cohort for students in group B with merit (M=-1.86, SD=3.9) is significantly different (p=0.023) from students with distinction grade (M=-4.18, SD=4.00) indicating that students with distinction tend to score towards the sequential style while students with merit grades are more balanced (Table 4.18).

Table 4. 18: ILS mean scores by Academic Achievement 1 or 2 (AA 1 or AA 2), 95% confidence interval of difference of means (95% CI) and significant ANOVA p-value for year cohorts 3 and 4 (groups A, B, and C)

Year Cohort (Group	ILS	AA 1 or 2		Number	Mean	95% CI	p-value
3 (A)	Active/ Reflective	AA1	Fail ≤44	2	-1.00	-51.82 to 49.82	0.021
			Borderline 45-49	3	-3.67	-6.54 to -0.80	
			Pass 50-59	23	-3.09	-4.86 to -1.31	
			Merit 60-69	59	-0.68	-1.75 to 0.40	
			Distinction ≥70	14	1.29	-0.93 to 3.50	
			Total	101	-1.05	-1.88 to -0.22	
4 (A)	Active/ Reflective	AA1	Fail ≤ 44	0	0	0	0.023
			Borderline 45-49	0	0	0	
			Pass 50-59	3	-2.33	-9.92 to 5.26	
			Merit 60-69	21	-2.24	-4.24 to -0.23	
			Distinction ≥70	17	1.12	-0.22 to 2.45	
			Total	41	-0.85	-2.10 to 0.40	
3 (C)	Active / Reflective	AA1	Fail ≤ 44	0	0	0	0.017
			Borderline 45-49	2	-4.00	-42.12 to 34.12	
			Pass 50-59	8	-3.75	-6.27 to -1.23	
			Merit 60-69	26	0.00	-1.65 to 1.65	
			Distinction ≥70	9	1.67	-0.51 to 3.84	
			Total	45	-0.51	-1.73 to 0.71	
3 (B)	Sequential / Global	AA2	Fail ≤ 44	0	0	0	0.023
			Borderline 45-49	0	0	0	
			Pass 50-59	2	-8.00	-46.12 to 30.12	
			Merit 60-69	37	-1.86	-3.18 to -0.55	
			Distinction ≥70	22	-4.18	-5.97 to -2.39	
			Total	61	-2.90	-3.97 to -1.83	

4.9.2. Comparative Data of the Approach to Learning and Studying (ALSI) by Academic Achievement:

A one–way between group analysis of variance was conducted to explore the association of students' academic achievement on the deep, surface, monitoring and organised/effort approach as measured by ALSI on each three occasions that the questionnaire was distributed. There was no significant difference between the different approaches and the academic achievement of students. The distribution of ALSI according to academic achievement for third and fourth year students is illustrated in Appendix C.

4.9.3. Comparative Data of the Reflection in Learning Scale (RLS) by Academic Achievement:

A one–way between groups analysis of variance was conducted to explore the impact of students' academic achievement on the reflective process and there was no difference between the academic achievement scores and the reflective process as measured by RLS. The distribution of RLS according to academic achievement for the third and fourth year cohorts is shown in Appendix C.

4.9.4. Comparative Data of the Dundee Ready Educational Environment Measure (DREEM) by Academic Achievement:

Third and fourth year cohorts in group A, were compared with their academic achievement 1. There was no significant difference for total DREEM and subscales and academic achievements for the third year cohort. The mean value, 95% confidence interval of means, and p-value for third year students group A, B, and C are illustrated in Appendix C.

Table 4.19 shows the distribution of the DREEM and subscales for the fourth year cohort in group A according to the academic achievement 1. There is a statistically

significant difference for the total DREEM [F (2, 39) = 3.382, p=.044], academic self-perception [F 92, 39) = 3.441, p=.042] and perception of atmosphere [F (2, 39) = 5.226, p=.010] scores for the fourth year cohort for students in group A (Table 4.19). Students with passing grades have a lower mean value for the total DREEM (M=96, SD=49), academic self-perception (M=14.67, SD=11.02), and perception of atmosphere (M=20, SD=14.73) than students with a merit grade (M=125.82, SD=14.98) (p=.044), (M=21.18, SD=3.81) (p = 0.042), and (M=31.36, SD=4.93) (p = 0.010) respectively (Table 4.19). It was also found that students with passing grades have a lower mean score for perception of atmosphere than students with distinction (M=29.18, SD=4.69) (Table 4.19).

There are no significant differences between academic achievement 2 and the DREEM and subscales for the third (group B and C) and fourth year cohorts (group C). Mean scores for DREEM and subscales, 95% confidence interval and p-values by the academic achievement for the fourth year cohort for students in group C is demonstrated in Appendix C.

Table 4. 19: DREEM and subscales mean scores by Academic Achievement 1, 95% confidence interval of difference of mean (95% CI) and p-values for year cohort 4 (group A)

Year (Group)	DREEM & Subscales	Academic Achievement 1	Number	Mean	95% C I	P-value
4 (A)	**Total DREEM**	Fail ≤ 44	0	0	0	**0.044**
		Borderline 45-49	0	0	0	
		Pass 50-59	3	96.00	-25.72 to 217.72	
		Merit 60-69	22	125.82	119.17 to 132.46	
		Distinction ≥70	17	123.47	115.24 to 131.71	
		Total	42	122.74	116.59 to 128.89	
	Perception of Learning	Fail ≤ 44	0	0	0	0.390
		Borderline 45-49	0	0	0	
		Pass 50-59	3	25.33	-1.46 to 52.13	
		Merit 60-69	22	29.32	27.57 to 31.07	
		Distinction ≥70	17	28.06	25.43 to 30.68	
		Total	42	28.52	26.97 to 30.08	
	Perception of Teachers	Fail ≤ 44	0	0	0	0.112
		Borderline 45-49	0	0	0	
		Pass 50-59	3	20.67	1.86 to 39.48	
		Merit 60-69	22	25.55	23.51 to 27.58	
		Distinction ≥70	17	27.06	24.66 to 29.46	
		Total	42	25.81	24.26 to 27.36	
	Academic Self-Perception	Fail ≤ 44	0	0	0	**0.042**
		Borderline 45-49	0	0	0	
		Pass 50-59	3	14.67	-12.70 to 42.03	
		Merit 60-69	22	21.18	19.49 to 22.87	
		Distinction ≥70	17	22.00	20.03 to 23.97	
		Total	42	21.05	19.57 to 22.52	
	Perception of Atmosphere	Fail ≤ 44	0	0	0	**0.010**
		Borderline 45-49	0	0	0	
		Pass 50-59	3	20	-16.59 to 56.59	
		Merit 60-69	22	31.36	29.18 to 33.55	
		Distinction ≥70	17	29.18	26.76 to 31.59	
		Total	42	29.67	27.69 to 31.64	
	Social Self-Perception	Fail ≤ 44	0	0	0	0.347
		Borderline 45-49	0	0	0	
		Pass 50-59	3	15.33	1.65 to 29.01	
		Merit 60-69	22	18.41	16.90 to 19.92	
		Distinction ≥70	17	17.18	15.03 to 19.32	
		Total	42	17.69	16.48 to 18.90	

4.10. The Dental Undergraduate Student Model:

Standard multiple regression was used to explore the dental students' learning characteristics. Table 4.20 illustrates the dental undergraduate students learning characteristics for a third and fourth year student at Barts and The London School of Medicine and Dentistry, Queen Mary, University of London.

Index of Learning styles (ILS):

- Students' learning styles are balanced for the active / reflective scales but students from Other ethnic backgrounds tend to be more reflective (p=0.043) (Table 4.20).

- Females are more sensing while males are more visual (p=0.002) (Table 4.20). Both males and females are balanced in the sequential / global scale but females tend to shift towards the sequential style (p=0.024) (Table 4.20).

Approach to Learning and Studying (ALSI):

- The mean score of the total ALSI inventory was higher for third year than fourth year students (p=0.000), and students with merit grade had higher mean score for the total ALSI than students with distinction (p=0.045) (Table 4.20).

- Students in the third year cohort have a higher mean score for the deep approach to learning (p=0.000) and as the age increases so does the mean score for the deep approach to learning (p=0.019) (Table 4.20).

- Third year students scored higher than fourth year students for surface (p=0.000), monitoring (p=0.000), and organised / effort approach to learning and studying (p=0.000).

- Students from Asian ethnic background have lower values for the organised / effort approach (p=0.011) (Table 4.20).

Reflection in Learning Scale (RLS):

- Students in the fourth year cohort have higher RLS scores (p=0.050) as illustrated in Table 4.20.

Dundee Ready Education Environment Method (DREEM):

- Students from Asian ethnic background have lower mean values for the total DREEM (p=0.022), perception of learning (p=0.002), and perception of teachers (p=0.015) scores as illustrated in Table 4.20.

Table 4. 20: Multivariable Analysis of ILS, ALSI, RLS, and DREEM with different independent variables for year cohorts 3 and 4

Assessment Tools	Variable	Coefficient	SE	95% CI of Coefficient	p-value	R^2
ILS	Active/Reflective					
	** Ethnicity (category 2) v all others	1.64	0.8	0.06 to 3.23	**0.043**	0.035
	Sensitive/Intuitive					
	Gender male vs. female	2.69	0.86	0.98 to 4.41	**0.002**	0.078
	Visual/Verbal					
	Gender male vs. female	-1.78	0.68	-3.11 to -0.44	**0.009**	0.047
	Sequential/Global					
	Gender male vs. female	1.64	0.72	0.22 to 3.06	**0.024**	0.044
ALSI	Total ALSI					
	Year	-24.19	1.8	-27.75 to -20.63	**0.000**	0.616
	****Academic Achievement	-0.18	0.09	-0.36 to -.004	**0.045**	0.629
	Deep					
	Year	-5.35	0.82	-6.98 to -3.71	**0.000**	0.271
	*Age (category)	1.43	0.6	0.24 to 2,61	**0.019**	0.307
	Surface					
	Year	-2.54	0.69	-3.91 to -1.17	**0.000**	0.107
	Monitoring					
	Year	-8.52	0.55	-9.60 to -7.43	**0.000**	0.681
	Organised/Effort					
	Year	-7.85	0.7	-9.24 to -6.45	**0.000**	0.524
	** Ethnicity (category 1)	-1.55	0.6	-2.75 to -0.36	**0.011**	0.551
RLS	Total RLS					
	Year	0.26	0.13	0.00 to 0.52	**0.050**	0.029

Continued from Table 4.20

Assessment Tools	Variable	Coefficient	SE	95% CI of Coefficient	p-value	R²
DREEM	Total DREEM					
	**Ethnicity (category 1)	-7.68	3.31	-14.23 to -1.13	**0.022**	0.046
	Total Perception of Learning					
	**Ethnicity (category 1)	-2.83	0.9	-4.62 to -1.04	**0.002**	0.081
	Total Perception of Teaching					
	**Ethnicity (category 1)	-2.27	0.92	-4.10 to -0.44	**0.015**	0.051

*Age: Cat 1=17-21 year old. 2: 22-16 year old, 3: ≥27 years old
**Ethnicity: Cat 1=Asian: Asian-Bangladeshi, Asian-Indian, and Asian-Pakistani. 2: Others: Asian-Chinese, Asian-other, Black-African, Mixed-other, Mixed-white-Asian, and missing. 3: White
***Socioeconomic status: Cat 1:Managers, Senior officials, Professional occupations, 2: Associate professionals, Technicians, Administrative and Secretarial, 3; Skilled trade, Personal service, and Sales/Customer service, and 4; Process/plant machine operatives, elementary, and missing
****Academic Achievement: Cat 1=Fail≤40%. 2: Borderline 45-49%, 3: Pass 50-59%. 4: Merit 60-69%. 5: Distinction≥70%

In summary, the third and fourth year cohorts at Barts and The London School of Medicine and Dentistry, Queen Mary, University of London have a sensing and visual learning style, with females being more sensing style while males are more visual. The third year cohort as a group, adopt a variety of approaches to learning and studying simultaneously more so than the fourth year cohort. Older students adopt a more deep approach while students from Asian ethnic backgrounds have a lower score for the organised / effort approach to learning and studying. Students in the fourth year cohort reflect more than the third year cohort. Students from Asian background also have a more negative view of their overall educational environment, their learning, and perception of their teachers.

4.11: Discussion:

The aim of the pilot study was to test the feasibility of the four structured questionnaires on dental undergraduate students, as well as assessing the students' learning styles, learning approaches, the reflective process, and perception of the educational environment as measured by ILS, ALSI, RLS and DREEM respectively (Felder, 2007, ETL, 2001, Sobral, 2001, Roff, 2005). As an outcome of this pilot study, valuable data on the learning characteristics of the dental students emerged. This gave an opportunity to compare the results with that of the main study, since studies of this nature are lacking.

One hundred and twenty six third year and forty one fourth year students completed the questionnaires with response rates varying from 75% to 79% for the four different assessment tools. The majority of students (52.1%) were aged between 19 to 21 and female (55.7%). Forty eight percent of students were of Asian Indian, Asian Pakistani, or of Asian Bangladeshi origin and 48% of the parents were either managers, senior officials, or have professional occupations (Table 4.1).

4.11.1. The Learning Styles of Dental Undergraduate Students at QMUL:

The learning styles of dental undergraduate students have received little or no attention from dental educators, although students' knowledge of their own learning style could enlighten them on their learning strengths and weaknesses and can be utilised by academics to investigate the factors that will lead to a more effective learning and teaching (Hawk and Shah, 2007).

In this pilot study, Cronbach alpha was 0.81 on the first occasion that ILS was administered, which indicates reliability of the scale to measure the learning styles. However Cronbach alpha was rather lower (0.55 and 0.61) for the second and third occasion that the inventory was administered but the results lie within the alpha values of previous studies which ranged from 0.7 to 0.5 (Cook, 2005). According to

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Tuckman (1999), an instrument that measures univariate quantities such as test of knowledge or achievement should have a Cronbach alpha of 0.75 or greater, while instruments that measure preference or attitudes such as the learning style of students, a Cronbach alpha of 0.50 or greater is acceptable.

This pilot study demonstrated that the dental undergraduates at Barts and The London School of Medicine and Dentistry are practical and prefer to observe how information connects and applies to practice and they are oriented towards facts and procedures (sensing). They also prefer visual representation of material for example; pictures, diagrams, flow charts, and models and remember what they see. Since, there are no other studies that assess the learning styles of undergraduate dental students to compare our results with, a North American study conducted on orthodontic residents was considered (Hughes et al., 2009). The majority of residents' learning styles are sensing, highly visual, and balanced between the active / reflective and sequential / global learning styles, which is not dissimilar to this pilot study. Third and fourth year students' are more sensing (43.7%), visual (44.4%), and balanced (65.5%) for the active / reflective and the sequential / global (57%) learning style. It has been noted in previous studies on learning styles (Zywno, 2003) that students who choose subject areas such as mathematics or physics are largely intuitive, while students who prefer disciplines such as civil engineering or nursing are more likely to be sensing learners, and this finding is similar to the dental undergraduates who are also more sensing.

Third year students learning style for the active / reflective dimension, tend to shift towards the active style with time (p=0.006) (Table 4.3). This might reflect the activities in which students are engaging, as they move into the fourth year, such as more group activities and clinical work which will cause a shift in their learning styles. However, there was no actual change for either the active or the reflective style, the majority remain balanced in their approach. There were no significant

differences in learning styles between third and fourth year students with time, and no significant age differences with learning styles.

In this study, female students are more sensing than male students (p=0.007), they like to work in real life situations and benefit from solving problems. While male students learn from visual representation of material (p=0.009) (Figures 4.6 and 4.7). There are also some significant differences for the sequential / global and the active / reflective learning style, but an actual difference in styles between genders as with the sensing / intuitive and visual / verbal learning styles was not seen.

The gender differences raises issues of how best to distribute students when working in groups during clinical sessions and which pairs work more productively together; pair them in the same gender group or one male and one female. And how can we identify which pairs are more productive, either by measuring the students' production, students' satisfaction, or patient satisfaction? Our findings are similar to gender differences found in engineering students, where females are more sequential, sensing, and less visual (Litzinger et al., 2005). However, no such gender differences were reported for orthodontic residents (Hughes et al., 2009), this might be due to the fact that the orthodontic residents are working within one discipline (orthodontics), also they are older, more experienced and have stable learning styles. However when investigating the learning styles of undergraduate dental students, gender differences can probably be demonstrated because the students are exposed to a variety of dental disciplines, they are novices, and lack experience and are coping with the different requirements of the dental environment.

Students from Asian Indian, Asian Pakistani, and Asian Bangladeshi background, have demonstrated a significantly more sequential learning style (p=0.021) (Table 4.14) when compared to students of white ethnicity, however all ethnic groups remain balanced between the sequential / global learning style. Students with a

lower socioeconomic status tend to benefit from lectures and discussions (verbal) rather than visual representation of material, and this was demonstrated throughout the study (p=0.007, p=0.018) (Table 4.17). These results indicate that the learning styles of students from Asian ethnicity and students from lower socioeconomic background differ from other students and they may respond differently to certain teaching approaches.

The learning / teaching environment of this dental school seems to favour sensing and visual learners, therefore students with other learning styles may be taught in a mismatched manner which may diminish their motivation to learn. Generally, learning styles are a description of common behaviour patterns and are shaped by an individual's past experiences and the context in which learning takes place (Keefe, 1979, Valiente, 2008), and optimal teaching should include a balance between the different dimensions of learning styles models to accommodate all learners (Felder and Brent, 2005).

It was noted that students with academic achievement of distinction (academic grades >70) learn by thinking things out and prefer working alone or in small groups (reflective) than students with borderline (academic grades 45-49%) (p=0.021), pass (academic grades 50-59%) (p=0.023), or merit academic achievements (academic grades 60-69%) (p=0.017) (Table 4.18). Throughout the study this was only demonstrated for the active / reflective learning style, however a significant difference for the sequential / global style was demonstrated during the second data collection in which third year students with distinction (academic grades >70) were more sequential than students with merit (academic grades 60-69%) (Table 4.18). There is a debate on whether to utilise learning styles to predict academic achievement or not (Van Zwanenberg et al., 2000). On one hand, Kolb states that matching teaching styles with the learning styles of students will lead to improved academic achievement (Kolb, 1984), while Felder (Felder and Brent, 2005) argues

that learning styles provide no indication of what students are and are not capable of, nor can they be used to predict academic performance.

In this study, it was noted that students with distinction, score more towards the reflective style, however students remain balanced for the active / reflective dimension and there is no change over time. Therefore, learning styles in this pilot study cannot be used to predict academic achievements and should only be used to enhance students' awareness of their learning strength and weaknesses.

4.11.2. The Approach to Learning and Studying of the Dental Undergraduate Students at QMUL:

Research on learning approaches is lacking in dental education, although understanding the learning processes of dental students is important in facilitating independent learning and encouraging the development of critical thinking (Snelgrove and Slater, 2003).

Cronbach alpha coefficient in this study ranged from 0.60 to 0.84 for the three different occasions that the assessment was administered, these values are similar to other studies conducted using the ALSI (Entwistle et al., 2000, Mattick et al., 2004).

The approach to learning and studying of the undergraduate dental students in this study indicate that approximately 76% of students adopt a deep approach, 65% are surface learners, 41% are monitoring learners, and 45% are organised-effort learners. The distribution of the approaches to learning and studying did not significantly change with time (Figure 4.3). In this study there is no preference for a particular learning approach for the dental undergraduate students, in contrast to studies conducted on medical students, where it was reported that there was a preference for surface learning (Newble and Entwistle, 1986). The third year cohort as compared to fourth year have significantly higher scores for all learning and

studying approaches (p=0.000) (Table 4.4). This could be due to the effect of the learning environment on the third year cohort, by which students change their approaches to learning and studying from one course to another depending on the curricular and examination requirements in order to adapt to different settings or different learning task demands as described by Entwistle and others (Entwistle, 2000, Duff, 2002).

There is an overlap in the preference of the students' approach to learning and studying in this cohort and ideally these various combinations should form a coherent whole in which all the different approaches fit together. Some students may express a combination of approaches called "orchestrations", where orchestration is defined as the contextualized study approach adopted by individual students or groups of students (Meyer, 1991). Individual students can adopt a variety of approaches, and if they are incompatible, they are called dissonant orchestrations, which maybe the result of a mismatch between a students' personal intentions and his or her perception of the learning environment (Meyer, 1991, Entwistle et al., 2000).

There have been more studies on the approaches to learning and studying of medical students than dental students, thus Lindeman's study on the learning approaches of medical and dental students in the United States (Lindemann et al., 2001) is useful as a comparison. Surface learning preference for the Barts and the London students was higher (65%) than the Lindemann study, in which dental students were equally likely to report using a deep or surface approach (42.6%, and 45% respectively), but with a reduction in the surface approach to 42% over time. This was not seen in the pilot study as there was an increase not only in the surface but in all the other approaches (Figure 4.4). When comparing mean scores for the different approaches to learning and studying with a further study conducted on first year medical undergraduate students in the United Kingdom (Mattick et al., 2004),

the dental undergraduate students in our pilot study have lower mean scores for the deep and monitoring approach, a higher surface approach and somewhat similar mean scores for the organised / effort approach. This may well indicate that students are memorising without understanding (surface) and students adopting this approach have an intention of only reproducing the material, they are unable to see relationships between ideas or concepts, in other words, fragmented knowledge and unreflective studying (Meyer, 1991, Entwistle, 2009).

No significant differences between the approach to learning with gender or with age were detected, and this is dissimilar to what Richardson and others have reported about age differences of students in higher education courses, where mature students are more likely to adopt a meaning orientation (deep) but less likely to adopt a reproducing orientation (surface) than younger students (Richardson, 1994a, Richardson, 1995, Watkins and Regmi, 1996). There are also no significant differences noted for academic achievement, in contrast to those studies that have reported that adopting a deep approach will lead to improved academic performance (Svensson, 1977, Zhang, 2000, Duff et al., 2004).

Students from Asian Indian, Asian Pakistani, and Asian Bangladeshi background adopt a more surface approach than students from other ethnic backgrounds (such as Asian Chinese, Black-African, Mixed-white-Asian, and Asian others) while students from other ethnic backgrounds adopt a more deep and organised / effort approach which may reflect cultural differences between ethnicities in perception of their educational environment and their understanding of learning (Volet and Jarvela, 2000, Lonka et al., 2004). Students of Asian background, characterise learning as a combination of memorising and understanding (Marton et al., 1997b, Entwistle and Peterson, 2004), and in this study it was noted that Asian Chinese students use memorisation with understanding. Students in this study from Asian Bangladeshi, Asian Indian, and Asian Pakistani background adopted a more surface

approach (p=0.017) (Table 4.15) (memorisation without understanding) which may well be due to their perception of the learning / teaching environment and social expectations and pressures. Their view of assessment as a restrictive public examination in addition to high parental expectations (Kember and Leung, 2009) may have affected their perceptions of the overall educational (p=0.044) and learning environment (p=0.002) (Table 4.16). Students with higher socioeconomic background also adopted an organised / effort approach (Table 4.17), which is a combination of good study habits and time-managment motivated by thier intention to achieve higher grades (Entwistle et al., 2001).

4.11.3. The Reflective Process of the Dental Undergraduate Students at QMUL:

Assessing the students reflective process may give students insight into how they learn from their experiences which could therefore influence the outcome of their academic progress. The Reflective process in this pilot study was measured using Sobral's RLS. The reliability for RLS was similar for previous studies using RLS and Cronbach α ranged from 0.89 to 0.91 for the three occasions the inventory was administered (Sobral, 2005).

The stability of the RLS scores 60.13 (SD=13.75), 59.32 (SD = 14.64), and 61.56 (SD=15.83) on repeated measurements suggests that the third and fourth year cohorts as a group have a stable level of an overall reflection-in-learning activity under different conditions of learning whether at the start or end of the year. This is similar to results obtained from second year medical students in a Brazilian University (Sobral, 2005). In this pilot study, about 60% of the undergarduate dental students have autonomy to reflect under favorable conditions (ample). When comparing the RLS mean scores obtained from this study with a study conducted on 103 medical students begining their clinical work at the University of Brazilia

(Sobral, 2000), the dental undergarduate students have a higher RLS mean score, thus are able to reflect more readily. However the mean scores for the RLS were lower than scores obtained by second year medical students (n=282) (M=70.94, SD=10.83) (Sobral, 2004).

There are no significant differences with age, gender, or ethnicity, but where students had higher socioeconomic status they were able to reflect more (p=0.011) (Table 4.17), this could be explained by the fact those students also adopt an organised / effort approach, which in turn is related to a deep approach and use of good time management to organise their studying (Entwistle, 2009). This will lead to a higher reflection in learning as measured by RLS.

Students were asked to rate their own personal efficacy in the reflective process according to a descriptor for each efficacy in the RLS questionnaire (item 15). The majority of students (35 to 49 %) described themselves as having autonomy in their ability to reflect under the right circumstances (ample), indicating they have the necessary skills to reflect, and which could be improved by putting more time and effort. However, other students need incentives and opportunities to reflect under favourable conditions (partial).

To differentiate between students' actual RLS score and their perception on their reflective ability (item 15), the RLS difference was calculated. About half of the students (41% to 51%) were aligned between the perceived level of reflection and their actual RLS score, indicating that they have the necessary skills needed in order to reflect in their learning and understand the process of reflection.

4.11.4. The Dental Undergraduate Students' Perception of Their Learning Environment at QMUL:

DREEM is a useful tool to assess the educational environment and has been recommended for internal quality assessment and provides the means to compare institutions' educational environments with each other (Zamzuri et al., 2004).

DREEM was administered on three occasions; the Cronbach alpha ranged from (0.91 to 0.93) which is similar to previous studies utilising DREEM (de Oliveira Filho et al., 2005). It is a reliable instrument to measure the learning environment at QMUL, however in the literature, there are only two studies using the DREEM inventory on dental students. These are firstly a study conducted on 73 Malaysian dental technology students and secondly on 63 first year Indian dental students, reporting mean DREEM score of 125/200 (Zamzuri et al., 2004) and 116/200 respectively (Thomas et al., 2009). In comparison, the total mean score for the DREEM inventory in this pilot study was 125.65/200 (SD=20.48), 117.69/200 (SD=21.11), 121.43/200 (SD=22.84) on three different occasions and the learning environment was perceived acceptable by the students. The DREEM score for the first occasion lies within an acceptable range and is comparable to previous scores obtained from medical students at the University of Birmingham in the United Kingdom where the DREEM score was reported to be 124/200 (Dunne et al., 2006), but lower for the second and third occasions.

Examining individual DREEM item scores can identify specific problem areas where the environment could be enhanced or improved to ensure a constructive teaching / learning environment. Item 15 (I have good friends in this school) (M=3.26, SD=0.72) was rated highest and this relates to the students social well being, demonstrating the students satisfaction. In this study the lowest score obtained was for item 12 (The school is well timetabled) (M=1.45, SD =1.20) (Table 4.11) which

relates to the students' perception of their atmosphere and their concern about the school schedule.

There are significant differences for the third year cohort with time that reflects their dissatisfaction with their educational environment. This is represented by total DREEM scores (p=0.000), perception of learning (p=0.000), perception of teachers (p=0.014), academic self perception (p=0.024), and perception of the atmosphere (p=0.001) (Table 4.10). These finding give a clear indication of specific areas where improvement could be applied. For example, the low scores for perception of learning scale is reflected by teachers overemphasizing factual learning (Item 25: M=1.87, SD=1.01) and students feeling overwhelmed with too many facts rather than gaining practical skills. Low perception of the teachers represented by teachers who are authoritarian, (Item 9: M=1.71, SD=1.81) and the school timetable (Item 12: M=1.60, SD=1.20), reflect their dissatisfaction with the dental school atmosphere (Table 4.11). More information is needed from the students in the form of qualitative studies, which then can be used to initiate change and improvement in the curriculum and the timetabling of the school to remediate problematic areas in the educational environment (Dunne et al., 2006).

Previous studies in Spain, Nepal, and Nigeria demonstated that female medical students have a better perception of their educational environment than their male counterparts (Roff et al., 1997, Dunne et al., 2006). However, in this study and when considering UK medical students there was no difference (Miles and Leinster, 2007, Whittle et al., 2007).

Older students have a better perception of their learning (p=0.028) than the younger students (Table 4.13). This may be a reflection of how older students understand the learning processes better, such as learning objectives and active learning than younger students (Richardson, 1995). These results are comparable to results from

a UK medical school where older clinical students were more satisfied with their learning environment than younger preclinical students (Dunne et al., 2006).

Students from Asian Indian, Asian Pakistani, and Asian Bangladeshi background have lower perception of their overall environment (p=0.044) and their perception of learning (p=0.002) (Table 4.16) and reflected in the surface approach to learning and studying they adopted (p=0.017) (Table 4.15) as previously mentioned. This may be explained by cultural differences in the way that students perceive their learning that was previously mentioned in the approach to learning and studying discussion.

Students with low academic grades are dissatisfied with their academic perception (p=0.042), atmosphere (p=0.010), and the overall educational environment (p=0.042) (Table 4.19), indicating that a less positive perception of an educational environment will reflect on the students' academic grades. These findings compare favourably with Roff's claims that DREEM is a reliable tool for predicting academic success in health care students (Mayya and Roff, 2004, Roff, 2005) and improving the educational environment will go some way to improving the students' academic grades by influencing the desired approach to learning and studying that will lead to optimal learning (Roff, 2005).

4.12. The Overall Dental Student Profile for the QMUL undergraduate dental students:

In this section, the dental undergraduate student at QMUL and the factors associated with their learning are presented:

- ILS: students' learning styles are balanced between the active / reflective dimension, but students from Asian Chinese, Black African, mixed others, mixed-white-Asian, Asian others tend to be more reflective. However there is no actual change in learning style, as students remain balanced (95% CI 0.06 to 3.23) (Table 4.20). Students at QMUL like to learn facts, solve problems; they are patient, practical and are good at hands on work (sensing) and prefer learning from visual representation of material through diagrams and pictures. Females are more sensing (p=0.002), while males are more visual (p=0.009), however, both are balanced for the active / reflective and sequential / global styles (Table 4.20).

- ALSI: the third and fourth year cohorts simultaneously demonstrated a combination of approaches. However, third year students adopt a more deep, surface, monitoring, and organised/effort approach than the fourth years. It has been said that an overlap in approaches is due to the lack of understanding of the concepts behind self-regulated learning or could be the mismatch between the approaches adopted by students and perception of certain key elements in the teaching / learning environment such as the demands of the assessments (Meyer, 1991, Entwistle, 2000). Older students adopt a deep approach to learning and studying, and as mentioned earlier, mature students are more likely to adopt a deep approach, while younger students tend to adopt a surface approach (Richardson, 1995, Watkins and Regmi, 1996). Students from Asian-Bangladeshi, Asian-Indian, and Asian-Pakistani background have a low organised / effort score, these students

are memorising without relating information and concepts to each other (unreflective learning) thus leading to fragmented knowledge (Marton et al., 1997a, Entwistle and Peterson, 2004).

- RLS: the students' reflective process is self-regulated under favourable conditions such as when opportunities and time are available to them (students have autonomy). The fourth year cohort has a higher RLS score, which in turn reflects the activities that the students are engaged in which encourages them to reflect on their learning more than the third year cohort, such as more clinical work and critical thinking (Table 4.20).

- DREEM: the overall dental environment was acceptable, although students from Asian Indian, Asian Pakistani, and Asian Bangladeshi ethnic background have a more negative view of their learning environment, teachers, and overall dental educational environment, which in turn may affect the approaches to learning and studying they adopt. More research into this ethnic group is needed to improve the learning and teaching at QMUL as mentioned earlier since they represent 48% of the student population.

Chapter 5   Results of the Main Study (KAUFD)

5.1. Collection of Data:

The first data collection commenced during February/March (2008) (academic year 07/08) on first to sixth year students who comprised group A (n 495: F 275, M 222) with a response rate of 79.6%. The second data collection was completed during October/November (2008) (academic year 08/09) on group B students from first to fifth year cohorts (n 482: F 276, M 206), (response rate of 89.2%) of whom 356 students were seen during the first data collection. The third data collection was completed during May/June (2009) (academic year 08/09) on group C students from first to fifth year cohorts (n 446: F 239, M 206) with a response rate of 85.65% (for explanation of data collected for each cohort please refer to Table 3.2, page 70). A total of 624 students (F 347, M 277) participated throughout the study, as demonstrated in Table 5.1, and the overall analysis is conducted on these students. Year, gender, age, residency, parents' occupation, parents' education, monthly income and academic achievement are shown in Table 5.2.

Table 5.1: Distribution of the year cohorts 1 through 6 in groups A, B, and C including the overall total and proportion of year cohorts

Year Cohort	Numbers in Groups			Overall Total	Percent
	A Feb/Mar 2008	B Oct/Nov 2008	C May/Jun 2009		
1	82	67 (A) + 51=118	85	14(A) +34 (B) + 85 (C)= **134**	21%
2	103	83 (A) + 20=104	105	19 (A) +105 (C)=**124**	20%
3	84	64 (A) + 21=85	92	20(A) + 85 (C)=**105**	17%
4	83	70 (A) + 15=85	80	13(A) + 85 (C)=**98**	16%
5	86	72 (A) + 18=90	83	14(A) + 7 (B) + 83 (C)=**104**	17%
6	59	-	-	**59** (A) only	9%
	497	482	445	**624**	100%

Table 5.2: Demographic Data for 624 students included in the final analysis

Demographic Data		Number	Percent
Gender	Male	277	44.4%
	Female	347	55.6%
	Total	**624**	100%
Age	17-20 year old	276	44.3%
	21-24 year old	331	53.1%
	25-28 year old	16	2.6%
	Total	623	100%
	Missing	1	
	Total	**624**	
Residency	Apartment	255	40.9%
	Villa	368	59.1%
	Total	623	100%
	Missing	1	
	Total	**624**	
Type of Residence	Owned	496	80.1%
	Rented	123	19.9%
	Total	619	100%
	Missing	5	
	Total	**624**	
Monthly Income	Less than 2,000 SR	17	2.8%
	2,000-5,000 SR	30	4.9%
	5,000-10,000 SR	95	15.4%
	More than 10,000 SR	474	76.9%
	Total	616	100%
	Missing	8	
	Total	**624**	
Father Occupation*	Managers and Senior Officials	194	31.6%
	Professional Occupations A	202	33%
	Professional Teaching Occupations B	67	10.9%
	Associate Professional and Science and Technology Occupations	27	4.4%
	Protective service	64	10.4%
	Artistic and Literary occupations	1	0.2%
	Media associate	2	0.3%
	Transport professionals	20	3.3%
	Secretarial and related occupations	12	2%
	Skilled trades	7	1.1%
	Unemployed	17	2.8%
	Total	613	100%
	Missing	11	
	Total	**624**	
Mother Occupation*	Managers and Senior Officials	15	2.4%
	Professional Occupations A	48	7.8%
	Professional Teaching Occupations B	175	28.4%
	Associate professional & science & technology	5	0.8%
	Artistic & literary	2	0.3%
	Secretarial and related occupations	11	1.8%
	Elementary administration	1	0.2%
	Housewife	360	58.3%
	Total	617	100%
	Missing	7	
	Total	**624**	

Continued from Table 5.2

Demographic Data		Number	Percent
Father Education	Less than High school	33	6.4%
	High School	87	17%
	University education	255	49.7%
	Higher education	131	25.5%
	No education	7	1.4%
	Total	513	100%
	Missing	111	
	Total	**624**	
Mother Education	Less than High school	80	15.6%
	High School	128	24.9%
	University education	233	45.3%
	Higher education	50	9.7%
	No education	23	4.5%
	Total	514	100%
	Missing	110	
	Total	**624**	
Academic Achievement 07/08	Excellent	65	11.4%
	Very good	218	38.1%
	Good	195	34.1%
	Satisfactory	13	2.3%
	Pass	24	4.2%
	Fail	57	10%
	Total	572	100%
	Missing	52	
	Total	**624**	
Academic Achievement 08/09	Excellent	45	8.5%
	Very good	215	40.4%
	Good	194	36.5%
	Satisfactory	26	4.9%
	Pass	25	4.7%
	Fail	27	5.1%
	Total	532	100%
	Missing	92	
	Total	**624**	

*Father / Mother Occupation for statistical purposes:
Cat=1: Managers and Senior officials, Professional occupations, Professional Teaching occupations, 2: Associate professional and Science and technology occupations, Protective services, Artistic and literacy occupations, Media associate, and Transport professionals, 3: Secretarial and related occupations, Skilled trade, 4: Elementary occupations, 5: Unemployed, and Housewife

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5.2. Reliability of the Assessment Tools:

Cronbach coefficient alpha was used to evaluate the reliability of the questionnaires as described below in Table 5.3. The Chronbach alpha for the Index of learning Styles (ILS) is (α=0.53, 0.57, and 0.62) for groups A, B, and C respectively as illustrated in Table 5.3. The Approach to Learning and Studying (ALSI) reliability as measured by Cronbach alpha was low for group A (α=0.61) and group B (α=0.62), but higher for group C (α=0.71) (Table 5.3). The reliability for the RLS was high for all groups which indicate the reliability of the RLS scale to measure reflection (Table 5.3). The reliability as measured by Cronbach alpha was also high for the DREEM questionnaire for all the three occasions that the DREEM was conducted (Table 5.3).

Table 5.3: Cronbach's Alpha Reliability Values for Assessment Tools ILS, ALSI, RLS, and DREEM and number of items in the tools for all year cohorts (group A, B, and C)

Assessment Tool	Group	Cronbach Alpha	Number of items
ILS	A	0.53	44
	B	0.57	
	C	0.62	
ALSI	A	0.61	18
	B	0.62	
	C	0.71	
RLS	A	0.82	15
	B	0.86	
	C	0.87	
DREEM	A	0.87	50
	C	0.89	

5.3. Comparative Data of the Assessment Tools Related to Year:

5.3.1. Comparative Data of Index of Learning Styles (ILS) by Year:

5.3.1.1. Descriptive Data for ILS:

The ILS was distributed to the whole student body during academic year 2007/08 for year cohorts one through six and the distribution of learning styles of the student body in group A is; 20.7% are active learners (69.6% balanced, 9.7% reflective learners), 47.9% are sensing learners (44.7% balanced, 7.4% intuitive learners), 68.2% are visual learners (28.2% balanced, 3.6% verbal learners), and 18.1% are sequential learners (balanced 71.2%, 10.7% global learners). The frequency and percentage of learning styles for group A are shown in Appendix D.

For the second data collection, the ILS was distributed to year cohorts one to five, and a total of 482 respondents in group B were gathered for ILS; 27.4% are active (64.6% balanced, 7.7% reflective learners), 53.5% are sensing (41.7% balanced, 4.8% intuitive), 67.4% are visual (28.8% balanced, 3.7% verbal learners), and 17.6% are sequential learners (balanced 70.5%, 11.8% global learners). The frequency and percentage ILS per year for group B are shown in Appendix D.

For group C, only students in the fifth year cohort for academic year 2008/09 were asked to complete the questionnaire due to feasibility and collection of data. A total of 85 respondents were gathered, and the ILS distribution was; 24.7% are active (69.4% balanced, 5.9% reflective learners), 65.9% are sensing (30.6% balanced, 3.5% intuitive), 74.1% are visual (24.7% balanced, 1.2% verbal learners), and 22.4% are sequential learners (balanced 64.7%, 12.9% global learners). Frequency and percentage ILS for fifth year cohort in group C is shown in Appendix D.

To illustrate the distribution of ILS according to year cohort, radar charts were used to represent ILS scores for students in group A from first to sixth year cohorts and shown in Figure 5.1a and b. Negative and positive values are given to each dimension of the learning style model, for example; for the active / reflective learning

style, the score calculated using the ILS questionnaire lies within the -3 to 3 range, therefore the learning style is balanced between the two learning dimensions. But if the score is within the -5 to -11 range, the learning style is considered to be active, while values ranging from 5 to 11 are considered to be a reflective learning style.

As can be seen from the radar charts (Figure 5.1a and 5.1b), students are balanced for the active / reflective and the sequential / global style. While students are more sensing and visual and they are highly sensing and visual with advanced academic years (Figure 5.1a and 5.1b).

Figure 5.1a: Radar charts representing mean scores for the Active/Reflective and Sensing/Intuitive style for year cohorts 1 through 6 group A (academic year 07/08)

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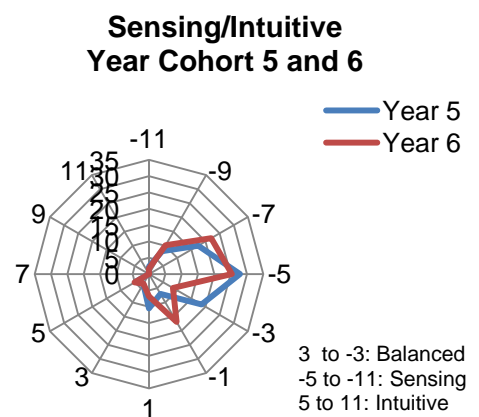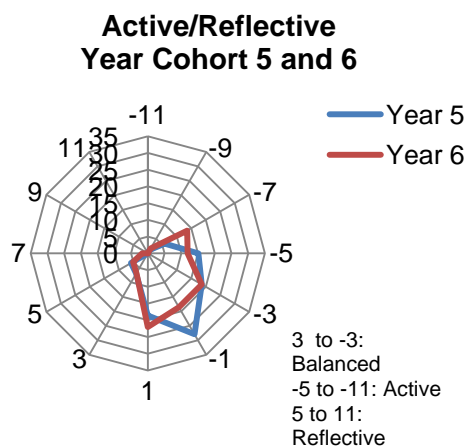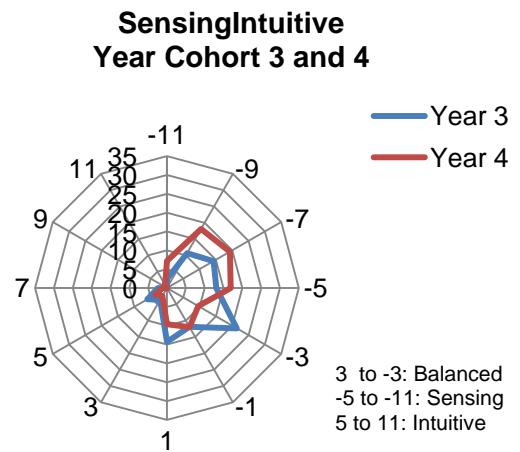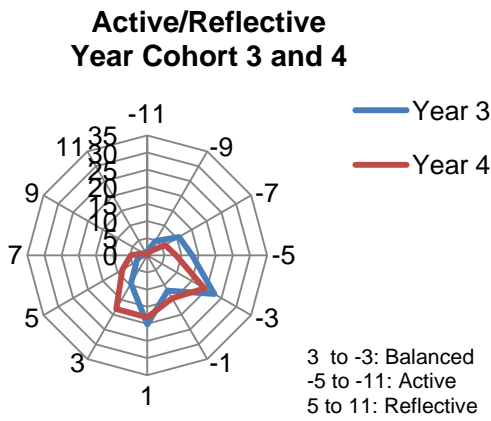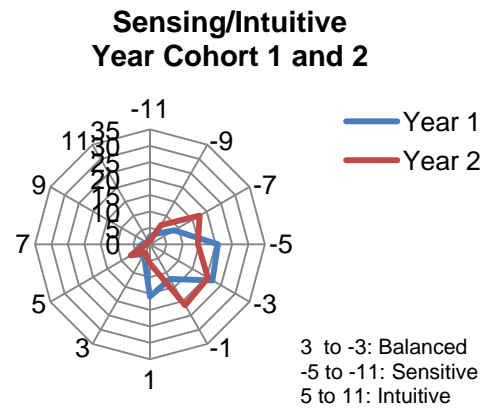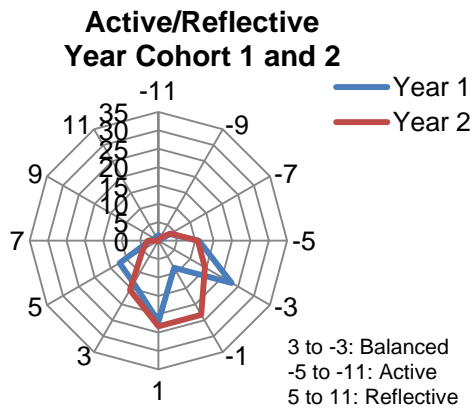
Figure 5.1b: Radar charts representing mean scores for the Visual/Verbal and Sequential/Global style for year cohorts 1 through 6 group A (academic year 07/08)

Visual/Verbal
Year Cohort 1 and 2

3 to -3: Balanced
-5 to -11: Visual
5 to 11: Verbal

Sequential/Global
Year Cohort 1 and 2

3 to -3: Balanced
-5 to -11: Sequential
5 to 11: Global

Visual/Verbal
Year Cohort 3 and 4

3 to -3: Balanced
-5 to -11: Visual
5 to 11: Verbal

Sequential/Global
Year Cohort 3 and 4

3 to -3: Balanced
-5 to -11: Sequential
5 to 11: Global

Visual/Verbal
Year Cohort 5 and 6

3 to -3: Balanced
-5 to -11: Visual
5 to 11: Verbal

Sequential/Global
Year Cohort 5 and 6

3 to -3: Balanced
-5 to -11: Sequential
5 to 11: Global

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5.3.1.2. Comparative Analysis of ILS by Academic years:

To explore the differences between academic year cohorts from year cohort one through six and learning styles as measured by (ILS), the difference in means between the years was calculated and to detect changes with time for students with both measures, paired t-tests were conducted. The results for students in group A and B for academic years one through five is shown in Table 5.4. The results for the multiple comparisons test for the significant years are shown in Table 5.5.

For the active / reflective style, there are significant differences between the academic year cohorts at the first and second time of testing (groups A and B), where there is a tendency for the scores to shift towards the active style with time. Although there are significant difference between academic years (p=0.001 and p=0.033), an actual change in learning style was not seen as students remain balanced (Table 5.4). When students move to a preclinical work year in which they are learning by doing, as demonstrated by the third year cohort they are significantly more active than the first (p=0.014) and fourth year cohorts (p=0.016) (Table 5.5).

There is a highly significant difference between year cohorts in group A for the sensing / intuitive style (p=0.001) (Table 5.4), students score more towards the sensing style with increasing academic year, for example the fourth year cohort are more sensing than first (p=0.001) and second year cohorts (p=0.034) (Table 5.5). For the visual / verbal style, there is a significant change (p=0.026 and p=0.043) between the academic years (Table 5.4). The learning style for students at KAUFD is visual, but the fifth year cohort (group B) is significantly more visual than other academic year cohorts (Table 5.4 and 5.5). There are no significant changes in the sequential / global learning style between academic year cohorts (Table 5.4).

Table 5.4: ILS mean scores for students across year cohorts 1 through 6 in groups A and B, 95% confidence interval of mean difference (95% CI) and p-value for ANOVA, mean difference between groups (A-B) in those years with both measures, 95% confidence interval of the difference of means (95% CI), and p-values from the paired t-test across years cohorts 1 through 5

Year (n A/n B)	Mean A (95% CI)	Mean B (95% CI)	Mean	95% CI	p-value
		Active/Reflective	**Mean**	**95% CI**	**p-value**
1 (82/118)	-0.06 (-0.95 to 0.83)	-1.07 (-1.81 to -0.33)	0.64	-0.37 to 1.66	0.212
2 (103/104)	-0.42 (-1.07 to 0.23)	-1.27 (-2.03 to -0.51)	0.48	-0.30 to 1.26	0.244
3 (84/85)	-1.93 (-2.78 to -1.07)	-2.47 (-3.53 to -1.96)	1.09	0.12 to 2.07	**0.029**
4 (83/85)	-0.08 (-0.94 to 0.77)	-1.64 (-2.49 to -0.78)	1.37	0.37 to 2.37	**0.008**
5 (86/90)	-1.42 (-2.09 to -0.74)	-1.73 (-2.47 to -0.99)	0.36	-0.49 to 1.21	0.400
6 (69)	-1.64 (-2.59 to -0.69)				
p-value for ANOVA	**0.001**	**0.033**			
		Sensing/Intuitive	**Mean**	**95% CI**	**p-value**
1 (82/118)	-2.02 (-2.99 to -1.06)	-3.54 (-4.40 to -2.68)	1.43	0.19 to 2.68	**0.024**
2 (103/104)	-2.75 (-3.58 to -1.92)	-4.48 (-5.25 to -3.71)	1.54	0.60 to 2.49	**0.002**
3 (84/85)	-2.93 (-3.87 to -1.99)	-3.82 (-4.69 to -2.96)	0.50	-0.41 to 1.41	0.277
4 (83/85)	-4.95 (-5.54 to -3.64)	-4.39 (-5.23 to -3.55)	-0.14	-1.22 to 0.93	0.791
5 (86/90)	-3.79 (-4.59 to -2.99)	-4.64 (-5.52 to -3.77)	0.64	-0.24 to 1.52	0.151
6 (69)	-3.92 (-4.92 to -2.91)				
p-value for ANOVA	**0.001**	0.272			
		Visual/Verbal	**Mean**	**95% CI**	**p-value**
1 (82/118)	-5.63 (-6.51 to -4.76)	-5.71 (-6.40 to -5.02)	0.60	-0.31 to 1.50	0.193
2 (103/104)	-4.46 (-5.37 to -3.54)	-4.37 (-5.32 to -3.41)	0.02	-0.67 to 0.72	0.945
3 (84/85)	-5.90 (-6.70 to -5.11)	-5.57 (-6.56 to -4.94)	0.09	-0.89 to 1.08	0.849
4 (83/85)	-4.37 (-5.34 to -3.40)	-5.73 (-6.60 to -4.85)	1.00	-0.04 to 2.04	0.058
5 (86/90)	-4.93 (-5.82 to -4.04)	-6.00 (-6.86 to -5.14)	1.47	0.49 to 2.45	**0.004**
6 (69)	-6.08 (-7.06 to -5.11)				
p-value for ANOVA	**0.026**	**0.043**			
		Sequential/Global	**Mean**	**95% CI**	**p-value**
1 (82/118)	-0.32 (-1.07 to 0.43)	-0.75 (-1.42 to -0.07)	0.87	-0.02 to -1.75	0.060
2 (103/104)	-0.81 (-1.53 to -0.08)	-0.62 (-1.41 to 0.16)	-0.19	-1.21 to 0.83	0.710
3 (84/85)	-0.17 (-0.92 to 0.59)	-0.13 (-0.94 to 0.68)	0.16	-0.91 to 1.22	0.770
4 (83/85)	-0.73 (-1.56 to 0.09)	-0.79 (-1.60 to 0.02)	0.46	-0.47 to -1.39	0.330
5 (86/90)	-0.51 (-1.31 to 0.29)	-0.44 (-1.26 to 0.37)	0.14	-0.82 to 1.10	0.773
6 (69)	-0.42 (-1.47 to 0.62)				
p-value for ANOVA	0.854	0.781			

Table 5.5: Multiple comparison of the mean difference of ILS and significant years cohorts, 95% confidence interval of differences of mean (95% CI) and p-value

ILS	Year cohort (Group) (I)	Year cohort (J)	Mean Difference (I-J)	95% CI	p-value
Active/Reflective	3 (A)	1	-1.87	- 3.50 to -0.24	**0.014**
		4	-1.84	-3.47 to -0.22	**0.016**
Sensing/Intuitive	4 (A)	1	-2.57	-4.43 to -0.71	**0.001**
		2	-1.84	-3.60 to -0.08	**0.034**
Active/Reflective	1 (B)	3	1.67	0.18 to 3.17	**0.020**
Visual/Verbal	2 (B)	5	1.64	0.00 to 3.27	**0.050**

5.3.1.3. Comparative Analysis of ILS within the Academic years:

To investigate if there is a change in learning styles with time for students within the academic years for group A, B, and C, a paired t-test was used as shown in Table 5.6.

There are significant differences for the active / reflective style within certain academic years, such as the third year cohort where the mean score in group A (M=-1.72, SD=3.93) significantly differs from group B (M=-2.81, SD=3.63), t (64) = 2.23, p=0.029 (two-tailed) and likewise for the fourth year cohort group A (M=-0.11, SD=3.94) group B (M=-1.49, SD=4.08), t (70) = 2.75, p=0.008 (two-tailed) (Table 5.6). Indicating that with time third and fourth year cohorts score towards the active style, but they are still balanced for the active / reflective learning style. The fifth year cohort in group A (M=-1.31, SD=3.15) have significantly different mean score for the third time the questionnaire was given (group C) (M=-2.10, SD=3.10), t (70) = 2.21, p=0.031 (two-tailed) (Table 5.6). In other words, fifth year students tend to shift towards the active scale, at the end of their studies, but the learning style remains balanced for the active / reflective dimension.

There are significant differences for the sensing / intuitive style for students in the first year cohort group A (M=-2.34, SD=3.86) and group B (M=-3.78, SD=4.81), t (66) = 1.26, p=0.024 (two-tailed) (Table 5.6). The second year students in group A have a significantly different mean score (M=-3.07, SD=3.96) than group B (M=-4.61, SD=4.07), t (82) = 3.25, p=0.002 (two-tailed). For students in the fifth year cohort, the mean score for group A (M=-3.65, SD=3.77) differs significantly from group C (M=-4.75, SD=3.89), t (71) = 2.57, p=0.031 (two-tailed) (Table 5.6). These results demonstrate that with time, first, second and fifth year cohorts become more sensing.

Students in the fifth year cohort in group A (M=-4.67, SD=4.31), have a significantly different mean score for the visual / verbal learning style than group B (M=-6.14, SD=4.20), t (71) = 2.99, p=0.004 (two-tailed) (Table 5.6) and group C (M=-6.80, SD=3.75), t (70) =4.64, p=0.000 (two-tailed). Fifth year students become highly more visual with time; which may reflect the educational environment which is mainly directed towards visual learners i.e. clinical practice.

There was no difference within the academic year cohorts for the sequential / global learning style.

To summarise, for the active / reflective style, students are balanced for this style but third, fourth and fifth year cohorts score more towards the active style with time. For the sensing / intuitive style, with time the first, second, and fifth year cohorts become more sensing. And students in the fifth year cohort become more visual with time.

Table 5.6: ILS mean differences in scores (A-B) for year cohorts 1 through 5, (B-C) and (A-C) for year cohort 5, 95% confidence interval of the differences of means (95% CI), and p-values for the paired t-test

Year cohort (n)	Difference (A-B)			Differences (B-C)			Difference (A-C)		
	Mean	95%CI	p-value	Mean	95%CI	p-value	Mean	95% CI	p-value
Active/ reflective									
1 (67)	0.64	-0.37 to 1.66	0.212						
2 (83)	0.48	-0.30 to 1.26	0.244						
3 (64)	1.09	0.12 to 2.07	**0.029**						
4 (70)	1.37	0.37 to 2.37	**0.008**						
5 (72)	0.36	-0.49 to 1.21	0.400	0.18	-0.54 to 0.90	0.616	0.79	0.07 to 1.50	**0.031**
Sensing/Intuitive									
1 (67)	1.43	0.19 to 2.68	**0.024**						
2 (83)	1.54	0.60 to 2.49	**0.002**						
3 (64)	0.50	-0.41 to 1.41	0.277						
4 (70)	-0.14	-1.22 to 0.93	0.791						
5 (72)	0.64	-0.24 to 1.52	0.151	0.29	-0.55 to 1.12	0.498	1.10	0.25 to 1.95	**0.012**
Visual/Verbal									
1 (67)	0.60	-0.31 to 1.50	0.193						
2 (83)	0.02	-0.67 to 0.72	0.945						
3 (64)	0.09	-0.89 to 1.08	0.849						
4 (70)	1.00	-0.04 to 2.04	0.058						
5 (72)	1.47	0.49 to 2.45	**0.004**	0.44	-0.58 to 1.46	0.391	2.11	1.20 to 3.02	**0.000**
Sequential/Global									
1 (67)	0.87	-0.02 to -1.75	0.060						
2 (83)	-0.19	-1.21 to 0.83	0.710						
3 (64)	0.16	-0.91 to 1.22	0.770						
4 (70)	0.46	-0.47 to -1.39	0.330						
5 (72)	0.14	-0.82 to 1.10	0.773	0.18	-0.64 to 0.99	0.659	0.73	-0.34 to -1.81	0.178

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5.3.2. Comparative Data of Approach to Learning and Studying (ALSI) by Year:

5.3.2.1. Descriptive Data of ALSI:

The ALSI was distributed to the whole student body during academic year 2007/08 for year cohorts one through six, during the second data collection the ALSI was distributed to first, third, and fifth academic year cohorts only. For group C, the fifth year student cohort was asked to participate only, for feasibility and practicality in carrying out the study (please refer to Table 3.2). As can be seen from the bar charts, the year cohorts adopt a variety of approaches at the same time, for the deep approach, 65% of first year cohorts scored high for the deep approach while 35% of the same students adopted a medium deep approach (Figure 5.2). While 45% from the sixth year cohorts adopted a high deep approach, in contrast 55% of the same students also adopted a medium deep approach (Figure 5.2). For the surface approach the majority adopted a medium score 75% for first year cohort and 60% of fourth year cohort adopted a medium score for the surface approach (Figure 5.3). About 65% of the first year cohorts adopted high scores for the monitoring approach, while 50% - 60% of fifth and sixth year cohorts scored high on the monitoring approach (Figure 5.4). With respect to the organised / effort approach, first and fifth year students scored high (55% - 60%), while 50% - 55% of second, third and fourth year cohorts had medium scores for this approach (Figure 5.5). There were no significant changes for the academic year cohorts in groups B and C. The frequency and percentage for the ALSI scales across first through sixth year cohorts groups A, B, and C is shown in Appendix D.

Figure 5.2: Distribution of the Deep approach as measured by ALSI (low, mid, and high) for year cohorts 1 through 6 (group A)
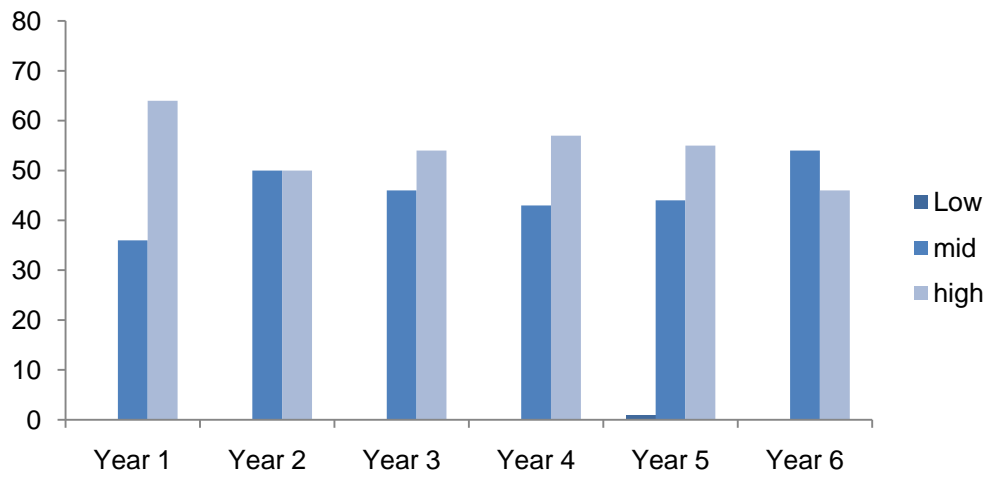
Figure 5.3: Distribution of the Surface approach as measured by ALSI (low, mid, and high) for year cohorts 1 through 6 (group A)
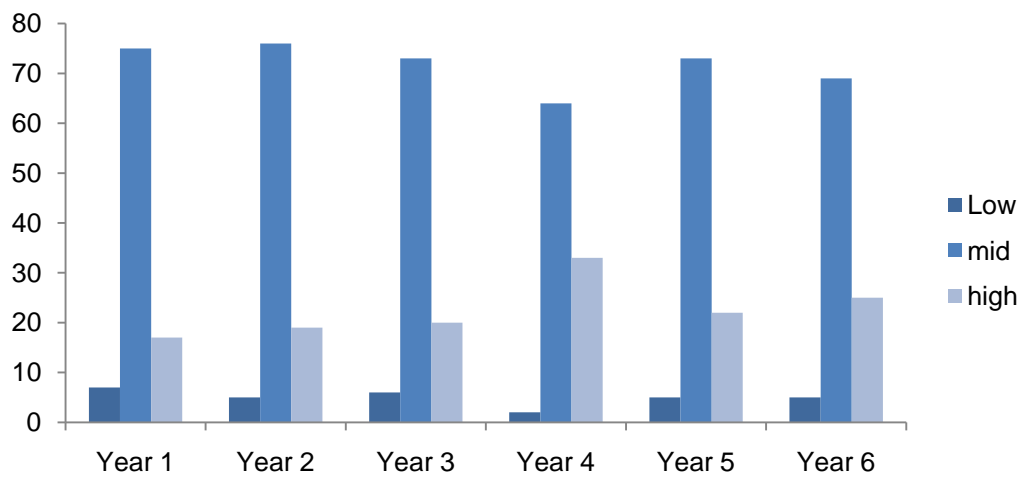
Figure 5.4: Distribution of the Monitoring approach for as measured by ALSI (low, mid, and high) for year cohorts 1 through 6 (group A)
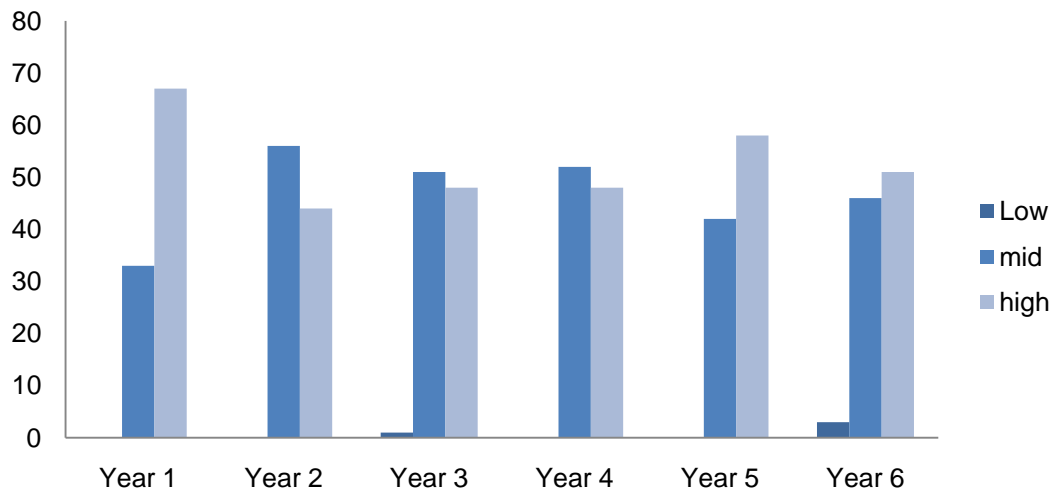
Figure 5.5: Distribution of the Organised / Effort approach as measured by ALSI (low, mid, and high) for year cohorts 1 through 6 (group A)
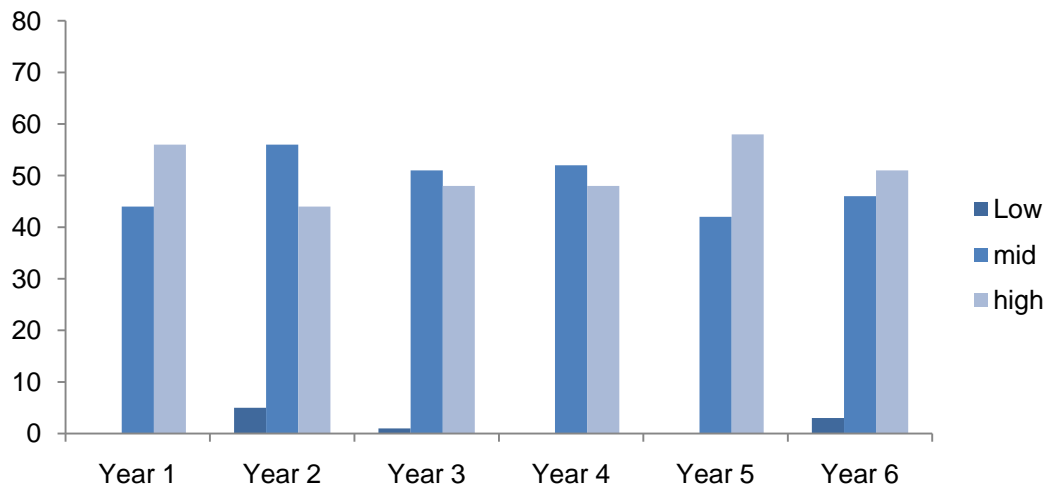
5.3.2.2. Comparative Analysis of ALSI by Academic years:

A one-way between-groups analysis of variance (ANOVA) was conducted to explore the impact of year cohort on the approach to learning and studying as measured by (ALSI), there are no significant differences between the different academic years and the deep, surface, monitoring, and organised / effort approach. The ANOVA and the ALSI mean scores by year cohorts for groups A and B are shown in Appendix D.

5.3.2.3. Comparative Analysis of ALSI within the Academic years:

The difference in the approach to learning and studying as measured by ALSI by the year cohorts with time, was investigated using a paired t-test and performed on first, third and fifth year cohorts as illustrated in Table 5.7.

The organised / effort mean score for the third year cohort in group A (M=14.37, SD=3.38) is significantly different from group B (M=-15.16, SD=2.67), t (61) = -2.35, p=0.022 (two-tailed), indicating that there is an increase in the organised / effort approach score with time for the third year cohort (Table 5.7).

The monitoring mean score for students in the fifth year cohort group A (M=15.57, SD=3.00) is significantly different from group B (M=16.42, SD=2.54), t (71) = -2.45, p=0.017 (two-tailed), illustrating that the fifth year cohort as a group adopt a more monitoring approach with time (Table 5.7).

Table 5.7: ALSI mean differences (A-B) for year cohorts 1,3, and 5, (B-C) and (A-C) for year cohort 5, 95% confidence interval of the differences of the means (95% CI), and p-values for the paired t-test

Year Cohort (n)	Difference (A-B)			Differences (B-C)			Difference (A-C)		
	Mean	95%CI	p-value	Mean	95%CI	p-value	Mean	95% CI	p-value
Total ALSI									
1 (66)	0.09	-1.39 to 1.58	0.903						
2 (83)									
3 (63)	-1.13	-3.04 to 0.83	0.463						
4 (70)									
5 (76)	-1.88	-3.76 to 0.01	0.052	0.37	-1.43 to 2.17	0.685	-0.67	-2.28 to 0.93	0.407
Deep Approach									
1 (66)	0.33	-0.57 to 1.24	0.463						
2 (83)									
3 (63)	-0.46	-1.39 to 0.47	0.324						
4 (70)									
5 (76)	-0.92	-1.39 to 0.47	0.058	0.46	-0. 48 to 1.39	0.331	0.16	-0.67 to 0.98	0.701
Surface Approach									
1 (66)	-0.47	-1.33 to 0.39	0.280						
2 (83)									
3 (63)	0.84	-0.05 to 1.73	0.064						
4 (70)									
5 (76)	-0.06	-0.88 to 0.77	0.894	-0.43	-1.32 to 0.45	0.331	-0.44	-1.23 to 0.37	0.282
Monitoring Approach									
1 (66)	-0.18	-0.98 to 0.62	0.650						
2 (83)									
3 (63)	-0.64	-1.37 to 0.10	0.090						
4 (70)									
5 (76)	-0.85	-1.54 to -0.16	**0.017**	0.09	-0.58 to 0.76	0.785	-0.42	-1.24 to 0.39	0.308
Organised / Effort Approach									
1 (66)	0.41	-0.40 to 1.22	0.314						
2 (83)									
3 (63)	-0.79	-1.46 to -0.12	**0.022**						
4 (70)									
5 (76)	-0.10	-0.83 to 0.64	0.793	0.22	-0.47 to 0.91	0.521	-0.03	-0.81 to 0.75	0.941

5.3.3. Comparative Data of the Reflection in Learning Scale (RLS) by Year:

5.3.3.1. Descriptive Data of RLS:

A total of 463 respondents in group A were collected for the RLS, for the second data collection the RLS inventory was only distributed to first, third, and fifth year cohort (group B) (academic year 2008/09) with 280 respondents. For group C, the RLS was distributed to academic year cohort year one through five, and a total of 420 students completed the questionnaire. The majority of the students were either partial (students need encouragement and opportunities) or ample (students have autonomy under favourable conditions) in their ability to reflect as measured by RLS as demonstrated in Table 5.8 which illustrates the distribution of Sobrals's Reflection in Learning Scale (RLS) scores for groups A, B, and C.

Table 5.8: Total RLS mean scores, SD, and missing numbers for year cohorts 1 through 6 (groups A, B, and C)

Year Cohort		Total RLS Group A Academic year 07/08	Total RLS Group B Academic year 08/09	Total RLS Group C Academic year 08/09
1	Number	81	118	85
	Mean	64.88	62.69	62.32
	SD	11.72	13.27	12.45
2	Number	99		105
	Mean	60.87		56.05
	SD	13.21		13.22
3	Number	83	83	92
	Mean	60.00	64.19	60.79
	SD	11.86	12.13	11.19
4	Number	83		80
	Mean	56.61		58.90
	SD	12.38		11.97
5	Number	86	88	84
	Mean	60.69	63.69	64.98
	SD	11.07	13.36	13.95
6	Number	58		
	Mean	60.48		
	SD	12.65		

The final scores for the RLS were scaled to represent the levels of reflection: restricted ([score of 14-34] student need additional preparation such as support, practice, and feedback); partial ([score of 35-55] student needs motivation, incentives, and opportunities); ample ([score of 56-76] student has autonomy under

favourable conditions); and maximal ([score 77-98] student has full autonomy even under negative pressure such as lack of time). This allowed for more variation in the distribution of students along the scale. It was also used to compare the final RLS score with (item 15) of the RLS inventory, the self-assessment question by which the students rate themselves on the effectiveness of their reflective process.

The frequency and percentage distribution of the total RLS scale is shown in Appendix D. Figures 5.6 - 5.8 illustrate the distribution of Sobral's Reflection in Learning scale for groups A, B, and C according to year cohort. The majority of students (50% -68%) in group A are ample in their ability to reflect as measured by RLS (Figure 5.6). For group B, 53% - 58% of first, third, and fifth year cohorts are also ample as illustrated in Figure 5.7. The majority of students (55% - 60%) in group C in all year cohorts are also ample in their ability to reflect except for the first year cohort, where 36% of students were partial in their ability to reflect (Figure 5.8), and this is higher than the same cohort in group A (Figure 5.6).

Figure 5.6: Distribution of the RLS Scale (restricted, partial, ample, or maximal) for year cohort 1 through 6 (group A) (academic year 07/08)
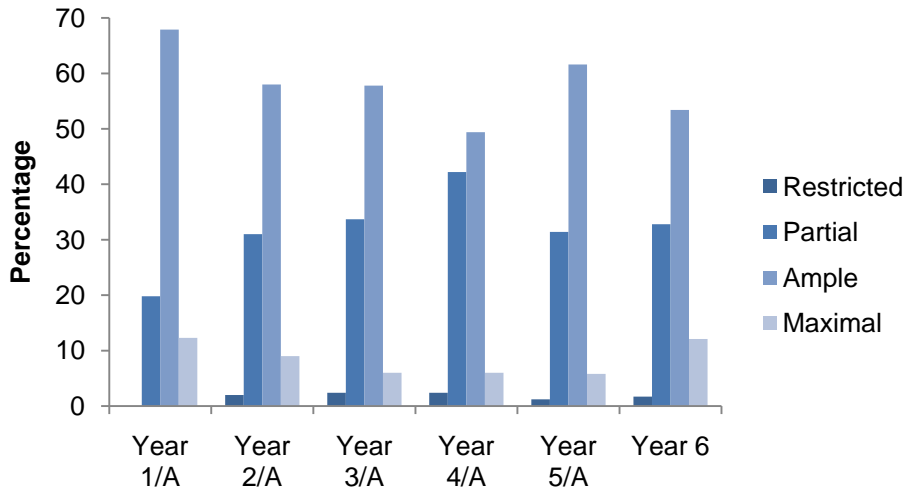
Figure 5.7: Distribution of the RLS Scale (restricted, partial, ample, or maximal) for year cohorts 1, 3, and 5 (group B) (academic year 08/09):
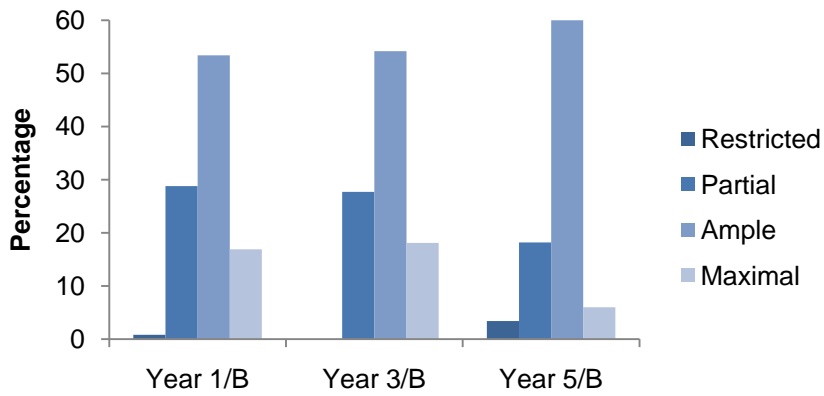
Figure 5.8: Distribution of the RLS Scale (restricted, partial, ample, or maximal) for year cohorts 1 through 5 (group C) (academic year 08/09):
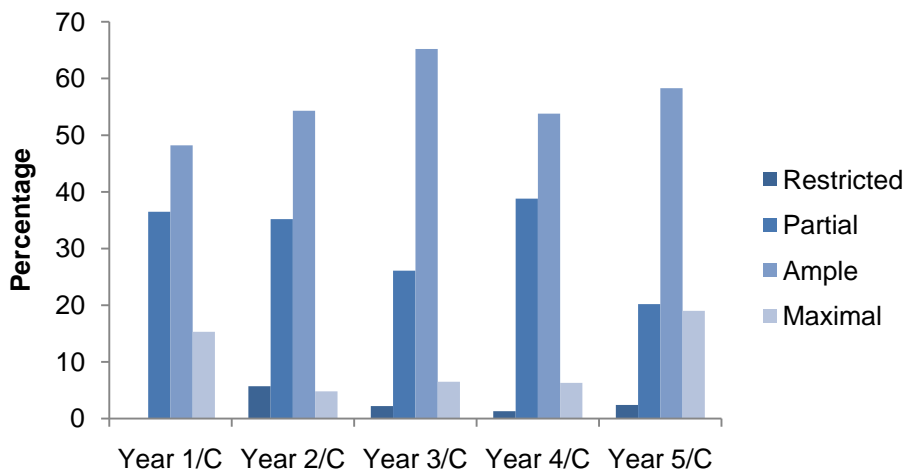
The last item of the RLS inventory, item 15, the subjects were asked to rate their personal efficacy to reflect on the previously mentioned four categories; restricted, partial, ample or maximal. Figures 5.9 - 5.11 demonstrates the distribution of item 15 for groups A, B, and C across year cohorts one through six. The frequency and percentage for the RLS item 15 is illustrated in Appendix D.

As seen in Figure 5.9, first and second year cohorts perceived themselves as being partial (students needs motivation, incentives, and opportunities) in their ability to reflect (40% -50%). While third, fourth, and sixth year cohorts were somewhat equally distributed between partial and ample (students have autonomy under favourable conditions) scales. The majority of fifth year students rated themselves as being ample in their ability to reflect.

For students in group B, 30% - 42% of the first and third year cohorts perceived their ability to reflect as either partial or ample as seen in Figure 5.10. Forty two percent of the fifth year cohort believed that they were ample in their ability to reflect. For group C, about 34% - 45% of the students perceived their ability to reflect as either partial or ample as seen in Figure 5.11.

Figure 5.9: Distribution of item RLS15 (restricted, partial, ample, or maximal) for year cohorts 1 through 6 (group A) (academic year 07/08)
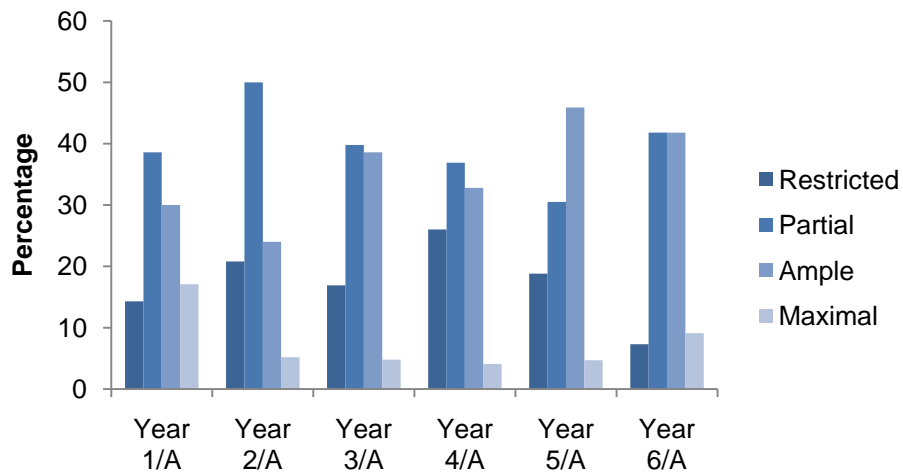
Figure 5.10: Distribution of item RLS15 (restricted, partial, ample, or maximal) for year cohorts 1, 3, and 5 (group B) (academic year 08/09)
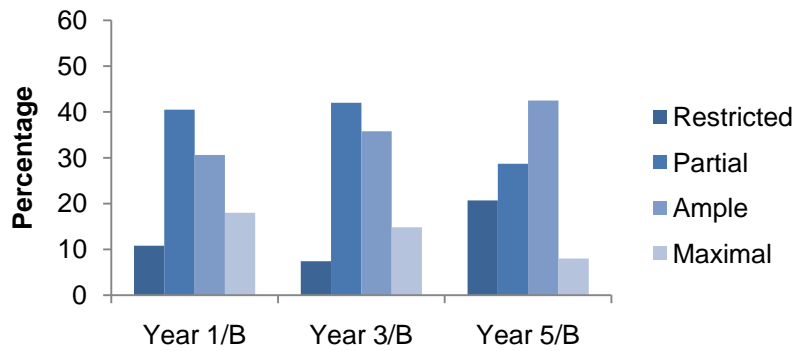
Figure 5.11: Distribution of item RLS15 (restricted, partial, ample, or maximal) for year cohorts 1 through 5 (group C) (academic year 08/09)
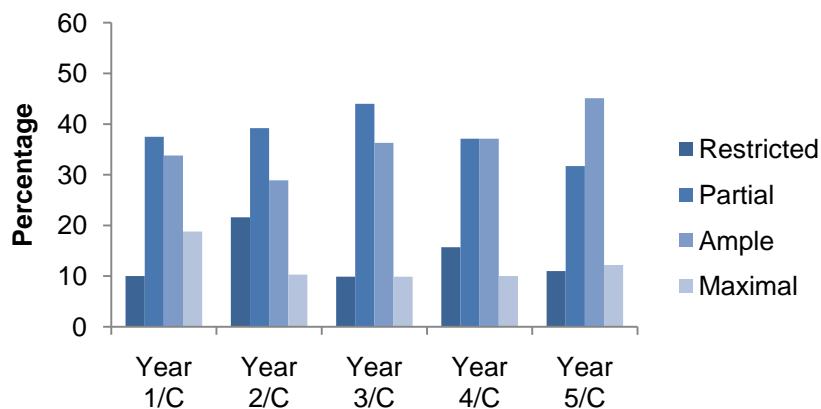
The difference between the total RLS scale (determined from the total RLS score) and item 15 in the RLS inventory was calculated, and was give the name RLS difference. Negative values (-3 to -1) indicate that students rate their reflection as being higher than it actually is, while positive values (1 to 3) identify students that rate their reflective process as lower than it actually is. The value (0) indicates no difference between the actual reflective process and their perceived reflection. As seen in Figure 5.12, about 40% of students (group A) in the first and second year cohort perceived their ability to reflect as lower than their actual score of reflection as measured by RLS. As the students move into third year, a majority of students (50%) rate their self perception as the same as their measured reflection, and this was similar for the fourth year cohort. About 30% of the fifth and sixth year cohorts perceive their ability to reflect as less than their actual RLS scale (Figure 5.12). The frequency and percentage of the RLS difference for groups A, B, and C across the academic year is illustrated in Appendix D.

Figure 5.12: Bar Chart of RLS Difference (RLS Scale – RLS Item 15) distribution for year cohorts 1 to 6 (group A)
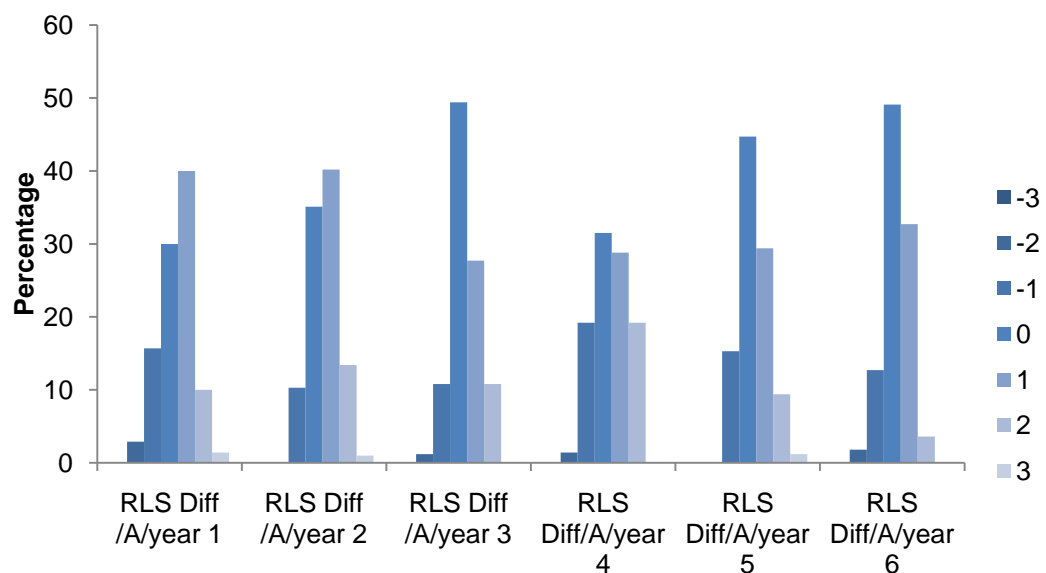
5.3.3.2. Comparative Analysis of RLS by Academic Years:

One-way between-groups analysis of variance (ANOVA) was conducted to investigate the impact of year cohort on the reflective process as measured by (RLS), the results are shown in Table 5.9 and 5.10. There were significant differences for the mean RLS score for certain year cohorts in groups A (p=0.002) and C (p=0.000) as illustrated in Table 5.9. Post hoc comparisons demonstrate (Table 5.10) that there is a statistically significant difference between the academic year cohorts and the overall RLS score [F (5, 484) = 3.83, p=0.002]. The overall RLS mean score (M = 64.88, SD = 11.72) for students in the first year (group A) is significantly higher than fourth year cohort (group A) (M = 56.61, SD = 12.38). There is a significant difference between year cohort and the overall RLS score as well [F (9, 436) = 3.22, p=0.001] for group C, second year students overall RLS score (M = 56.05, SD = 13.22) is significantly lower than first (M = 62.32, SD = 12.45) and fifth year cohorts (M = 64.98, SD = 13.95) mean score (Table 5.10). This indicates that first year cohort have a higher RLS score than later cohorts, but students in the fifth year cohort have an increase in the total RLS score with time, indicating an increase in the reflective process.

Table 5.9: Total RLS mean scores, 95% confidence interval of mean difference (95% CI), and p-value for year cohorts 1 through 6 (group A), year cohorts 1, 3, and 5 (group B), and year cohorts 1 through 5 (group C)

Year Cohort (n A/ n B/ n C)	Total RLS		
	Mean A (95% CI)	Mean B (95% CI)	Mean C (95% CI)
1 (81/118/85)	64.88 (62.99 to 67.47)	62.69 (60.28 to 65.11)	62.32 (59.63 to 65.00)
2 (99/104/105)	60.87 (58.23 to 63.50)		56.05 (53.49 to 58.61)
3 (83/83/92)	60.00 (57.41 to 62.59)	64.19 (61.54 to 66.84)	60.79 (58.48 to 63.11)
4 (83/85/80)	56.61 (53.91 to 59.32)		58.90 (56.24 to 61.56)
5 (86/88/84)	60.69 (58.31 to 63.06)	63.69(60.86 to 66.52)	64.98 (61.95 to 68.00)
6 (58) group A only	60.48 (57.16 to 63.81)		
p-value for ANOVA	**0.002**	0.265	**0.000**

Year Cohort (Numbers A/B/C)	RLS Difference		
	Mean A (95% CI)	Mean B (95% CI)	Mean C (95% CI)
1 (81/118/79)	0.43 (0.19 to 0.67)	0.40 (0.13 to 0.67)	0.15 (-0.07 to 0.37)
2 (99/104/96)	0.60 (0.42 to 0.78)		0.35 (0.14 to 0.56)
3 (83/83/91)	0.36 (0.17 to 0.55)	0.52 (0.27 to 0.76)	0.32 (0.14 to 0.50)
4 (83/85/69)	0.45 (0.21 to 0.70)		0.25 (0.01 to 0.48)
5 (86/88/82)	0.36 (0.17 to 0.56)	0.53 (0.28 to 0.79)	0.34 (0.13 to 0.55)
6 (58) group A only	0.24 (0.02 to 0.45)		
p-value for ANOVA	0.261	0.832	0.648

Table 5.10: Post Hoc Comparison of mean Total RLS scores, 95% confidence interval of mean difference (95% CI), and p-value for the total RLS score for year cohort 1 and 4 (group A) and year cohort 1, 2, and 5 (group C)

Year Cohort (Group)	Total RLS score	Number	Mean	95% CI	P-value
1 (A)	Total RLS	81	64.88	2.82 to 13.70	**0.002**
4 (A)		83	56.61		
1 (C)		50	63.70	0.36 to 14.60	
2 (C)	Total RLS	88	56.22		**0.001**
5 (C)		70	65.40	-15.62 to -2.74	

5.3.3.3. Comparative Analysis of RLS within Academic Years:

The RLS questionnaire was distributed to year cohort one through six in group A and for year cohorts one through five in group C, but only to first, third, and fifth year cohorts for the second occasion as mentioned earlier (please refer to the data collection Table 3.2). To explore the difference within the year cohorts and the total RLS score, a paired t-test was conducted for groups A and C for students from first to sixth year cohort and groups A, B, and C for first, third, and fifth year cohorts. The result for the paired t-test is illustrated in Table 5.11. There are significant differences within year cohorts, such as the second year cohort group A, who have a significantly higher total RLS score (M=60.87, SD=13.21) than students in group C (M=56.05, SD=13.22), t (84) = 2.91, p=0.004 (two-tailed), indicating that with time students in the second year cohort have a lower RLS score (Table 5.10 and 5.11). For the third year cohort group B, the total RLS score (M=64.19, SD=12.13) is significantly higher than group A (M=60.00, SD=11.86), t (61) = -2.45, p=0.017 (two-tailed), and group C (M=60.79, SD=11.19) (p=0.008) with time (Table 5.10 and 5.11).

In general, there is an overall decrease in the total RLS score with time except for the fifth year cohort, in which the total RLS score for students in group A cohort (M=60.69, SD=11.07) is lower than group B (M=63.69, SD=13.36) t (70) = -2.43, p=0.018) (Table 5.11). And by the time students in the fifth year cohort reach the end of their studies (group C), there is a further significant increase (M=64.98, SD=13.95) in the reflective process as measured by total RLS scale (p=0.050) (Table 5.10 and 5.11).

A one-way analysis of variance (ANOVA) was also carried out to investigate the impact of academic year on the RLS difference (RLS Scale – RLS Item 15); there are no statistical significant differences between the year cohorts as seen in Table 5.11. ANOVA was also used to explore differences within the year cohorts for the

RLS difference (RLS scale – RLS item 15), it was found that the second year cohort

in group C, have a higher actual RLS score than their perceived reflective process

(item 15) (p=0.019) (Table 5.11).

Table 5.11: Total RLS mean difference (A-B difference, B-C difference) for year cohorts 1, 3, and 5, and (A-C difference) for year cohorts 1 through 5, RLS Difference (RLS Scale – RLS Item 15: A-B difference, B-C difference, and A-C difference), 95% confidence interval of the differences of the means (95% CI), and p-values for the paired t-test

Year Cohort (n)	Difference (A-B)			Differences (B-C)			Difference (A-C)		
	Mean	95%CI	p-value	Mean	95%CI	p-value	Mean	95% CI	p-value
Total RLS									
1(67)	2.83	-0.14 to 5.81	0.062	1.35	-1.59 to 4.30	0.363	2.46	-1.38 to 6.29	0.203
2 (83)							4.34	1.38 to 7.30	**0.004**
3 (64)	-3.90	-7.09 to -0.72	**0.017**	3.23	0.85 to 5.61	**0.008**	-0.46	-2.87 to 1.94	0.702
4 (70)							-2.44	-5.63 to 0.76	0.133
5(72)	-3.82	-6.95 to -0.68	**0.018**	-0.89	-3.94 to 2.16	0.562	-3.77	-7.55 to 0.00	**0.050**
RLS Difference									
1 (67)	0.18	-0.219 to 0.57	0.349	0.19	-0.11 to 0.49	0.211	0.15	-0.30 to 0.61	0.498
2 (83)							0.36	0.06 to 0.66	**0.019**
3 (64)	-0.02	-0.28 to 0.25	0.901	0.09	-0.18 to 0.37	0.506	0.11	-0.12 to 0.35	0.336
4 (70)							0.00	-0.37 to 0.37	0.506
5 (72)	-0.09	-0.39to 0.22	0.571	0.14	-0.12 to 0.39	0.290	0.04	-0.23 to 0.32	0.750

5.3.4. Comparative Data of the Dundee Ready Educational Environment Method (DREEM) by Year:

5.3.4.1. Descriptive Data of DREEM and Subscales:

The DREEM questionnaire was distributed twice during the study, towards the end of the academic years 2007/08 and 2008/09 in order to give a better idea about the dental educational environment. Four hundred and ninety students in group A (academic year 2007/08), completed the DREEM questionnaire, 73.7% of whom viewed their environment as more positive than negative with an overall DREEM score of 112.76/200 (Figure 5.13), 62.9% of the students had a positive perception of their learning (score 26.32/48), 64.3% perceived the teachers as moving in a positive direction (score 24.62/44), 63.7% of students perceived their academic self-perception as more positive (score 18.91/32), 63.1% perceived their atmosphere as positive (score 27/48), while 61.6% of students perceived their social self-perception as "not too bad" (score 15.89/28) (Figure 5.14)

For the second data collection (academic year 2008/09), 443 students in group C completed the DREEM questionnaire. 65% of the students viewed their environment as more positive than negative with an overall DREEM score of 107.41/200 (Figure 5.13). 52.8% of the students had a positive perception of their learning (score 24.99/48), 56% perceived teachers as moving in a positive direction (score 23.27/44), 59.8% of students perceived their academic self-perception as more positive (score 18.75/32), 58% perceived their atmosphere as positive (score 25.45/48), while 56.9% of students perceived their social self-perception as "not too bad" (score 15.10/28) (Figure 5.14). Distribution of DREEM scores for the dental undergraduates groups A and C across first to sixth year are shown in Appendix D. Figures 5.13 illustrates the distribution of the total DREEM mean scores for students in group A and C from year cohort one through six and the overall student body. As can be seen from the bar charts, there is a decrease in the DREEM mean scores for

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all year cohorts, and more so for the second year cohort. In addition Figure 5.14 illustrates the overall distribution of the mean scores for DREEM subscales; perception of learning, teachers, academic self, atmosphere, and social self. There is an overall decrease in all the DREEM subscales for students in group C (academic year 2008/09) as shown in Figure 5.14.

Figure 5.13: Total DREEM mean scores for year cohorts 1 through 6 and overall mean scores by groups A and C:
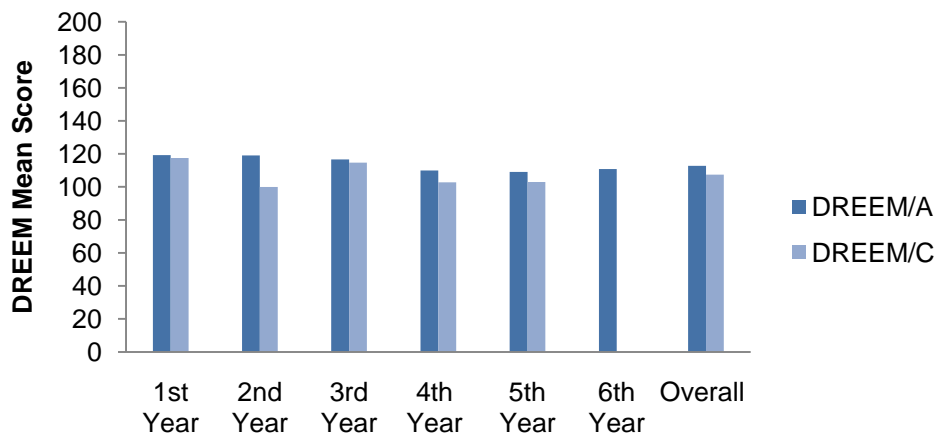
Figure 5.14: Overall mean scores for the DREEM Subscales; Perception of Learning (PL), Perception of Teachers (PT), Academic Self Perception (ASP), Perception of Atmosphere (PA), and Social Self Perception (SSP) by groups A and C
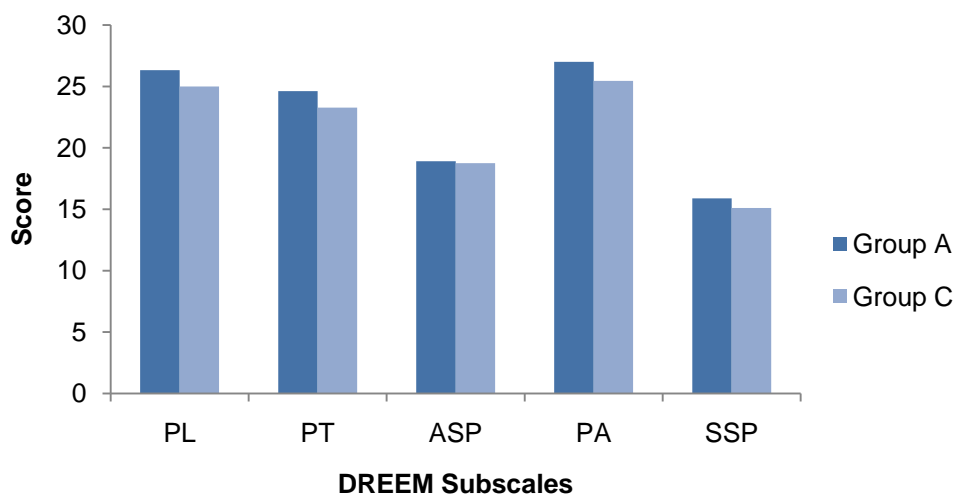
Individual mean and standard deviation scores for individual DREEM items and subscales (item 1- item 50) scores for undergraduate students in groups A and C from year cohorts one through six are illustrated in Appendix D.

The DREEM inventory can be used to identify specific strengths and weaknesses in an educational environment. Items with mean values of 2 or less should be examined more closely as they indicate problem areas within an educational environment, while items with a mean score of more than 3 are positive points. Items with a mean of 2 - 3 are aspects that could be enhanced. Table 5.12 illustrates the weak DREEM items labelled in red and Table 5.13 demonstrates the few positive factors of the dental environment labelled in green.

In this study the highest score was for DREEM item 15 (I have good friends in this school) (M=3.36, SD=0.86) which represents the social aspect of the dental environment (Table 5.13). Table 5.12 shows that there are more weak items than positive and the lowest score was for item 3 (There is a good support system for students who get stressed) (M=1.40, SD =1.25), and especially the second (M=0.97, SD=1.03) and fifth year cohorts (M=0.84, SD=1.16) whom scored very low for this item. There are other items that reflected a troubling environment for students' learning such as teaching is not student centred (item 13), cheating is a problem in the school (item 17), and the timetable of the school (item 12).

Table 5.12: Weaknesses of the Learning Environment for DREEM Items for year cohorts 1 through 6 group A and C (items with mean scores ≤ 2 labelled in Red)

Item No.	DREEM items	Year Cohort 1 Group A Mean	SD	Year Cohort 1 Group C Mean	SD	Year Cohort 2 Group A Mean	SD	Year Cohort 2 Group C Mean	SD	Year Cohort 3 Group A Mean	SD	Year Cohort 3 Group C Mean	SD	Year Cohort 4 Group A Mean	SD	Year Cohort 4 Group C Mean	SD	Year Cohort 5 Group A Mean	SD	Year Cohort 5 Group C Mean	SD	Year Cohort 6 Group A Mean	SD
3	There is a good support system for students who get stressed	2.12	1.16	**1.66**	1.04	**1.57**	1.17	**0.97**	1.03	**1.28**	1.09	**1.22**	1.08	**1.18**	1.25	**1.10**	1.20	**1.08**	1.33	**0.84**	1.16	**1.07**	1.12
4	I am too tired to enjoy the course	**1.64**	1.16	**1.57**	1.14	**1.79**	1.09	**1.02**	1.06	**1.60**	1.11	**1.17**	1.07	**1.54**	1.16	**1.13**	1.16	**1.44**	1.08	**1.13**	1.22	**1.03**	1.12
6	The teachers are patient with patients	2.47	0.99	2.35	0.68	2.28	0.83	2.10	0.90	2.63	0.94	2.25	0.97	2.27	1.21	2.02	1.03	2.08	1.12	**1.93**	1.08	2.36	1.01
7	The teaching is often stimulating	2.04	1.03	2.11	0.85	2.12	1.03	**1.58**	0.93	2.10	0.99	2.14	0.87	**1.84**	1.05	**1.79**	0.99	2.08	1.13	**1.73**	1.04	2.14	1.05
8	The teachers ridicule the students	2.21	1.18	2.36	0.98	2.01	1.01	2.02	1.01	2.43	1.55	2.20	0.99	**1.71**	1.05	**1.63**	1.02	**1.61**	1.06	**1.39**	0.93	**1.88**	1.09
9	The teachers are authoritarian	2.11	1.05	2.28	0.94	2.01	1.01	2.08	1.09	2.04	1.91	**1.76**	0.93	**1.53**	1.08	**1.35**	0.95	**1.50**	1.10	**1.25**	0.89	**1.59**	1.10
11	The atmosphere is relaxed during the ward (clinical) teaching	2.37	0.92	2.40	0.88	2.28	0.91	**1.83**	1.01	2.34	0.87	2.23	0.92	2.37	1.00	**1.78**	1.00	**1.83**	1.09	**1.57**	1.13	**1.59**	1.20
12	The school is well timetabled	2.38	1.08	2.30	1.08	2.11	1.16	**1.45**	1.17	2.23	1.21	**1.85**	1.12	2.16	1.27	**1.73**	1.09	**1.69**	1.23	**1.61**	1.17	**1.91**	1.24
13	The teaching is student centred	2.66	0.89	2.02	1.04	2.37	1.03	**1.62**	0.97	2.28	1.14	2.09	1.01	2.35	1.13	**1.67**	1.03	**1.99**	1.07	**1.66**	1.10	2.35	1.03
14	I am rarely bored on this course	**1.85**	1.21	**1.47**	1.25	**1.82**	1.23	**1.32**	1.10	**1.59**	1.20	**1.30**	1.06	**1.77**	1.16	**1.32**	1.03	**1.46**	1.12	**1.43**	1.29	**1.64**	1.21
17	Cheating is a problem in this school	2.06	1.44	2.17	1.41	**1.80**	1.31	**1.75**	1.25	**1.94**	1.34	2.10	1.27	**1.99**	1.32	**1.95**	1.22	**1.99**	1.49	**1.83**	1.36	**1.98**	1.32
18	The teachers have good communications skills with patients	2.15	0.88	2.29	0.80	2.23	0.87	**1.94**	0.97	2.48	0.69	2.30	0.83	2.28	1.10	2.08	1.02	2.31	0.93	**1.99**	1.06	2.58	0.93
21	I feel I am being well prepared for my profession	2.54	1.02	2.56	0.83	2.32	1.09	2.21	0.97	2.46	0.90	2.41	0.92	2.16	1.02	**1.98**	1.01	2.24	1.03	2.40	1.02	2.38	1.07
23	The atmosphere is relaxed during lectures	2.39	1.05	2.64	0.79	2.27	1.06	**1.75**	1.11	2.45	1.06	2.60	0.83	2.37	0.97	2.06	0.97	2.45	1.02	2.02	1.14	2.34	1.10

Continued from Table 5.12

Item No.	DREEM items	Year Cohort 1 Group A Mean	SD	Group C Mean	SD	Year Cohort 2 Group A Mean	SD	Group C Mean	SD	Year Cohort 3 Group A Mean	SD	Group C Mean	SD	Year Cohort 4 Group A Mean	SD	Group C Mean	SD	Year Cohort 5 Group A Mean	SD	Group C Mean	SD	Year Cohort 6 Group A Mean	SD
24	The teaching time is put to good use	2.60	0.95	2.42	1.05	2.39	1.00	**1.69**	1.19	2.27	1.07	2.32	0.94	2.11	1.11	**1.88**	1.11	**1.86**	1.07	**1.66**	1.13	2.12	1.11
25	The teaching over-emphasizes factual learning	**1.40**	0.85	2.68	1.10	**1.56**	0.95	**1.96**	1.25	**1.43**	0.74	2.62	0.93	**1.81**	0.97	2.37	1.08	**1.64**	0.91	2.56	1.09	**1.50**	0.80
26	Last year's work has been a good preparation for this year's work	2.53	1.08	2.68	1.10	2.27	1.11	**1.96**	1.25	2.04	1.07	2.62	0.93	2.06	1.26	2.37	1.08	2.48	1.11	2.56	1.09	2.60	1.02
27	I am able to memorize all I need	2.42	1.08	2.08	0.96	**1.95**	1.16	**1.46**	1.07	2.02	1.01	**1.91**	0.99	**1.83**	1.12	**1.80**	0.99	**1.79**	1.00	**1.59**	0.92	**1.86**	1.13
28	I seldom feel lonely	2.26	1.25	2.47	1.14	2.22	1.23	2.27	1.14	2.18	1.17	2.14	1.24	2.10	1.27	2.20	1.07	**1.95**	1.31	**1.98**	1.22	2.14	1.43
29	The teachers are good at providing feedback to students	2.36	1.02	2.41	0.91	2.37	0.93	**1.94**	1.08	2.56	0.98	2.36	0.79	2.52	0.98	**1.94**	1.09	2.11	0.98	**1.63**	1.12	2.21	1.10
32	The teachers provide constructive criticism here	2.17	0.96	2.38	0.80	2.15	0.97	2.01	1.02	2.48	0.89	2.30	0.86	2.11	1.00	2.16	1.18	**1.95**	1.03	**1.90**	1.07	2.10	1.00
35	I find the experience disappointing	2.47	1.15	2.53	1.19	2.25	1.06	2.33	1.07	**1.37**	1.11	2.52	1.03	2.05	1.21	2.23	1.06	2.35	1.18	2.11	1.25	2.27	1.04
38	I am clear about the learning objectives of the course	2.36	1.02	2.36	1.02	2.22	0.91	**1.81**	1.10	2.30	0.96	2.45	0.86	2.62	0.85	2.31	0.90	2.31	0.95	2.08	1.11	2.33	1.01
39	The teachers get angry in class	**1.92**	1.13	**1.79**	1.01	**1.81**	1.10	**1.88**	1.12	**1.91**	1.00	2.23	0.97	**1.67**	1.09	**1.75**	0.94	2.25	1.25	**1.99**	1.07	2.03	0.93
41	My problem-solving skills are being well developed here	2.55	1.12	2.18	1.09	2.20	.94	**1.89**	1.00	2.30	1.04	2.19	0.89	2.16	0.93	**1.92**	1.23	2.16	1.11	2.18	1.01	2.14	1.25
42	The enjoyment outweighs the stress of studying dentistry	2.31	1.16	**1.92**	1.12	**1.96**	1.13	**1.46**	1.21	**1.73**	1.08	**1.62**	1.11	**1.82**	1.25	**1.33**	1.34	**1.52**	1.26	**1.30**	1.20	**1.65**	1.23
43	The atmosphere motivates me as a learner	2.41	1.03	2.41	0.84	2.06	1.04	**1.65**	1.17	2.12	1.06	**1.99**	0.94	2.07	1.12	**1.73**	1.10	**1.65**	1.08	**1.56**	1.11	**1.86**	1.11

Continued from Table 5.12

Item No.	DREEM items	Year Cohort 1 Group A Mean	SD	Group C Mean	SD	Year Cohort 2 Group A Mean	SD	Group C Mean	SD	Year Cohort 3 Group A Mean	SD	Group C Mean	SD	Year Cohort 4 Group A Mean	SD	Group C Mean	SD	Year Cohort 5 Group A Mean	SD	Group C Mean	SD	Year Cohort6 Group A Mean	SD
44	The teaching encourages me to be an active learner	2.38	1.11	2.60	0.83	2.22	0.98	1.94	1.09	2.09	1.08	2.04	1.03	2.05	1.12	1.81	1.14	1.90	1.11	1.87	1.18	2.16	1.08
48	The teaching is too teacher-centred	1.76	1.08	1.52	1.14	1.52	0.98	1.26	0.98	1.63	0.92	1.64	0.86	1.73	1.00	1.27	0.87	1.50	0.94	1.59	1.01	1.67	1.05
50	The students irritate the teachers	2.08	1.23	1.87	1.17	1.44	1.16	1.29	1.11	1.95	1.13	2.36	1.14	1.69	1.16	1.78	1.18	2.31	1.15	2.20	1.12	2.28	1.07

Table 5.13: Strength of the Learning Environment for DREEM Items for year cohorts 1 through 6 groups A and C (items with mean scores ≥ 3 labelled in Green)

Item No.	DREEM items	Year Cohort 1 Group A Mean	SD	Group C Mean	SD	Year Cohort 2 Group A Mean	SD	Group C Mean	SD	Year Cohort 3 Group A Mean	SD	Group C Mean	SD	Year Cohort 4 Group A Mean	SD	Group C Mean	SD	Year Cohort 5 Group A Mean	SD	Group C Mean	SD	Year Cohort 6 Group A Mean	SD
1	I am encouraged to participate in class	3.09	0.81	2.54	0.92	2.49	1.18	2.14	1.09	2.41	1.09	2.49	0.98	2.39	1.25	2.63	1.03	2.60	1.16	2.40	1.15	2.59	1.19
2	The Teachers are knowledgeable	2.83	0.97	2.45	1.02	2.84	0.93	2.65	0.91	3.17	0.75	3.04	0.82	2.79	0.94	2.85	0.74	2.88	0.85	2.63	0.98	3.15	0.69
15	I have good friends in this school	3.33	0.90	3.33	0.80	3.27	0.88	3.39	0.73	3.58	0.60	3.43	0.74	3.33	0.93	3.27	0.77	3.38	0.82	3.49	0.77	3.25	0.97
19	My social life is good	3.11	0.98	3.13	0.95	2.97	0.94	2.84	1.14	3.20	0.89	3.05	0.94	3.09	0.90	2.64	1.05	2.86	1.13	2.72	1.22	2.90	1.06
30	There are opportunities for me to develop interpersonal skills	3.06	0.81	3.02	0.69	2.43	0.97	2.34	1.03	2.81	0.65	2.67	0.81	2.51	1.07	2.27	1.04	2.59	0.93	2.54	1.07	2.64	0.99
46	My accommodation is pleasant	2.86	1.20	3.18	0.95	2.90	0.85	3.13	0.80	3.06	0.85	2.91	0.89	2.89	0.92	2.90	0.94	2.94	0.90	2.94	0.96	2.93	0.74

5.3.4.2. Comparative Analysis of DREEM and Subscales by Year Cohorts:

To explore the difference the total DREEM and subscales scores within the year cohorts, a paired t-test was conducted. A one-way between-groups analysis of variance (ANOVA) was also conducted to investigate the difference between the year cohorts as seen in Table 5.14 for groups A and C from first to sixth year cohorts.

Total DREEM: there are significant differences in DREEM scores within year cohorts, for example second year students in group A (M=121.77, SD=17.34) have a higher mean score when compared to group C (M=120.75, SD=15.74), t (84) = 5.94, p=0.000 (two-tailed) as illustrated in Table 5.14. Fourth and fifth year cohorts in group A also have a significantly higher (p=0.000 and p=0.001) total DREEM score (M=111.65 SD=18.98, M=110.36, SD=16.70) than students in group C (M=102.75 SD=17.49, M=102.95 SD=20.15) (Table 5.14). With time, students in second, fourth, and fifth year cohorts demonstrate an overall decrease in the total DREEM score, thus having a lower perception of their educational environment.

Perception of Learning: significant differences for the second year cohort was noted, students in group A (M=26.32, SD=5.31) have a higher perception of learning score than students in group C (M=23.05, SD=5.49) (p=0.000) (Table 5.14). The Fourth year cohort in group A also have a significantly higher perception of learning (M=26.32, SD=5.24), than students in group C (M=23.91, SD=5.44) (p=0.002) (Table 5.14).

Perception of Teachers: second year cohort also had significant differences between groups A (M=23.93, SD=4.37) and C (M=22.24 SD=6.15) (p=0.000) (Table 5.14). Fourth year cohort also have significant differences for perception of teachers between group A (M=23.60, SD=5.19) and C (M=22.11, SD=4.69) (p=0.009) (Table 5.14). Also the fifth year cohort group A have a higher perception of teachers (M=23.66, SD=5.39) than group C (M=21.33, SD=5.38) (p=0.000) (Table 5.14).

Academic Self-Perception: there were significant differences within the third year cohort, students in group A have significantly lower mean scores for the academic self perception (M=18.87, SD=4.06) than those in group C (M=19.51, SD=4.06), t (69) = -1.99, p=0.050 as illustrated in Table 5.14.

Perception of Atmosphere: the second year cohort group A have a significantly higher mean score (M=26.74, SD=5.81) than students in group C (M=23.13, SD=6.73) (p=0.000) (Table 5.14). There were also significant differences between the fourth year cohort group A (M=26.47, SD=6.44) and group C (M=23.97, SD=5.58) (p=0.000) (Table 5.14). Fifth year students in group A, also have higher mean scores for their atmosphere (M=25.73, SD=6.48) than group C (M=23.64, SD=7.21) (p=0.001) (Table 5.14).

Social Self-Perception: the second year cohort group A have significantly different mean scores (M=16.29, SD=3.06) than group C (M=14.84, SD=3.22) (p=0.003) (Table 5.14). Third (M=16.34, SD=3.03) and fourth year cohorts (M=15.69, SD=3.48) in group A also have higher mean score than group C (M=15.13 SD=3.59 and M=14.44 SD=2.87) (p=0.013 and p=0.003 respectively) as illustrated in Table 5.14.

Table 5.14: Mean scores for DREEM and Subscales for year cohorts 1 through 6 groups A and C and mean difference scores (group A-C in those with both measures), 95% confidence interval of the differences of the means (95% CI) and mean difference, and p-values for paired t-test and ANOVA

Year Cohort (n A/n C)	Total DREEM		Mean (A-C)		
	Mean A (95% CI)	Mean C (95% CI)	Mean Difference	95% CI	p-value
1 (81/85)	119.23 (115.37 to123.10)	117.53 (114.01 to 121.05)	1.02	-4.54 to 6.58	0.714
2 (102/104)	111.09 (107.69 to 114.49)	99.90 (95.96 to 103.85)	1 0.87	7.23 to 14.51	**0.000**
3 (83/91)	116.62 (112.50 to -120.74)	114.71 (110.68 to 118.75)	1.35	-2.55 to 5.25	0.493
4 (83/80)	109.91 (105.55 to 114.28)	102.75 (98.86 to 106.64)	8.35	4.07 to 12.64	**0.000**
5 (85/83)	109.02 (105.03 to 113.02)	102.95 (98.55 to 107.35)	7.13	3.20 to 11.06	**0.001**
6 (59)	110.76 (104.26 to 117.27)				
p-value for ANOVA	**0.002**	**0.000**			

Year Cohort (n A/n C)	Perception of Learning		Mean (A-C)		
	Mean A (95% CI)	Mean C (95% CI)	Mean Difference	95% CI	p-value
1 (81/85)	28.17 (27.05 to 29.30)	27.47 (26.36 to 28.58)	0.69	-1.19 to 2.57	0.467
2 (102/104)	26.13 (25.11 to 27.14)	23.05 (21.98 to 24.12)	3.36	2.14 to 4.59	**0.000**
3 (83/91)	26.33 (25.18 to 27.47)	26.48 (25.29 to 27.68)	-0.10	-1.40 to 1.20	0.879
4 (83/80)	26.01 (24.81 to 27.21)	23.91 (22.70 to 25.12)	2.13	0.84 to 3.42	**0.002**
5 (85/83)	25.35 (24.19 to 26.52)	24.29 (23.00 to 25.58)	0.97	-0.39 to 2.34	0.160
6 (59)	25.90 (25.83 to 26.81)				
p-value for ANOVA	**0.030**	**0.000**			

Year Cohort (n A/n C)	Perception of Teachers		Mean (A-C)		
	Mean A (95% CI)	Mean C (95% CI)	Mean Difference	95% CI	p-value
1 (81/118)	24.81 (23.70 to -25.93)	24.69 (23.59 to 25.80)	0.58	-0.86 to 2.03	0.420
2 (102/104)	23.93 (23.07 to 24.79)	22.24 (21.04 to 23.44)	1.54	0.48 to 2.59	**0.000**
3 (83/85)	26.76 (25.60 to 27.92)	25.89 (24.82 to 26.96)	1.19	-0.19 to 2.56	0.090
4 (83/85)	23.60 (22.47 to 24.74)	22.11 (21.07 to 23.16)	1.56	0.40 to 2.73	**0.009**
5 (85/90)	23.66 (22.49 to 24.82)	21.33 (20.15 to 22.50)	2.42	1.14 to 3.70	**0.000**
6 (59)	25.39 (23.73 to 27.05)				
p-value for ANOVA	**0.000**	**0.000**			

Continued from Table 5.14

Year Cohort (n A/n C)	Academic Self-Perception		Mean (A-C)		
	Mean A (95% CI)	Mean C (95% CI)	Mean Difference	95% CI	p-value
1 (81/118)	20.44 (19.56 to 21.33)	20.16 (19.29 to 21.03)	-0.25	-1.71 to 1.21	0.733
2 (102/104)	17.96 (17.06 to 18.86)	16.88 (15.95 to 17.82)	1.03	-0.15 to 2.22	0.086
3 (83/85)	18.87 (17.98 to 19.76)	19.51 (18.66 to 20.35)	-0.97	-1.94 to 0.00	**0.050**
4 (83/85)	18.09 (17.12 to 19.05)	18.23 (17.30 to 19.15)	0.07	-1.07 to 1.22	0.898
5 (85/90)	19.40 (18.61 to 20.19)	19.31 (18.31 to 20.32)	0.42	-0.75 to 1.59	0.478
6 (59)	18.93 (17.63 to 20.24)				
p-value for ANOVA	**0.002**	**0.000**			

Year Cohort (n A/n C)	Perception of Atmosphere		Mean (A-C)		
	Mean A (95% CI)	Mean C (95% CI)	Mean Difference	95% CI	p-value
1 (81/85)	28.94 (27.68 to 30.20)	28.92 (27.76 to 30.08)	-0.42	-2.14 to 1.57	0.676
2 (102/104)	26.74 (25.59 to 27.88)	23.13 (21.82 to 24.43)	3.40	1.95 to 4.85	**0.000**
3 (83/91)	28.26 (26.90 to 29.61)	27.84 (26.69 to 28.98)	0.18	-1.04 to 1.42	0.761
4 (83/80)	26.47 (25.06 to 27.88)	23.98 (22.73 to 25.22)	3.14	1.49 to 4.79	**0.000**
5 (85/83)	25.73 (24.33 to 27.13)	23.64 (22.06 to 25.21)	2.65	1.13 to 4.17	**0.001**
6 (59)	25.59 (23.63 to 27.56)				
p-value for ANOVA	**0.003**	**0.000**			

Year Cohort (n A/n C)	Social self-Perception		Mean (A-C)		
	Mean A (95% CI)	Mean C (95% CI)	Mean Difference	95% CI	p-value
1 (81/85)	16.88 (15.98 to 17.78)	16.59 (15.96 to 17.22)	0.65	-0.68 to 1.97	0.333
2 (102/104)	16.29 (15.69 to 16.90)	14.84 (14.21 to 15.64)	1.31	0.46 to 2.15	**0.003**
3 (83/91)	16.34 (15.67 to 17.00)	15.13 (14.38 to 15.88)	1.04	0.23 to 1.85	**0.013**
4 (83/80)	15.69 (14.93 to 16.45)	14.44 (13.80 to 15.08)	1.38	0.49 to 2.26	**0.003**
5 (85/83)	14.92 (14.23 to 15.61)	14.49 (13.72 to 15.27)	0.54	-0.31 to 1.39	0.212
6 (59)	14.86 (13.87 to 15.86)				
p-value for ANOVA	**0.001**	**0.000**			

Table 5.15 represent the significant comparisons for the significant year cohorts in group A and Table 5.16 represents the significant post hoc comparisons using the Tukey HSD test for year cohorts in group C.

DREEM: for group A, there is a statistically significant difference (p=0.002) between students in the first year cohort (Table 5.14); students in this year have significantly higher mean DREEM score than fourth (p=0.026) and fifth (p=0.009) year cohorts (Table 5.15). For students in the first year cohort group C also have significantly higher scores for the total DREEM (p=0.000) than second, fourth, and fifth year cohorts (p=0.000) (Table 5.16). Second year students have a significantly lower total DREEM score than third year students (p=0.000) (Table 5.16). Third year students also have a significantly higher total DREEM scores than fourth and fifth year students (p=0.000) (Table 5.16). In general, those students in higher academic years have a lower perception of their overall environment, except the second year cohort (group C) they have a lower overall DREEM score (Table 5.14).

Perception of learning: students in the first year cohort group A, have a significantly higher mean score for the perception of learning [F (5, 487) = 2.50, p=0.013], (M = 28.17, SD = 5.10) than the fifth year cohort (M=25.35, SD= 5.40) (Table 5.15). First year students in group C also have a significantly higher mean scores for learning than second, fourth (p=0.000), and fifth year students (p=0.002) as illustrated in Table 5.15. While third year students (group C) have a significantly higher score than students in second and fourth year cohorts (p=0.000 and p=0.022 respectively) (Table 5.16).

Perception of Teachers: The third year cohort group A have a significantly higher score (M= 26.76, SD= 5.32) [F (5, 487) = 4.62, p=0.000], than second (M= 23.93, SD=4.38), fourth (M= 23.60, SD= 5.20), and fifth year (M= 23.66, SD= 5.40) cohorts (p=0.000) (Table 5.16).

Academic self-perception: students in the first year group A, have a higher academic self-perception score (M=20.44, SD= 3.99) [F (5, 486) = 3.91, p=0.002] than students in second (M=17.96, SD=4.59) (p=0.002) and fourth year cohorts (M= 18.09, SD= 4.41) (p=0.006) (Table 5.15). Students in the second year cohort (group C) have significantly lower scores than first (p=0.000), third (p=0.000), and fifth year students (p=0.002) (Table 5.16). While the first year cohort group C have significantly higher academic self perception than students in second (p=0.000) and fourth year (p=0.036) (Table 5.16).

Perception of Atmosphere: there are significant differences between the year cohorts [F (5, 486) = 3.61, p=0.003] (Table 5.14). Multiple comparison tests illustrate that the first year cohort group A have a significantly higher mean score, (M= 28.94, SD= 5.71) than fifth (M= 25.73, SD= 6.49) (p=0.014) and sixth year (M= 25.59, SD= 7.55) (p=0.025) cohorts (Table 5.15). While first and third year cohorts in group C have significantly higher scores for perception of atmosphere than second, fourth, and fifth year students (p=0.000) as illustrated in Table 5.16.

Social Self-Perception: differences between academic year cohorts in group A with respect to their social self-perception [F (5, 487) = 4.38, p=0.001] (Table 5.14) were noted for first year students who had significantly higher mean scores (M= 16.88, SD= 4.08) than fifth (M= 14.92, SD= 3.21) (p=0.004) and sixth year (M= 14.86, SD= 3.83) (p=0.009) cohorts (Table 5.15). Also the first year students in group C have significantly higher (p=0.000) mean score (M=16.59, SD=2.91) than second (M=14.84, SD=3.22) (p=0.002), third (M=15.13, SD=3.59) (p=0.026), fourth (M=14.44, SD=2.87) (p=0.000), and fifth year (M=14.49, SD=3.53) (p=0.000) cohorts (Table 5.14 and 5.16).

Table 5.15: Multiple comparison of significant mean difference, 95% confidence interval of mean difference (95% CI), p-value for DREEM and Subscales for year cohorts 1 through 6 (group A)

DREEM and Subscales (Group)	Year Cohort (I)	Year Cohort (J)	Mean Difference (I-J)	95% CI	p-value
Total DREEM (A)	1	4	9.32	0.68 to 17.96	**0.026**
		5	10.21	1.65 to 18.77	**0.009**
Perception of Learning (A)	1	5	2.82	0.37 to 5.27	**0.013**
Perception of Teachers (A)	3	2	2.83	0.62 to 5.04	**0.004**
		4	3.16	0.84 to 5.48	**0.002**
		5	3.10	0.79 to 5.41	**0.002**
Student Academic Perception (A)	1	2	2.48	0.66 to 4.31	**0.002**
		4	2.36	0.44 to 4.28	**0.006**
Student Perception Atmosphere (A)	1	5	3.21	0.41 to 6.01	**0.014**
		6	3.34	0.25 to 6.44	**0.025**
Student Social Self-Perception (A)	1	5	1.96	0.43 to 3.48	**0.004**
		6	2.01	0.33 to 3.69	**0.009**

Table 5.16: Multiple Comparison of significant mean difference, 95% confidence interval of mean difference (95% CI), p-value for DREEM and Subscales for year cohorts 1 to 6 (group C)

DREEM and Subscales (Group)	Year Cohort (I)	Year Cohort(J)	Mean Difference (I-J)	95% CI	p-value
Total DREEM (C)	1	2	17.63	10.07 to 25.18	**0.000**
		4	14.78	6.73 to 22.83	**0.000**
		5	14.58	6.60 to 22.55	**0.000**
	2	3	-14.81	-22.23 to -7.39	**0.000**
	3	4	11.96	4.04 to 19.89	**0.000**
		5	11.76	3.92 to 19.61	**0.000**
Perception of Learning (C)	1	2	4.42	2.20 to 6.65	**0.000**
		4	3.56	1.19 to 5.93	**0.000**
		5	3.18	0.83 to 5.53	**0.002**
	3	2	3.43	1.25 to 5.62	**0.000**
		4	2.57	0.24 to 4.90	**0.022**
Perception of Teachers (C)	1	2	2.45	0.30 to 4.60	**0.016**
		4	2.58	0.29 to 4.87	**0.018**
		5	3.37	1.10 to 5.64	**0.001**
	3	2	3.65	1.54 to 5.76	**0.000**
		4	3.78	1.52 to 6.03	**0.000**
		5	4.56	2.33 to 6.80	**0.000**
Student Academic Perception (C)	1	2	3.28	1.53 to 5.03	**0.000**
		4	1.94	0.08 to 3.80	**0.036**
	2	1	-3.28	-5.03 to -1.53	**0.000**
		3	-2.62	-4.33 to -0.91	**0.000**
		5	-2.43	-4.19 to -0.67	**0.002**

Continued from Table 5.16

Dependent Variable (Group)	Year Cohort (I)	Year Cohort(J)	Mean Difference (I-J)	95% CI	p-value
Student Perception Atmosphere (C)	1	2	5.79	3.33 to 8.25	**0.000**
		4	4.94	2.32 to 7.56	**0.000**
		5	5.28	2.68 to 7.88	**0.000**
	3	2	4.71	2.30 to 7.13	**0.000**
		4	3.86	1.28 to 6.44	**0.000**
		5	4.19	1.64 to 6.75	**0.000**
Student Social Self-Perception (C)	1	2	1.75	0.45 to 3.05	**0.002**
		3	1.45	0.11 to 2.80	**0.026**
		4	2.15	0.76 to 3.54	**0.000**
		5	2.09	0.72 to 3.47	**0.000**

The overall findings shows a trend of early year cohorts having somewhat higher scores for total DREEM and subscales than students in higher year cohorts as noted in group A, except for second year students who have a significantly lower perception of the overall environment, learning, teachers, atmosphere and social self- aspect (Table 5.14). Also the fourth year cohort have a significant decrease in DREEM and all subscales except for academic self perception (Table 5.14). In addition, students in the fifth year cohort, have negative views of their overall dental environment, teachers, and atmosphere of the school (Table 5.14).

To summarise the significant comparative data of the assessment tools by year cohort;

- ILS: for the active / reflective style, students are balanced for this style but third, fourth and fifth year cohorts score more towards the active style with time but without an actual change in the style. For the sensing / intuitive style, the first, second, and fifth year cohorts become more sensing with time. And students become more visual with increase academic years and especially the fifth year cohort with time.

- <u>ALSI:</u> there are no differences between year cohorts, but there are differences within certain year cohorts, for example the third year cohort adopt a more organised / effort approach, while students in the fifth year cohort adopt a more monitoring approach to studying and learning with time.

- <u>RLS:</u> there are significant differences between the academic year cohorts and the overall RLS score; in general, there is an overall decrease in the total RLS score with time for all year cohorts except for the fifth year cohort, indicating an increase in the reflective process.

- <u>DREEM:</u> the overall findings show a trend of early year cohorts (first and third year cohorts) to have a more positive view of their educational environment than students in higher year cohorts (fourth and fifth year cohorts), except for the second year cohort who have a generally negative perception of their overall environment, such as their learning, teachers, atmosphere and social self- aspect.

5.4. Comparative Data of the Assessment Tools Related to Gender:

5.4.1. Comparative Data of Index of Learning Styles (ILS) by Gender:

Independent t-tests were conducted to explore the association of the learning styles of students as measured by ILS and gender for group A across year cohorts one through six, group B across first through fifth year cohorts, and for group C across the fifth year cohort only. The gender frequency, percentage, and independent t-tests for the ILS for groups A, B, and C are illustrated in Appendix D.

The distribution of the ILS scores according to gender for first to sixth year students (group A) is illustrated with radar charts in Figure 5.15. Essentially there are no differences detected for any of the learning styles as measured by ILS between males and females (Figures 5.15a, b, c, and d), except for the fifth year cohort for the visual / verbal style ($p=0.054$), where males have a more visual learning styles than females (Appendix D). And for the sequential / global style for the third year cohort, females score more towards the sequential style ($p=0.031$) but both genders remain balanced for this style (Appendix D). The radar charts are similar to the distribution of learning styles among the different year cohorts as illustrated in Figure 5.1 (a and b).

Figure 5.15 a: Distribution of Active/Reflective mean scores according to gender for year cohorts 1 through 6 (group A)

Active/Reflective
Year Cohort 1/A

Males
Females

3 to -3: Balanced
-5 to -11: Active
5 to 11:
Reflective

Active/Reflective
Year Cohort 2/A

Males
Females

3 to -3: Balanced
-5 to -11: Active
5 to 11: Reflective

Active/Reflective
Year Cohort 3/A

Males
Females

3 to -3: Balanced
-5 to -11: Active
5 to 11: Reflective

Active/Reflective
Year Cohort 4/A

Males
Females

3 to -3 : Balanced
-5 to -11: Active
5 to 11: Reflective

Active/Reflective
Year Cohort 5/A

Males
Females

3 to -3: Balanced
-5 to -11: Active
5 to 11: Reflective

Active/Reflective
Year Cohort 6/A

Males
Females

3 to -3 : Balanced
-5 to -11: Active
5 to 11: Reflective

Figure 5.15 b: Distribution of Sensing/Intuitive mean scores according to gender for year cohorts 1 through 6 (group A)

Sensing/Intuitive
Year Cohort 1/A

— Males
— Females

3 to -3: Balanced
-5 to -11: Sensing
5 to 11: Intuitive

Sensing/Intuitive
Year Cohort 2/A

— Males
— Females

3 to -3: Balanced
-5 to -11: Sensing
5 to 11: Intuitive

Sensing/Intuitive
Year Cohort 3/A

— Males
— Females

3 to -3: Balanced
-5 to -11: Sensing
5 to 11: Intuitive

Sensing/Intuitive
Year Cohort 4/A

— Males
— Females

3 to -3 : Balanced
-5 to -11: Sensing
5 to 11: Intuitive

Sensing/Intuitive
Year Cohort 5/A

— Males
— Females

3 to -3: Balanced
-5 to -11: Sensing
5 to 11: Intuitive

Sensing/Intuitive
Year Cohort 6/A

— Males
— Females

3 to -3 :Balanced
-5 to -11: Sensing
5 to 11: Intuitive

Figure 5.15 c: Distribution of Visual/Verbal mean scores according to gender for year cohorts 1 through 6 (group A)

Visual/Verbal
Year Cohort 1/A

3 to -3: Balanced
-5 to -11: Visual
5 to 11: Verbal

Visual/Verbal
Year Cohort 2/A

3 to -3: Balanced
-5 to -11: Visual
5 to 11: Verbal

Visual/Verbal
Year Cohort 3/A

3 to -3: Balanced
-5 to -11: Visual
5 to 11: Verbal

Visual/Verbal
Year Cohort 4/A

3 to -3 : Balanced
-5 to -11: Visual
5 to 11: Verbal

Visual/Verbal
Year Cohort 5/A

3 to -3: Balanced
-5 to -11: Visual
5 to 11: Verbal

Visual/Verbal
Year Cohort 6/A

3 to -3: Balanced
-5 to -11: Visual
5 to 11: Verbal

Figure 5.15 d: Distribution of Sequential/Global mean scores according to gender for year cohorts 1 through 6 (group A)

Sequential/Global
Year Cohort 1/A

3 to -3: Balanced
-5 to -11: Sequential
5 to 11: Global

Sequential/Global
Year Cohort 2/A

3 to -3: Balanced
-5 to -11: Sequential
5 to 11: Global

Sequential/Global
Year Cohort 3/A

3 to -3: Balanced
-5 to -11: Sequential
5 to 11: Global

Sequential/Global
Year Cohort 4/A

3 to 3: Balanced
-5 to -11: Sequential
5 to 11: Global

Sequential/Global
Year Cohort 5/A

3 to -3 : Balanced
-5 to -11: Sequential
5 to 11: Global

Sequential/Global
Year Cohort 6/A

3 to -3 : Balanced
-5 to -11: Sequential
5 to 11: Global

Paired t-tests were carried out to examine gender differences in learning styles within the year cohorts for groups A and B as illustrated in Table 5.17. For group C, only the fifth year cohort was included for practicality in carrying out the study, the results are illustrated in Table 5.18.

Active / Reflective Learning Style: there are no gender differences for the active / reflective learning styles between the academic year cohorts, except for the fourth year cohort (group B), with time female students tend to score towards the active style (p=0.006), but there is no actual change of learning styles (Table 5.17).

Sensing / Intuitive Learning Style: there are no significant differences between the academic year cohorts for this learning style (Table 5.17). But male and female students in the second (group B) and females in the fifth year cohort (group B and C) tend to become more sensing with time (p=0.021, p=0.005, p=0.005 respectively) (Table 5.17 and 5.18).

Visual / Verbal Learning Style: there are no significant differences between the different academic year cohorts, but there are significant differences for the first year females (group B) and fifth year cohort males (group B) who score more towards the visual style with time (p=0.040, p=0.005 respectively) (Table 5.17).

Sequential / Global learning style: there are no gender differences for the sequential / global learning styles between the year cohorts.

Table 5.17: Paired t-test results for ILS mean differences (Males A-B, Females A-B), 95% confidence interval of differences of means (95% CI) and p-value for year cohorts 1 through 6

Year Cohort	Gender (n)	ILS Mean Difference (Group)	Mean	95%CI	p-value
1	Male (32)	Active/Reflective (A- B)	0.56	-0.80 to 1.92	0.406
		Sensing/Intuitive (A-B)	2.00	-0.32 to 4.32	0.088
		Visual/Verbal (A – B)	0.06	-1.51 to 1.63	0.936
		Sequential/Global (A –B)	1.06	-0.02 to 2.15	0.054
	Female (35)	Active/Reflective (A- B)	0.69	-0.89 to 2.26	0.381
		Sensing//Intuitive (A –B)	0.91	-0.28 to 2.11	0.129
		Visual/Verbal (A – B)	1.09	0.05 to 2.12	**0.040**
		Sequential/Global (A –B)	0.69	-0.75 to 2.12	0.338
2	Male (35)	Active/Reflective (A- B)	0.06	-1.19 to 1.31	0.927
		Sensing//Intuitive (A –B)	1.60	0.11 to 3.09	**0.036**
		Visual/Verbal (A – B)	-0.29	-1.47 to 0.89	0.626
		Sequential/Global (A –B)	0.40	-1.27 to 2.06	0.628
	Female (48)	Active/Reflective (A- B)	0.79	-0.24 to 1.82	0.128
		Sensing//Intuitive (A –B)	1.50	0.23 to 2.77	**0.021**
		Visual/Verbal (A – B)	0.25	-0.62 to 1.12	0.566
		Sequential/Global (A –B)	-0.63	-1.94 to 0.69	0.345
3	Male (25)	Active/Reflective (A- B)	1.44	-0.24 to 3.12	0.089
		Sensing//Intuitive (A –B)	0.56	-0.69 to 1.81	0.364
		Visual/Verbal (A – B)	1.04	-0.85 to 2.93	0.268
		Sequential/Global (A –B)	-0.16	-2.17 to 1.85	0.871
	Female (39)	Active/Reflective (A- B)	0.87	-0.38 to 2.12	0.167
		Sensing//Intuitive (A –B)	0.46	-0.85 to 1.77	0.480
		Visual/Verbal (A – B)	-0.51	-1.60 to 0.58	0.347
		Sequential/Global (A –B)	0.36	-0.89 to 1.61	0.565

Year	Gender (Number)	ILS and Group	Mean	95%CI	p-value
4	Male (33)	Active/Reflective (A- B)	0.97	-0.74 to 2.68	0.257
		Sensing//Intuitive (A –B)	0.54	-1.25 to 2.34	0.540
		Visual/Verbal (A – B)	1.33	-0.32 to 2.98	0.110
		Sequential/Global (A –B)	0.61	-0.97 to 2.19	0.441
	Female (37)	Active/Reflective (A- B)	1.73	0.53 to 2.93	**0.006**
		Sensing//Intuitive (A –B)	-0.76	-2.06 to 0.54	0.245
		Visual/Verbal (A – B)	0.70	-0.66 to 2.07	0.303
		Sequential/Global (A –B)	0.32	-0.80 to 1.45	0.563
5	Male (29)	Active/Reflective (A- B)	0.83	-0.42 to 2.07	0.184
		Sensing//Intuitive (A –B)	1.38	-0.12 to 2.87	0.069
		Visual/Verbal (A – B)	2.21	0.72 to 3.69	**0.005**
		Sequential/Global (A –B)	-0.14	-1.86 to 1.59	0.871
	Female (43)	Active/Reflective (A- B)	0.05	-1.14 to 1.23	0.937
		Sensing//Intuitive (A –B)	0.14	-0.95 to 1.23	0.798
		Visual/Verbal (A – B)	0.98	-0.35 to 2.30	0.144
		Sequential/Global (A –B)	0.33	-0.84 to 1.49	0.575

Table 5.18: Paired t-test results for ILS mean differences between genders (Male B-C, Female B-C), 95% confidence interval of differences of means (95% CI) and p-value for year cohort 5

Year	Gender (Number)	ILS	Mean	95% CI	p-value
5	Male (34)	Active/Reflective (B –C)	0.00	-1.07 to 1.07	1.000
		Sensing//Intuitive (B- C)	-.941	-2.44 to 0.56	0.211
		Visual/Verbal (B – C)	0.24	-0.95 to 1.42	0.689
		Sequential/Global (B - C)	-0.18	-1.56 to 1.21	0.798
	Female (43)	Active/Reflective (B –C)	0.33	-0.68 to 1.33	0.517
		Sensing//Intuitive (B- C)	1.26	0.40 to 2.12	**0.005**
		Visual/Verbal (B – C)	0.61	-1.00 to 2.21	0.453
		Sequential/Global (B - C)	0.46	-0.55 to 1.48	0.359

5.4.2. Comparative Data of the Approach to Learning and Studying (ALSI) by Gender:

To investigate the association of the approach to learning and studying as measured by ALSI and gender for the students in groups A and B from year cohorts one through six, an independent t-test was conducted, females in the first year cohort in group B, scored a significantly higher mean score for the deep approach (M=24.45, SD=3.00) than males (M=22.71, SD=3.35) (p=0.004), as did female students in the fourth year cohort in group A for the monitoring approach (M=16.00, SD=2.47) than males (M=14.85, SD=2.74) (p=0.049). There are no significant gender differences in group C for the fifth year cohort. The result for the independent t-tests for groups A, B, and C are illustrated in Appendix D.

The gender differences in ALSI within the year cohorts were investigated using a paired t-test as shown in Table 5.19. Male students in the fifth year cohort in group A have a significantly lower mean score for the deep approach (M=22.31, SD=3.98) than group B (M=24.55, SD=3.34) (p=0.005) (Table 5.19). For the monitoring approach, there were significant differences between females in group A and B for the third year (M=14.66 SD=3.21, M=15.61 SD=2.39) (p=0.048) and the fifth year cohort (M=15.70 SD=3.04, M=16.74 SD=2.22) (p=0.038) as illustrated in Table 5.19.

There are no differences between fifth year student cohorts in groups B and C, the paired t-test result are demonstrated in Appendix D.

Table 5.19: Paired t-test results of ALSI (total ALSI, Deep, Surface, Monitoring, and Organised/Effort) mean differences between genders (A-B), 95% confidence interval of differences of means (95% CI) and p-value for year cohorts 1,3 and 5

Year Cohort	Gender (n)	ALSI	Mean	95% CI	p-value
1	Male (31)	Total ALSI (A – B)	0.81	-1.37 to 2.98	0.455
		Deep (A – B)	0.52	-0.97 to 2.00	0.484
		Surface (A- B)	-0.55	-1.98 to 0.88	0.440
		Monitoring (A - B)	0.26	-1.02 to 1.54	0.683
		Organised/effort (A –B)	0.58	-0.88 to 2.04	0.422
	Female (35)	Total ALSI (A - B)	-0.54	-2.65 to 1.57	0.604
		Deep (A – B)	0.17	-0.98 to 1.32	0.763
		Surface (A - B)	-0.40	-1.49 to 0.69	0.460
		Monitoring (A - B)	-0.57	-1.61 to 0.46	0.270
		Organised/effort (A –B)	0.26	-0.62 to 1.14	0.556
3	Male (25)	Total ALSI (A - B)	-0.64	-4.16 to 2.88	0.710
		Deep (A – B)	-0.44	-2.19 to 1.31	0.608
		Surface (A - B)	1.12	-0.39 to 2.63	0.139
		Monitoring (A - B)	-0.16	-1.41 to 1.09	0.794
		Organised/effort (A –B)	-0.96	-1.93 to 0.01	0.052
	Female (38)	Total ALSI (A - B)	-1.45	-3.87 to 0.97	0.233
		Deep (A – B)	-0.47	-1.56 to 0.62	0.385
		Surface (A - B)	0.66	-0.49 to 1.81	0.255
		Monitoring (A - B)	-0.95	-1.89 to -0.01	**0.048**
		Organised/effort (A –B)	-.684	-1.63 to 0.26	0.150
5	Male (29)	Total ALSI (A - B)	-4.14	-6.96 to -1.32	**0.006**
		Deep (A – B)	-2.24	-3.74 to -0.74	**0.005**
		Surface (A - B)	-0.45	-1.61 to 0.72	0.438
		Monitoring (A - B)	-0.55	-1.51 to 0.41	0.247
		Organised/effort (A –B)	-0.86	-1.90 to 0.17	0.099
	Female (43)	Total ALSI (A - B)	-0.35	-2.86 to 2.16	0.781
		Deep (A – B)	-0.02	-1.22 to 1.17	0.969
		Surface (A - B)	0.21	-0.96 to 1.38	0.719
		Monitoring (A - B)	-1.05	-2.03 to -0.06	**0.038**
		Organised/effort (A –B)	0.42	-0.60 to 1.44	0.411

5.4.3. Comparative Data of the Reflection in Learning Scale (RLS) by Gender:

To explore the difference between gender and the reflective process as measured by RLS, an independent t-test was performed. The results for the t-test are illustrated in Table 5.20, and it demonstrated that female students in the fifth year cohort group C, have a significantly higher total RLS mean score (M=67.60, SD=13.46) than male students (M=61.47, SD=14.01) (p=0.046). For the RLS difference (RLS scale – item 15), male students in the fifth year cohort group B, have a lower RLS difference than females (p=0.002), this could indicate that females rate their ability to reflect as lower than their actual reflective process (Table 5.20).

Differences within genders were also noted as illustrated by paired t-test in Table 5.21, second year male students in group A have a significantly higher total RLS mean score (M=61.88, SD=14.30) than group C (M=55.58, SD=13.92) (p=0.009). Male students in the second year cohort group C perceive their ability to reflect as less than is actually measured by the RLS scale with time and this is illustrated by significant differences between groups A and C (p=0.024) for the RLS difference (RLS scale - item 15) (Table 5.21).

Female students in the third year cohort group B, have a higher total RLS mean score (M=63.92, SD=11.51) than group C (M=60.78, SD=11.26) (p=0.035), indicating a decrease in the RLS score with time (Table 5.21). While female students in the fifth year cohort group A have a significantly lower total RLS score (M=61.81, SD=12.65) than group B (M=66.24, SD=12.75) (p=0.040) and group C (M=67.67, SD=13.68) (p=0.037) (Table 5.21), this indicates that with time, female students in the fifth year cohort have a higher RLS score.

Table 5.20: Mean scores for Total RLS and RLS Difference (RLS Scale – RLS Item 15) between genders, 95% confidence interval of mean difference (95%CI), and p-value for year cohorts 1 through 6 (groups A), year cohorts 1, 3, and 5 (group B), and year cohort 1 through 5 (group C)

Year Cohort	RLS and Group	Gender	Number	Mean	95% CI	P-value
1	Total RLS (A)	male	39	65.67	-3.68 to 6.73	0.562
		female	42	64.14		
	Total RLS (B)	male	57	62.09	-6.03 to 3.68	0.633
		female	61	63.26		
	Total RLS (C)	male	45	59.36	-11.53 to -1.06	**0.019**
		female	40	65.65		
	RLS Difference (A)	male	29	0.28	-0.75 to 0.23	0.293
		female	41	0.54		
	RLS Difference (B)	male	56	0.29	-0.47 to 0.35	0.772
		female	55	0.35		
	RLS Difference (C)	male	43	0.02	-0.72 to 0.16	0.208
		female	36	0.31		
2	Total RLS (A)	male	50	62.12	-2.75 to 7.80	0.344
		female	49	59.59		
	Total RLS (B)	male	0			
		female	0			
	Total RLS (C)	male	49	56.06	-5.13 to 5.18	0.992
		female	56	56.04		
	RLS Difference (A)	male	52	0.67	-0.19 to 0.52	0.372
		female	45	0.51		
	RLS Difference (B)	male	0			
		female	0			
	RLS Difference (C)	male	45	0.24	-0.63 to 0.21	0.322
		female	51	0.45		
3	Total RLS (A)	male	34	61.21	-3.24 to 7.32	0.444
		female	49	59.16		
	Total RLS (B)	male	33	64.94	-4.20 to 6.68	0.651
		female	50	63.70		
	Total RLS (C)	male	35	61.40	-3.82 to 5.77	0.686
		female	57	60.42		
	RLS Difference (A)	male	34	0.21	-0.65 to 0.12	0.173
		female	49	0.47		
	RLS Difference (B)	male	31	0.26	-0.52 to 0.28	0.541
		female	50	0.38		
	RLS Difference (C)	male	34	0.21	-0.55 to 0.19	0.334
		female	57	0.39		
4	Total RLS (A)	male	41	57.05	-4.58 to 6.29	0.754
		female	42	56.19		
	Total RLS (B)	male	0			
		female	0			
	Total RLS (C)	male	42	57.26	-8.76 to 1.86	0.200
		female	38	60.71		
	RLS Difference (A)	male	34	0.47	-0.46 to 0.53	0.890
		female	39	0.44		
	RLS Difference (B)	male	0			
		female	0			
	RLS Difference (C)	male	32	0.19	-0.58 to 0.36	0.645
		female	37	0.30		

Continued from Table 5.20

Year Cohort	RLS and Group	Gender	Number	Mean	95% CI	P-value
5	Total RLS (A)	male	36	59.31	-7.19 to 2,44	0.329
		female	50	61.68		
	Total RLS (B)	male	39	60.90	-10.65 to 0.61	0.080
		female	49	65.92		
	Total RLS (C)	male	36	61.47	-12.14 to -0.12	**0.046**
		female	48	67.60		
	RLS Difference (A)	male	35	0.20	-0.67 to 0.11	0.158
		female	50	0.48		
	RLS Difference (B)	male	38	0.18	-1.02 to -0.23	**0.002**
		female	48	0.81		
	RLS Difference (C)	male	36	0.14	-0.79 to 0.06	0.095
		female	46	0.50		
6	Total RLS (A)	male	20	62.20	-4.41 to 9.65	0.458
		female	38	59.58		
	Total RLS (B)	male	0			
		female	0			
	Total RLS (C)	male	0			
		female	0			
	RLS Difference (A)	male	20	0.45	-0.11 to 0.78	0.132
		female	35	0.11		
	RLS Difference (B)	male	0			
		female	0			
	RLS Difference (C)	male	0			
		female	0			

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Table 5.21: Paired t-test for mean differences of Total RLS scores and RLS Difference (A-B, A-C, and B-C), 95% confidence interval of differences of means (95% CI) and p-value for genders for year cohorts 1 through 5 (group A), year cohorts 1, 3, and 5 (group B), and year cohorts 1 through 5 (group C)

Year Cohort	Gender	RLS and Group	Number	Mean	95% CI	p-value
1	Male	Total RLS (A- B)	31	1.84	-3.55 to 7.23	0.492
		Total RLS (A –C)	26	2.42	-3.58 to 8.43	0.414
		Total RLS (B –C)	43	3.65	-.135 to 7.44	0.058
		RLS Diff (A- B)	25	0.00	-0.57 to 0.57	1.000
		RLS Diff (A- C)	19	0.26	-0.40 to 0.92	0.413
		RLS Diff (B –C)	41	0.24	-0.14 to 0.63	0.208
	Female	Total RLS (A –B)	35	3.71	0.50 to 6.93	0.025
		Total RLS (A- C)	22	2.50	-2.50 to 7.50	0.311
		Total RLS (B –C)	39	-1.18	-5.80 to 3.44	0.608
		RLS Diff (A- B)	30	0.33	-0.22 to 0.88	0.224
		RLS Diff (A –C)	20	0.05	-0.64 to 0.74	0.881
		RLS Diff (B –C)	33	0.12	-0.37 to 0.61	0.619
2	Male	Total RLS (A – C)	43	6.30	1.65 to 10.95	**0.009**
		RLS Diff (A – C)	40	0.53	0.07 to 0.98	**0.024**
	Female	Total RLS (A – C)	42	2.33	-1.40 to 6.06	0.213
		RLS Diff (A –C)	37	0.19	-0.22 to 0.60	0.352
3	Male	Total RLS (A – B)	25	-3.64	-8.58 to 1.30	0.142
		Total RLS (A –C)	28	1.18	-2.84 to 5.20	0.552
		Total RLS (B –C)	29	3.38	-0.96 to 7.72	0.122
		RLS Diff (A- B)	23	-0.13	-0.51 to 0.24	0.479
		RLS Diff (A –C)	27	0.15	-0.15 to 0.45	0.327
		RLS Diff (B –C)	26	0.23	-0.20 to 0.66	0.282
	Female	Total RLS (A –B)	37	-4.08	-8.44 to 0.27	0.065
		Total RLS (A –C)	43	-1.53	-4.62 to 1.55	0.321
		Total RLS (B –C)	49	3.14	0.23 to 6.06	**0.035**
		RLS Diff (A- B)	37	0.05	-0.32 to 0.43	0.773
		RLS Diff (A –C)	43	0.09	-0.25 to 0.43	0.585
		RLS Diff (B –C)	49	0.02	-0.35 to 0.39	0.912
4	Male	Total RLS (A –C)	38	-1.21	-5.16 to 2.74	0.538
		RLS Diff (A –C)	25	0.04	-0.55 to 0.63	0.890
	Female	Total RLS (A – C)	31	-3.94	-9.36 to 1.49	0.149
		RLS Diff (A- C)	28	-0.04	-0.54 to 0.46	0.885
5	Male	Total RLS (A –B)	29	-2.93	-7.88 to 2.02	0.235
		Total RLS (A – C)	28	-1.71	-8.09 to 4.66	0.586
		Total RLS (B – C)	33	-0.18	-5.12 to 4.76	0.941
		RLS Diff (A –B)	28	0.11	-0.34 to 0.56	0.631
		RLS Diff (A –C)	28	0.210	-0.22 to 0.65	0.326
		RLS Diff (B –C)	32	-0.090	-0.42 to 0.23	0.557
	Female	Total RLS (A –B)	42	-4.43	-8.65 to -0.21	**0.040**
		Total RLS (A – C)	42	-5.14	-9.96 to -0.32	0.037
		Total RLS (B –C)	41	-1.46	-5.46 to 2.53	0.464
		RLS Diff (A –B)	41	-0.22	-0.64 to 0.20	0.298
		RLS Diff (A –C)	41	-0.070	-0.43 to 0.28	0.680
		RLS Diff (B –C)	41	0.32	-0.07 to 0.70	0.102

5.4.4. Comparative Data of the Dundee Ready Educational Environment Measure (DREEM) by Gender:

To explore the difference between genders and the perception of the environment as measured by DREEM, an independent t-test was performed as illustrated in Table 5.22 for group A. The significant findings for the t-tests for group C are illustrated in Table 5.23, the distribution of DREEM scores and subscales for students in group C according to gender is demonstrated in Appendix D.

Total DREEM: females in the fifth year cohort in group A have a more positive view of their overall environment (M=112.45, SD=17.01) than male students (M=104.36, SD=19.66) (p=0.046) (Table 5.22).

Perception of Learning: there are no significant differences between genders and year cohorts for the perception of learning.

Perception of Teachers: female students have a more positive view of their teachers than males and this was noted for the second (p=0.013), fifth (p= 0.016), and sixth year (p=0.027) cohorts where males in group A (M=22.91 SD=4.65, M=22.03, SD=5.91, M=22.85 SD=6.57 respectively) have lower mean scores for perception of teachers than females in the same group (M=25.04 SD=3.80, M=24.86 SD=4.70, M=26.69 SD=5.95 respectively) (Table 5.22).

Academic Self-Perception: there are no significant differences between genders and year cohorts for the academic perception.

Perception of Atmosphere: significant differences between males and females are also noted for the third (p=0.008) and fifth year (p=0.004) cohorts, where males (M=26.06 SD=4.76, M=23.42 SD=7.19) have a lower perception of the atmosphere than the female students (M=29.73 SD=6.62, M=27.43 SD=5.39) (Table 5.22).

Social Self-Perception: there are no significant differences between genders and year cohorts for the social self-perception.

Table 5.22: DREEM and Subscales mean scores by gender, 95% confidence interval of mean difference (95%CI), and p-value for independent t-tests for year cohorts 1 through 6 (group A)

Year Cohort (n M/F)	DREEM	Gender	Mean	95% CI	p-value
1 (39/40)	DREEM Total	male	118.15	-9.86 to 5.69	0.595
		female	120.24		
	Perception of Learning	male	28.18	-2.26 to 2.28	0.991
		female	28.17		
	Perception of Teachers	male	23.77	-4.21 to 0.18	0.071
		female	25.79		
	Student Academic Perception	male	20.74	-1.20 to 2.35	0.519
		female	20.17		
	Students Perception of Atmosphere	male	28.54	-3.31 to 1.77	0.547
		female	29.31		
	Student Social Self-Perception	male	17.13	-1.33 to 2.30	0.595
		female	16.64		
2 (53/49)	DREEM Total	male	110.94	-7.14 to 6.54	0.930
		female	111.24		
	Perception of Learning	male	25.98	-2.35 to 1.74	0.768
		female	26.29		
	Perception of Teachers	male	22.91	-3.81 to -0.46	**0.013**
		female	25.04		
	Student Academic Perception	male	18.19	-1.34 to 2.29	0.604
		female	17.71		
	Students Perception of Atmosphere	male	27.13	-1.46 to 3.12	0.476
		female	26.31		
	Student Social Self-Perception	male	16.57	-0.64 to 1.77	0.354
		female	16.00		
3 (33/49)	DREEM Total	male	112.97	-14.46 to 2.24	0.149
		female	119.08		
	Perception of Learning	male	25.74	-3.33 to 1.33	0.396
		female	26.73		
	Perception of Teachers	male	25.88	-3.84 to 0.87	0.213
		female	27.37		
	Student Academic Perception	male	19.12	-1.39 to 2.24	0.644
		female	18.69		
	Students Perception of Atmosphere	male	26.06	-6.34 to -1.01	**0.008**
		female	29.73		
	Student Social Self-Perception	male	15.94	-2.02 to 0.68	0.325
		female	16.61		

Year Cohort (n M/F)	DREEM	Gender	Mean	95% CI	p-value
4 (40/42)	DREEM Total	male	112.83	-3.02 to 14.38	0.197
		female	107.14		
	Perception of Learning	male	26.71	-1.02 to 3.77	0.257
		female	25.33		
	Perception of Teachers	male	23.76	-1.98 to 2.59	0.792
		female	23.45		
	Student Academic Perception	male	18.18	-1.78 to 2.13	0.859
		female	18.00		
	Students Perception of Atmosphere	male	27.85	-0.03 to 5.50	0.053
		female	25.12		
	Student Social Self-Perception	male	16.15	-0.61 to 2.43	0.237
		female	15.24		
5 (36/49)	DREEM Total	male	104.36	-16.03 to -0.15	**0.046**
		female	112.45		
	Perception of Learning	male	24.72	-3.46 to 1.27	0.359
		female	25.82		
	Perception of Teachers	male	22.03	-5.12 to -0.54	**0.016**
		female	24.86		
	Student Academic Perception	male	19.58	-1.30 to 1.94	0.697
		female	19.27		
	Students Perception of Atmosphere	male	23.42	-6.72 to -1.30	**0.004**
		female	27.43		
	Student Social Self-Perception	male	14.72	-1.75 to 1.07	0.633
		female	15.06		
6 (20/39)	DREEM Total	male	110.65	-14.26 to 13.91	0.981
		female	110.82		
	Perception of Learning	male	25.85	-3.96 to 3.81	0.970
		female	25.92		
	Perception of Teachers	male	22.85	-7.24 to -0.45	**0.027**
		female	26.69		
	Student Academic Perception	male	20.50	-0.34 to 5.09	0.085
		female	18.13		
	Students Perception of Atmosphere	male	26.25	-0.35 to 0.42	0.858
		female	25.26		
	Student Social Self-Perception	male	15.40	-3.19 to 5.18	0.636
		female	14.59		

There are also significant differences between the second and fourth year cohort males and females in group C as illustrated in Table 5.23.

Total DREEM: male students in the fourth year cohort have a higher total DREEM score (M=107.33, SD=15.61) than females (M=97.68, SD=18.25) (p=0.013) (Table 5.23).

Perception of Learning: male students in the fourth year cohort have a significantly higher score (M=25.52, SD=5.22) than females (M=22.13, SD=5.18) (p=0.005) (Table 5.23).

Perception of Teachers: second year female students (M=23.34, SD=6.16) have a significantly higher score than males (M=20.96, SD=5.97) (p=0.049) (Table 5.23).

Academic Self-Perception: males in the fourth year cohort have a significantly higher mean score (M=19.19, SD=3.67) than female students (M=17.16, SD=4.45) (p=0.028) (Table 5.23).

Perception of Atmosphere: males in the fourth year cohort have a higher mean score (M=25.26, SD=5.51) than female students in the same group (M=22.55, SD=5.38) (p=0.029) (Table 5.23).

Social Self-Perception: males in the fourth year cohort have a significantly higher mean score (M=15.05, SD=2.56) than female students (M=13.76, SD=3.08) (p=0.045) (Table 5.23).

Table 5.23: Independent t-test significant mean scores for DREEM and Subscales by gender, 95% confidence interval of mean difference (95%CI), and p-value for year cohorts 2 and 4 (group C)

Year Cohort (n M/F)	DREEM	Gender	Mean	95% CI	p-value
	DREEM Total	male	97.46	-12.44 to 3.36	0.257
		female	102.00		
	Perception of Learning	male	23.38	-1.54 to 2.76	0.577
		female	22.77		
	Perception of Teaching	male	20.96	-4.75 to -0.01	**0.049**
2		female	23.34		
(48/56)	Student Academic Perception	male	16.52	-2.55 to 1.20	0.477
		female	17.20		
	Student Perception of Atmosphere	male	22.35	-4.06 to 1.19	0.282
		female	23.79		
	Student Social Self-Perception	male	14.67	-1.58 to 0.95	0.622
		female	14.98		
	DREEM Total	male	107.33	2.11 to 17.19	**0.013**
		female	97.68		
	Perception of Learning	male	25.52	1.07 to 5.71	**0.005**
		female	22.13		
	Perception of Teachers	male	22.26	-1.79 to 2.42	0.767
4		female	21.95		
(42/38)	Student Academic Perception	male	19.19	0.22 to 3.84	**0.028**
		female	17.16		
	Student Perception of Atmosphere	male	25.26	0.28 to 5.14	**0.029**
		female	22.55		
	Student Social Self-Perception	male	15.05	0.03 to 2.54	**0.045**
		female	13.76		

To investigate the association of the educational environment as measured by DREEM within the year cohort genders from year cohort one to six with time, a paired t-test was conducted as seen in Table 5.24.

Total DREEM: there is a decrease in the total DREEM score for both males and females in second (p=0.000), fourth (p=0.037, p=0.002), and fifth year cohorts (p=0.018, p=0.010), over time as illustrated in Table 5.24.

Perception of Learning: second year males (p=0.001) and females (p=0.000) have a lower perception of their learning with time as illustrated in Table 5.24. While only

females in the fourth year cohort have a lower perception of their learning with time (p=0.001) (Table 5.24).

Perception of Teachers: there is a significant decrease for perception of teachers for male students in the second (p=0.005) and fourth year cohorts (p=0.032) as well as females in the fifth year cohort (p=0.000) with time as illustrated in Table 5.24.

Academic Self-Perception: there are significant differences with time between genders and different year cohorts, males in the second year cohort have a higher academic self-perception (p=0.021), while females in the third year cohort have a lower academic perception with time (p=0.035) (Table 5.24).

Perception of Atmosphere: there is a significant decrease in the perception of atmosphere for males in the second (p=0.000) and fourth year cohort (p=0.010) and females in third (p=0.037), fourth (p=0.014), and fifth year cohorts (p= 0.004) with time (Table 5.24).

Social Self-Perception: males in the second (p=0.006) and third year (p=0.000) cohorts have lower social perception, while both males (p=0.037) and females (p=0.038) in the fourth year cohort have a lower social self-perception with time as illustrated in Table 5.24.

Table 5.24: Paired t-test mean gender differences (A-C), 95% confidence interval of the difference of the means (95% CI) and p-value for DREEM and subscales for year cohorts 1 through 5

Year Cohort	Gender (n)	DREEM and Group	Mean Difference	95% CI	p-value
1	Male (26)	DREEM Total (A- C)	0.73	-8.42 to 9.88	0.871
		Perception of Learning (A –C)	1.62	-1.18 to 4.41	0.246
		Perception of Teachers (A – C)	0.35	-2.08 to 2.77	0.771
		Student Academic Perception (A –C)	0.58	-1.90 to 3.06	0.636
		Student Perception of Atmosphere (A – C)	-0.69	-3.94 to 2.55	0.664
		Student Social Self-Perception (A – C)	0.62	-1.16 to 2.39	0.482
	Female (22)	DREEM Total (A –C)	1.36	-5.07 to 7.79	0.664
		Perception of Learning (A –C)	-0.41	-3.03 to 2.22	0.749
		Perception of Teachers (A - C)	0.86	-0.68 to 2.41	0.258
		Student Academic Perception (A – C)	-0.14	-1.65 to 1.38	0.853
		Student Perception of Atmosphere (A – C)	-0.09	-2.45 to 2.27	0.937
		Student Social Self-Perception (A – C)	0.68	-1.48 to 2.84	0.519
2	Male (44)	DREEM Total (A –C)	14.96	9.70 to 20.21	**0.000**
		Perception of Learning (A –C)	3.23	1.36 to 5.09	**0.001**
		Perception of Teachers (A – C)	2.41	0.78 to 4.04	**0.005**
		Student Academic Perception (A – C)	-1.98	-3.64 to -0.32	**0.021**
		Student Perception of Atmosphere (A – C)	5.11	3.00 to 7.22	**0.000**
		Student Social Self-Perception (A – C)	1.77	0.53 to 3.02	**0.006**
	Female (41)	DREEM Total (A –C)	6.49	1.61 to 11.37	**0.010**
		Perception of Learning (A –C)	3.51	1.87 to 5.16	**0.000**
		Perception of Teachers (A – C)	0.61	-0.71 to 1.93	0.356
		Student Academic Perception (A – C)	-0.02	-1.74 to 1.69	0.977
		Student Perception of Atmosphere (A – C)	1.56	-0.35 to 3.48	0.107
		Student Social Self-Perception (A – C)	0.81	-0.37 to 1.98	0.172
3	Male (28)	DREEM Total (A –C)	0.11	-7.89 to 8.11	0.977
		Perception of Learning (A –C)	-1.36	-3.70 to 0.98	0.245
		Perception of Teachers (A – C)	2.11	-0.56 to 4.77	0.116
		Student Academic Perception (A – C)	0.50	-1.24 to 2.24	0.56
		Student Perception of Atmosphere (A – C)	-1.82	-4.07 to 0.44	0.110
		Student Social Self-Perception (A – C)	1.79	0.67 to 2.90	**0.003**
	Female (42)	DREEM Total (A –C)	2.14	-2.00 to 6.29	0.302
		Perception of Learning (A –C)	0.74	-0.80 to 2.27	0.338
		Perception of Teachers (A – C)	0.57	-0.95 to 2.09	0.453
		Student Academic Perception (A – C)	1.29	0.10 to 2.47	**0.035**
		Student Perception of Atmosphere (A – C)	1.48	0.14 to 2.82	**0.031**
		Student Social Self-Perception (A – C)	0.55	-0.59 to 1.69	0.338

Continued from Table 5.24

Year	Gender	DREEM and Group	Mean	95% CI	p-value
4	Male (38)	DREEM Total (A –C)	5.76	0.37 to 11.14	**0.037**
		Perception of Learning (A –C)	0.87	-0.82 to 2.56	0.305
		Perception of Teachers (A – C)	1.61	0.15 to 3.06	**0.032**
		Student Academic Perception (A – C)	0.97	-0.76 to 2.71	0.262
		Student Perception of Atmosphere (A – C)	2.79	0.72 to 4.86	**0.010**
		Student Social Self-Perception (A – C)	1.26	0.08 to 2.44	**0.037**
	Female (31)	DREEM Total (A –C)	11.45	4.41 to 18.49	**0.002**
		Perception of Learning (A –C)	3.68	1.74 to 5.62	**0.001**
		Perception of Teachers (A – C)	1.52	-0.47 to 3.51	0.130
		Student Academic Perception (A – C)	-1.32	-2.72 to 0.07	0.062
		Student Perception of Atmosphere (A – C)	3.58	0.78 to 6.38	**0.014**
		Student Social Self-Perception (A – C)	1.52	0.09 to 2.94	**0.038**
5	Male (28)	DREEM Total (A –C)	6.00	1.09 to 10.91	**0.018**
		Perception of Learning (A –C)	1.50	-0.53 to 3.53	0.140
		Perception of Teachers (A – C)	0.82	-1.28 to 2.93	0.430
		Student Academic Perception (A – C)	-1.75	-3.65 to 0.15	0.069
		Student Perception of Atmosphere (A – C)	1.32	-0.20 to 2.84	0.086
		Student Social Self-Perception (A – C)	0.57	-0.62 to 1.76	0.332
	Female (41)	DREEM Total (A –C)	7.90	2.03 to 13.77	**0.010**
		Perception of Learning (A –C)	0.61	-1.29 to 2.51	0.519
		Perception of Teachers (A – C)	3.51	1.92 to 5.11	**0.000**
		Student Academic Perception (A – C)	0.49	-1.01 to 1.98	0.514
		Student Perception of Atmosphere (A – C)	3.56	1.21 to 5.91	**0.004**
		Student Social Self-Perception (A C)	0.51	-0.71 to 1.73	0.401

To summarise the significant comparative data of the assessment tools by gender;

- ILS: the male students are more visual than females, while females score more towards the sequential style. In relation to the differences within year cohorts, females in the fourth year cohorts score more towards the active style, while females in the second and fifth year cohorts are more sensing with time. First year females and fifth year males become more visual with time.

- ALSI: females in the first year cohort adopt a more deep approach, while females in the fourth year cohort adopt a more monitoring approach. With

time, males in the fifth year cohort have a lower deep approach. While females in the second and fifth year cohorts adopt a more monitoring approach with time.

- RLS: females in the fifth year cohort have a higher total RLS with time, while males in the second year and females in the third year cohorts have a lower total RLS score with time.

- DREEM: overall, male students in the second year cohort have a lower perception for all aspects of the environment, except for academic self perception which improved with time. While female students in the same year, have a lower perception of their overall environment and learning. Male students in the fourth year cohort have a lower perception of their environment, teachers, atmosphere, and social self perception, while females have a lower perception of their environment, learning, atmosphere, and social self perception with time. Females in the fifth year cohort have a lower perception of their overall environment, teachers, and atmosphere with time, while males have a lower perception of their environment only.

5.5. Comparative Data of the Assessment Tools Related by Age:

Age is categorised into three categories (category 1; 17-20 years, 2; 21-24 years, 3; 25-28 years) such that the coefficients reflect the effect of one higher category. Multiple linear regression was used to assess age with ILS (active/reflective, sensitive/intuitive, visual/verbal, and sequential/global), ALSI (deep, surface, monitoring, and organised/effort approach), RLS, and DREEM and subscales (perception of learning, perception of teaching, academic self perception, perception of atmosphere, and social self perception). Table 5.25 demonstrates the results and are presented below.

5.5.1. Index of Learning Styles (ILS):

Active / Reflective: students in category 3 (25-28 year old) in the sixth year group A, score more towards the active learning style, whereas students in age category 2 (21-24 year old) in the first year cohort group B, tend to score a more reflective learning style (Table 5.25), but there were only two subjects in this age category (21-24 year old) and when the subjects were removed, there was no significance. Although there are significant differences for the active / reflective style, but the style does not change for the first or sixth year cohorts.

Visual / Verbal: younger students in age category 1 (17-20 year old) in the first year cohort group B have a more visual learning style (Table 5.25), while students in age category 2 (21-24 year old) are more verbal but there are only two subjects in this category therefore there is no change in the style.

Sequential / Global: students in age category 2 (21-24 year old) in the second (p=0.024) and third year (p=0.012) cohorts tend to score towards the global style, but the learning style does not change they remain balanced (Table 5.25).

5.5.2. Approach to Learning and Studying (ALSI):

Deep approach: for the first year cohort (group B) there was only one student in the age category 2 (21-24 year old), this student has a lower deep (p=0.008) and monitoring approach (p=0.010) score (Table 5.25).

Organised/effort approach: fifth year students in age category 3 (25-28 year old) in group A have a higher organised/effort score than younger students in category 2 (21-24 year old) (Table 5.25). On the other hand, students in age group 2 (21-24 year old) have a higher organised/effort score than students in age group 1 (17-20 year old) (Table 5.25), but there was only one student in this category. However, when removing the student in the first year (group B) (age category 2) and the fifth year cohort (group B) (age category 1) there are no significant differences for the deep and organised/effort approaches.

5.5.3. Reflection in Learning Scale (RLS):

Total RLS score: fifth year students (group C) aged 25-28 year old have a lower reflective score when compared to students aged 21-24 year old (p=0.035) (Table 5.25).

RLS difference: second year cohort (group A) aged 21-24 year old have a smaller RLS difference than students aged 17-20 year old or 25-28 year old, which indicates that their self efficacy is the same as their actual RLS scale (p=0.022) (Table 5.25).

5.5.4. Dundee Ready Environment Educational Method (DREEM):

Third year students in group A who are in age category 2 (21-24 year old) have a lower overall DREEM score (p=0.011). Second year cohort in group C age category 2 (21-24 year old) perceive their learning as better than younger students in age category 1 (17-21 year old). While students in the third year cohort groups A and C category 2 (21-24 year old) have a lower perception of their teachers than age

category 1 (p=0.006 and p=0.034) (Table 5.25). Students in age category 2 (21-24 year old) in first (group C) and third year cohorts (group A) have a lower perception of their atmosphere than younger students in age category 1 (p=0.040 and p=0.001) (Table 5.25). But there are only two students in the age category 2 for the first year cohort and when the subjects are removed there is no significant difference.

Table 5.25: The Association of ILS, ALSI, RLS, DREEM and subscales according to year cohort and group by age (Coefficient, SE, 95% confidence interval of coefficient, p-value, and R^2):

Assessment Tool	Variable	Year Cohort (Group)	Coefficient	SE	95% CI of coefficient	p-value	R^2
ILS	Active/reflective Age 2 vs. Age 1	1 (B)	8.21	2.81	2.65 to 13.76	**0.004**	0.069
	Visual/verbal Age 2 vs. Age 1	1 (B)	6.83	2.64	1.61 to 12.05	**0.011**	0.055
	Sequential/global Age 2 vs. Age 1	2 (B)	2.50	1.09	0.34 to 4.66	**0.024**	0.049
	Sequential/global Age 2 vs. Age 1	3 (A)	1.94	0.76	0.43 to 3.45	**0.012**	0.075
	Active/reflective Age 3 vs. Age 2	6 (A)	-4.54	1.61	-7.77 to -1.31	**0.007**	0.122
ALSI	Deep Age 2 vs. Age 1	1 (B)	-8.70	3.20	-15.04 to -2.36	**0.008**	0.060
	Monitoring Age 2 vs. Age 1	1 (B)	-7.15	2.71	-12.52 to -1.77	**0.010**	0.056
	Organised/effort Age 2 vs. Age 1	5 (A)	9.35	3.75	1.89 to 16.80	**0.015**	0.076
	Organised/effort Age 3 vs. Age 2	5 (A)	10.33	4.02	2.33 to 18.33	**0.012**	0.076
RLS	RLS difference Age 2	2 (A)	-0.60	0.26	-1.11 to -0.09	**0.022**	0.054
	Total RLS Age 3	5 (C)	-31.50	14.69	-60.70 to -2.28	**0.035**	0.135

Continued from Table 5.25

Assessment Tool	Variable	Year Cohort (Group)	Coefficient	SE	95% CI of Coefficient	p-value	R^2
DREEM	Total Perception of Atmosphere Age 2 vs. Age 1	1 (C)	-11.05	5.29	-21.58 to -0.52	**0.040**	0.050
	Total Perception of Learning Age 2 vs. Age 1	2 (C)	2.90	1.40	0.12 to 5.68	**0.041**	0.040
	Total Perception of Teachers Age 2 vs. Age 1	3 (A)	-3.28	1.16	-5.60 to -0.97	**0.006**	0.091
	Total Perception of Atmosphere Age 2 vs. Age 1	3 (A)	-4.64	1.32	-7.27 to -2.01	**0.001**	0.135
	DREEM Total Age 3 vs. Age 1	3 (A)	-10.74	4.14	-18.98 to -2.49	**0.011**	0.078
	Total Perception of Teachers Age 2 vs. Age 1	3 (C)	-2.39	1.11	-4.59 to -0.19	**0.034**	0.050

Age 1=17-20 years old, 2: 21-24 years old, 3: 25-28 years old

To summarise the significant comparative data of the assessment tools by age;

- ILS: although there are significant differences for the active / reflective style, for students in age group (22-26 year old) and student in age group (25-28 year old), but the style does not change for the year cohorts they remain balanced. Younger students in age category (17-20 year old) in the first year cohort have a more visual learning style. While students in age category 2 (21-24 year old) in the second and third year cohorts tend to score towards the global style, but students remain balanced for this style.

- ALSI: fifth year students in age category (25-28 year old) have a higher organised/effort score than the younger students (21-24 year old).

- <u>RLS:</u> fifth year students in age category (25-28 year old) have a lower reflective process when compared to students aged 21-24 year old.

- <u>DREEM:</u> third year students who are in age category (21-24 year old) have a lower overall DREEM score, perception of teachers and atmosphere than younger students (17-20 year old). While students in the second year cohort (aged 21-24 year old) perceive their learning as better than younger students (17-21 year old).

5.6. Comparative Data of Assessment Tools by Socioeconomic Status (SES):

The Standard Occupational Classification (SOC 2000) system was used to assess the occupation of parents/guardian in this study, since there is no system in use for the classification of socioeconomic status in Saudi Arabia. The SOC 2000 is used by Higher Education Statistics Agency (HESA) in the United Kingdom as mentioned earlier in the Methodology chapter (Chapter 3). The occupation for the parents/guardian was obtained from students who participated in this study, and then categorised in a similar manner as the UK study.

For statistical purposes, the father and mother occupation were classified into five categories: Category 1: Managers and senior officials, Professional occupations, Professional teaching occupations. Category 2: Associate professional and science and technology occupations, Protective services, Artistic and literary occupations, Media associates, and Transport professionals. Category 3: Secretarial and related occupations, and Skilled trade. Category 4: Elementary administration. Category 5: Unemployed, and housewife. The exact distribution of father / mother occupation is shown in Table 5.2.

To further assess the students' socioeconomic status, the type of housing, ownership status, and monthly income in Saudi Riyal was also obtained. To obtain an overall picture of the socioeconomic status, parents/guardian education was obtained during the second part of the study (October/November 2008). There was missing data for the education of the parents/guardian for sixth year students in group A (academic year 2007/08) as well as some students declining to answer (Table 5.2).

To analyse the data for the socioeconomic status of the students, a one-way analysis of variance (ANOVA) was conducted first to find the best way to enter the SES variables into the model for multiple linear regression. A model was set up for each dependable variable; ILS (active/reflective, sensitive/intuitive, visual/verbal,

and sequential/global), ALSI (deep, surface, monitoring, and organised/effort approach), RLS, and DREEM and subscales (perception of learning, perception of teaching, academic self perception, perception of atmosphere, and social self perception) against the independent variables used to assess socioeconomic status as represented by (father/mother occupation, residency, type of residency, monthly income, and father/mother education).

5.6.1. Comparative Data of ILS, ALSI, RLS, and DREEM by Socioeconomic Status (SES) for all year cohorts:

The analysis for the socioeconomic status was conducted on all students without separating the year cohorts, because we looked for an influence that was significant over the six year cohorts. Results are demonstrated in Table 5.26, the significant variables shown are linear unless otherwise stated.

5.6.1.1. Index of Learning Styles (ILS):

Mother education (masters or PhD) has an effect on students reflective style (p=0.012), but there is no actual change, students remain balanced for the active / reflective dimension (Table 5.26). Students are more visual when fathers' occupation is either manager, professional or associate professionals (p=0.008) (Table 5.26).

It is also noted that students with higher family monthly income score more to the sequential style (p=0.036) but still students remain balanced for this style (Table 5.26). These results are difficult to explain but as can be seen from the confidence interval of the coefficient students learning styles remain balanced and there is no actual change.

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5.6.1.2. Approach to Learning and Studying (ALSI):

The higher the mothers' education the lower the total ALSI score and this was demonstrated in group A (p=0.047) and B (p=0.029) (Table 5.26). The mothers' education (university and masters or PhD) (p=0.000) and fathers education (p=0.015) have a negative effect on the deep approach (Table 5.26). Students with fathers who are educated up to high school have higher surface scores (p=0.002), while students with fathers that have manager, professional, or associate professional occupations have lower surface scores (p=0.019) (Table 5.26). Mothers education (university or higher) also has an effect on the monitoring score (p=0.024) (Table 5.26). Students living in villas have higher organised /effort score (p=0.014), while higher mothers education is associated with lower scores (p=0.023) (Table 5.26).

5.6.1.3. Reflection in Learning Scale (RLS):

Only the type of housing (house or villa rather than an apartment or flat) had a positive effect on the total RLS score (p=0.007) (Table 5.26).

5.6.1.4. Dundee Ready Education Environment Method (DREEM):

On the first occasion the DREEM questionnaire was distributed (group A), it was noted that mothers' higher education (p=0.017) has a negative effect while at the same time, students with fathers who have manager, professional, or associate professional occupations have higher DREEM scores (p=0.037) (Table 5.26). It was demonstrated that students with mothers who are educated have a lower perception of learning score (p=0.001) (Table 5.26), and this was also seen in the first year analysis (p=0.035) (Table 5.27). While higher mother education (university or higher) has a negative effect on the perception of teachers score (p=0.003), and fathers occupation (manager, professional, or associate professional) has a positive

effect on the score (p=0.038) (Table 5.26). Students with mothers that have manager, professional or associate professional occupations have a lower score for the academic perception (p=0.013). The type of housing (villa or house) has a positive effect on the social perception (p=0.000), while students with mothers that have manager, professional, or associate professional occupations have lower social self-perception (p=0.008) (Table 5.26). On the second occasion that the DREEM questionnaire was distributed (group C), it was also noted that the overall DREEM score was effected negatively by a higher mothers education (university or higher) (p=0.049) (Table 5.26) as seen in group A. Students living in houses or villas (rather than flats or apartments) have a higher academic perception score (p=0.020) (Table 5.26). While students with mothers that have a university education have a higher perception of their atmosphere (p=0.024) (Table 5.26). It was also noted that the type of housing/residency (villa or house) has a positive effect on the social perception (p=0.041) as seen in group A.

Table 5.26: Independent Statistically Significant Associations of ILS, ALSI, RLS, and DREEM by SES for all year cohorts (groups A, B, and C), Coefficient, SE, 95% confidence interval of coefficient, p-value, and R^2

Assessment Tool	Variable	Group	Coefficient	SE	95% CI of Coefficient	p-value	R^2
ILS	Active/reflective Mother education (5)	(A)	2.43	0.97	0.54 to 4.33	**0.012**	0.016
	Sequential/Global Monthly Income	(A)	-0.68	0.32	-1.31 to -0.05	**0.036**	0.011
	Visual/Verbal Father Occupation (1, 2)	(B)	-1.15	0.43	-1.99 to -0.29	**0.008**	0.015
ALSI	Total ALSI Mother Education	(A)	-0.79	0.40	-1.57 to -0.01	**0.047**	0.010
	Surface Father education (1,2, 3)	(A)	1.14	0.37	0.41 to 1.88	**0.002**	0.021
	Organised/Effort Residency	(A)	0.92	0.37	0.19 to 1.65	**0.014**	0.026
	Mother Education		-0.42	0.18	-0.78 to -0.06	**0.023**	
	Total ALSI Mother Education	(B)	-0.98	0.45	-1.87 to -0.10	**0.029**	0.017
	Deep Mother Education (4, 5 vs. rest)	(B)	-2.55	0.66	-3.84 to -1.26	**0.000**	0.051
	Monitoring Mother Education (4, 5 vs. rest)	(B)	-1.27	0.56	-2.36 to -0.17	**0.024**	0.018
	Total ALSI Father education	(C)	-2.51	0.94	-4.39 to -0.64	**0.009**	0.083
	Deep Father education	(C)	-1.02	0.41	-1.83 to -0.21	**0.015**	0.073
	Surface Father Occupation (1, 2 vs. rest)	(C)	-2.03	0.84	-3.71 to -0.35	**0.019**	0.068
	Organised/Effort Father education	(C)	-0.84	0.40	-1.64 to -0.04	**0.039**	0.053
RLS	Total RLS Residency	(B)	4.19	1.55	1.14 to 7.23	**0.007**	0.026

Continued from Table 5.26

Assessment Tool	Variable	Year Group	Coefficient	SE	95% CI of Coefficient	p-value	R²
DREEM	Total DREEM Mother Education	(A)	-2.25	0.93	-4.08 to -0..41	**0.017**	
	Father Occupation (1, 2 vs. rest)		4.58	2.19	0.28 to 8.88	**0.037**	0.023
	Perception of Learning Mother Education	(A)	-0.85	0.26	-1.37 to -0.33	**0.001**	0.027
	Perception of Teachers Mother Education (4, 5 vs. rest)		-2.59	0.88	-4.32 to -0.86	**0.003**	
	Father Occupation (1, 2 vs. rest)		1.26	0.61	0.74 to 2.49	**0.038**	0.025
	Academic Self Perception Mother Occupation (1, 2 vs. rest)	(A)	-1.08	0.43	-1.93 to -0.23	**0.013**	0.016
	Social Self Perception Residency	(A)	1.31	0.36	0.60 to 2.01	**0.000**	
	Mothers Occupation (1, 2 vs. rest)		-0.95	0.36	-1.65 to -0.25	**0.008**	0.046
	Total DREEM Mother Education (4, 5 vs. rest)	(C)	-5.99	3.04	-11.96 to-0.01	**0.049**	0.009
	Academic Self Perception Residency	(C)	1.01	0.43	0.16 to 1.87	**0.020**	0.013
	Perception of Atmosphere Mother Education (4 vs. rest)	(C)	1.42	0.63	0.19 to 2.66	**0.024**	0.012
	Social Self Perception Residency	(C)	0.67	0.33	0.03 to 1.32	**0.041**	0.010

Residency=1: Apartment, 2: Villa
Type of Residency=1: own, 2: rent
Income=1: less than 2,000SR, 2: 2,000 -5,000SR, 3: 5,000-10,000SR, 4: more than 10,000SR
Father / Mother Occupation:
Cat=1: Managers and Senior officials, Professional occupations, Professional Teaching occupations, 2: Associate professional and Science and technology occupations, Protective services, Artistic and literacy occupations, Media associate, and Transport professionals, 3: : Secretarial and related occupations, Skilled trade, 4: Elementary occupations, 5: Unemployed, and Housewife
Father / Mother Education:
Cat=1: No education, 2: Less than high school, 3: High school, 4: University education , 5: Higher education

5.6.2. Comparative Data of ILS, ALSI, RLS, and DREEM by Socioeconomic Status (SES) for the first year cohort:

If there is an importance of socioeconomic status over the students learning styles, learning approaches, reflective process, and perception of the environment, one would expect it to be more evident in the first year cohort. Because these students have not been in the dental environment for very long, therefore their learning styles, approaches, reflection, and perception of environment are relatively unaffected by the university. Therefore a separate analysis was conducted for the first year cohort as presented in Table 5.27.

5.6.2.1. Index of Learning Style (ILS):

The first year cohort analysis demonstrated significance with monthly income (p=0.028), higher monthly income is associated with students scoring on the reflective style, but still students remain balanced (Table 5.27). It was also noted that a higher monthly income is associated with a more visual learning style (p=0.030) (Table 5.27). Also a higher monthly income together with fathers' manager occupation has an effect on the sequential / global style, students who have fathers that are managers have a more global score, while the higher the family income the more sequential the score, while fathers' manager occupation effect alone will lead to a more sequential score (Table 5.27).

5.6.2.2. Approach to Learning and Studying (ALSI):

The effect of mothers education was also demonstrated in the first year analysis on the deep approach (p=0.029), in addition fathers occupation (managers, professional, and associate professionals) also has a negative effect on the deep approach (Table 5.27). It was also noted that students with a higher monthly family income have lower surface scores (p=0.034) (Table 5.27). Students with fathers that

have manager, professional or associate professional occupations have a lower monitoring score (p=0.014) (Table 5.27).

5.6.2.3. Reflection in Learning Scale (RLS):

The type of housing (house or villa rather than an apartment or flat) has a positive effect on the total RLS score for the first year students (p=0.007) (Table 5.27). In addition, a higher monthly income (p=0.003) together with students who lived in owned homes (p=0.007) is associated with a higher RLS total score. A higher monthly family income alone also had a positive correlation with the RLS score (p=0.030) (Table 5.27).

5.6.2.4. Dundee Ready Education Environment Method (DREEM):

It was demonstrated that students with mothers who are educated have a lower perception of learning score (p=0.035) (Table 5.27), and this was also seen in the overall analysis (p=0.017) (Table 5.26). The type of housing (p=0.008) was also demonstrated to have a positive effect on their social aspect as well as monthly income (p=0.030) (Table 5.27).

Table 5.27: Year One Cohort Independent Statistically Significant Associations for ILS, ALSI, RLS, and DREEM by SES (groups A, B, and C), Coefficient, SE, 95% confidence interval of coefficient, p-value, and R^2

Assessment Tool	Variable	Group	Coefficient	SE	95% CI of coefficient	p-value	R^2
ILS	Active/Reflective Mother Education (5 vs. rest)	(A)	8.22	2.81	2.62 to 13.83	**0.005**	0.120
	Visual/Verbal Monthly Income	(A)	-1.87	0.85	-3.56 to -0.18	**0.030**	0.071
	Sequential/Global Father Occupation (1 vs. rest)	(A)	3.34	1.31	0.71 to 5.96	**0.013**	0.156
	Monthly Income		-1.78	0.73	-3.24 to -0.32	**0.018**	
	Active/Reflective Monthly Income	(B)	1.11	0.50	0.12 to 2.10	**0.028**	0.043
	Sequential/Global Father Occupation (1 vs. rest)	(B)	-1.92	0.85	-3.59 to -0.24	**0.025**	0.045
ALSI	Deep Father Occupation (1, 2 vs. rest)	(A)	-3.29	1.40	-6.09 to 0.48	**0.022**	0.081
	Surface Monthly Income	(A)	-1.50	0.69	-2.88 to -0.12	**0.034**	0.071
	Deep Mother Education (4, 5 vs. rest)	(B)	-2.47	1.12	-4.68 to -0.26	**0.029**	0.043
	Monitoring Father Occupation (1, 2 vs. rest)	(B)	-1.55	0.62	-2.78 to -0.32	**0.014**	0.054
RLS	Total RLS Monthly Income	(A)	6.80	2.16	2.47 to 11.12	**0.003**	0.181
	Type of Residency		7.79	2.79	2.21 to 13.36	**0.007**	
	Total RLS Residency	(B)	4.19	1.55	1.14 to 7.23	**0.007**	0.026
	Total RLS Monthly Income	(C)	4.31	1.95	0.42 to 8.20	**0.030**	0.058
DREEM	Perception of Learning Mother Education	(A)	-1.46	0.68	-2.81 to -0.11	**0.035**	0.070
	Social Self Perception Residency	(A)	2.75	1.01	0.73 to 4.76	**0.008**	0.107
	Social Self Perception Monthly Income	(C)	1.02	0.46	0.10 to 1.94	**0.030**	0.058

To summarise the significant comparative data of the assessment tools by socioeconomic status**;**

- <u>ILS:</u> mother education (masters or PhD) has an effect on students' reflective style but students remain balanced. Students are more visual when their fathers' occupation is either manager, professional or associate professionals. A higher family monthly income leads to a sequential learning style. The results are difficult to explain but students' learning styles remain balanced and there is no actual change in learning styles with time.

- <u>ALSI:</u> mothers' education (university and masters or PhD) and fathers' education have a negative effect on the deep approach. Fathers' education (up to high school) has a positive effect on the surface approach, while fathers' occupation (manager, professional, or associate professional) has a negative effect. Mothers education (university or higher) has an effect on the monitoring score, while type of housing (villas) and mothers' education has an effect on the organised /effort approach.

- <u>RLS:</u> the type of housing (house or villa) has a positive effect on the reflective process.

- <u>DREEM:</u> the overall DREEM score is effected by mothers' education (university or higher). It was also noted that the type of housing (villa) has a positive effect on the social perception.

5.7. Comparative Data of Assessment Tools by Academic Achievement:

The students' academic achievements were obtained from their record twice during the study; Academic Achievement 1 for academic year 2007/08 which was used to compare with data for group A. Academic Achievement 2 for academic year 2008/09 which was used to compare with data for groups B and C.

5.7.1. Comparative Data of the Index of Learning Style (ILS) by Academic Achievement:

The association of students' academic achievement 1 (academic year 2007/08) with the active/reflective, sensing/intuitive, visual/verbal and sequential/global as measured by the ILS for group A, was explored using one-way analysis of variance. There is a significant difference (p=0.012) for the fourth year cohort for students with very good and good academic grades and students who have a failing score for the sensing / intuitive learning style (Table 5.28). Students who scored very good (M=-5.47, SD=4.06) and good grades (M=-5.60, SD=3.61) have a sensing learning style, while students with failing grade (M=-2.24, SD=4.99) are more balanced in the sensing / intuitive learning style (Table 5.28). There were significant differences for the sequential / global style for fourth (p=0.045) and fifth year (p=0.043) cohorts (group A) as well. There were not enough subjects in the group for multiple comparisons for the fourth year cohort, while students in the fifth year cohort with very good grades (M=-1.59, SD=3.61) score more towards the sequential style than students with good grades (M=0.76, SD=3.03) but both groups remain balanced for this style (Table 5.28).

Table 5.28: ILS mean scores by Academic Achievement 1 (academic year 2007/08), 95% confidence interval of difference of means (95% CI) and p-value for year cohorts 1 through 6 (group A)

Year Cohort (Group)	ILS	Academic Achievement 1 (2007/08)	Number	Mean	95% CI	p-value
1 (A)	Active / Reflective	Excellent	32	-0.69	-2.11 to 0.73	
		Very Good	30	-0.47	-1.98 to 1.05	
		Good	16	1.00	-1.10 to 3.10	
		Satisfactory	0	0	0	0.440
		Pass	1	-1.00	0	
		Fail	1	5.00	0	
		Total	80	-0.20	-1.09 to 0.69	
	Sensing/ Intuitive	Excellent	32	-2.06	-3.75 to -0.37	
		Very Good	30	-3.07	-4.45 to -1.69	
		Good	16	-0.13	-2.65 to 2.40	
		Satisfactory	0	0	0	0.126
		Pass	1	-7.00	0	
		Fail	1	3.00	0	
		Total	80	-2.05	-3.04 to -1.06	
	Visual / Verbal	Excellent	32	-5.94	-7.08 to -4.79	
		Very Good	30	-5.73	-7.39 to -4.08	
		Good	16	-4.63	-7.18 to 2.07	
		Satisfactory	0	0	0	0.873
		Pass	1	-5.00	0	
		Fail	1	-5.00	0	
		Total	80	-5.58	-6.46 to -4.69	
	Sequential / Global	Excellent	32	-0.31	-1.47 to 0.84	
		Very Good	30	0.00	-1.28 to 1.28	
		Good	16	-0.13	-2.15 to 1.90	
		Satisfactory	0	0	0	0.405
		Pass	1	-5.00	0	
		Fail	1	-5.00	0	
		Excellent	32	-0.31	-1.47 to 0.84	
2 (A)	Active /Reflective	Excellent	13	0.23	-2.16 to 2.62	
		Very Good	32	-0.06	-1.24 to 1.11	
		Good	39	-1.05	-2.02 to -0.08	
		Satisfactory	0	0	0	0.516
		Pass	17	-0.53	-2.33 to 1.27	
		Fail	0	0	0	
		Total	101	-0.49	-1.13 to 0.16	
	Sensing / Intuitive	Excellent	13	-2.38	-5.01 to 0.24	
		Very Good	32	-2.88	-4.75 to -1.00	
		Good	39	-2.74	-3.90 to -1.59	
		Satisfactory	0	0	0	0.977
		Pass	17	-2.41	-4.43 to -0.40	
		Fail	0	0	0	
		Total	101	-2.68	-3.52 to -1.85	

Continued from Table 5.28

Year Cohort (Group)	ILS	Academic Achievement 1 (2007/08)	Number	Mean	95% CI	p-value
2 (A)	Visual / Verbal	Excellent	13	-3.15	-6.73 to 0.42	
		Very Good	32	-4.50	-6.37 to -2.63	
		Good	39	-4.95	-6.15 to -3.75	
		Satisfactory	0	0	0	0.682
		Pass	17	-4.53	-6.57 to -2.49	
		Fail	0	0	0	
		Total	101	-4.50	-5.40 to -3.61	
	Sequential / Global	Excellent	13	-0.69	-2.78 to 1.39	
		Very Good	32	-0.63	-1.96 to 0.71	
		Good	39	-1.41	-2.63 to -0.19	
		Satisfactory	0	0	0	0.666
		Pass	17	-0.18	-2.17 to 1.82	
		Fail	0	0	0	
		Total	101	-0.86	-1.59 to -0.13	
3 (A)	Active / Reflective	Excellent	12	-3.33	-5.35 to -1.32	
		Very Good	32	-1.00	-2.24 to 0.24	
		Good	19	-1.63	-3.79 to 0.53	
		Satisfactory	0	0	0	0.269
		Pass	1	-7.00	0	
		Fail	16	-2.25	-4.58 to 0.08	
		Total	80	-1.83	-2.69 to -0.96	
	Sensing / Intuitive	Excellent	12	-2.33	-5.32 to 0.65	
		Very Good	32	-2.81	-4.62 to -1.01	
		Good	19	-3.11	-4.82 to -1.39	
		Satisfactory	0	0	0	0.960
		Pass	1	-1.00	0	
		Fail	16	-3.38	-5.41 to -1.34	
		Total	80	-2.90	-3.86 o -1.94	
	Visual / Verbal	Excellent	12	-5.83	-8.51 to -3.15	
		Very Good	32	-5.56	-6.90 to -4.23	
		Good	19	-6.58	-8.14 to -5.02	
		Satisfactory	0	0	0	0.917
		Pass	1	-7.00	0	
		Fail	16	-6.00	-8.27 to -3.73	
		Total	80	-5.95	-6.78 to -5.12	
	Sequential / Global	Excellent	12	-1.67	-3.86 to 0.52	
		Very Good	32	0.13	-1.16 to 1.41	
		Good	19	-0.58	-2.04 to 0.88	
		Satisfactory	0	0	0	0.210
		Pass	1	5.00	0	
		Fail	16	0.75	-1.30 to 2.80	
		Total	80	-0.13	-0.91 to 0.66	

Continued from Table 5.28

Year Cohort (Group)	ILS	Academic Achievement 1 (2007/08)	Number	Mean	95% CI	p-value
	Active / Reflective	Excellent	0	0	0	
		Very Good	30	0.13	-1.25 to 1.52	
		Good	30	-0.27	-1.79 to 1.26	
		Satisfactory	1	3.00	0	0.842
		Pass	0	0	0	
		Fail	21	-0.33	-2.27 to 1.61	
		Total	82	-0.10	-0.96 to 0.77	
	Sensing/ Intuitive	Excellent	0	0	0	
		Very Good	30	-5.47	-6.98 to -3.95	
		Good	30	-5.60	-6.95 to -4.25	
		Satisfactory	1	1.00	0	**0.012**
		Pass	0	0	0	
		Fail	21	-2.24	-4.51 to 0.04	
4		Total	82	-4.61	-5.57 to -3.65	
(A)	Visual / Verbal	Excellent	0	0	0	
		Very Good	30	-4.20	-6.21 to -2.19	
		Good	30	-4.00	-5.54 to -2.46	
		Satisfactory	1	-9.00	0	0.683
		Pass	0	0	0	
		Fail	21	-4.81	-6.41 to -3.21	
		Total	82	-4.34	-5.32 to -3.36	
	Sequential / Global	Excellent	0	0	0	
		Very Good	30	0.13	-1.19 to 1.46	
		Good	30	-2.07	-3.39 to -0.74	
		Satisfactory	1	5.00	0	**0.045**
		Pass	0	0	0	
		Fail	21	-0.24	-2.07 to 1.59	
		Total	82	-0.71	-1.54 to 0.13	
	Active/ Reflective	Excellent	2	0.00	-12.71 to 12.71	
		Very Good	41	-1.44	-2.22 to -0.66	
		Good	33	-1.85	-3.14 to -0.56	
		Satisfactory	4	1.50	-3.27 to 6.27	0.346
		Pass	0	0	0	
		Fail	5	-1.00	-7.08 to 5.08	
		Total	85	-1.40	-2.08 to -0.72	
	Sensing/ Intuitive	Excellent	2	-4.00	-16.71 to 8.71	
		Very Good	41	-4.41	-5.57 to -3.26	
		Good	33	-2.58	-3.97 to -1.18	
5		Satisfactory	4	-4.50	-11.56 to 2.56	0.228
(A)		Pass	0	0	0	
		Fail	5	-5.40	-7.48 to -3.32	
		Total	85	-3.75	-4.56 to -2.94	
	Visual / Verbal	Excellent	2	-7.00	-57.82 to 43.82	
		Very Good	41	-4.27	-5.63 to -2.91	
		Good	33	-5.67	-7.18 to -4.16	
		Satisfactory	4	-3.50	-8.94 to 1.94	0.551
		Pass	0	0	0	
		Fail	5	-5.40	-7.48 to -3.32	
		Total	85	-4.91	-5.80 to -4.01	

Continued from Table 5.28

Year Cohort (Group)	ILS	Academic Achievement 1 (2007/08)	Number	Mean	95% CI	p-value
5 (A)	Sequential / Global	Excellent	2	-4.00	-67.53 to59.53	
		Very Good	41	-1.59	-2.73 to -0.45	
		Good	33	0.76	-0.32 to 1.83	
		Satisfactory	4	-0.50	-10.00 to 9.00	**0.043**
		Pass	0	0	0	
		Fail	5	1.00	-4.55 to 6.55	
		Total	85	-0.53	-1.34 to 0.28	
6 (A)	Active / Reflective	Excellent	1	-1.00	0	
		Very Good	28	-1.86	-3.36 to -0.36	
		Good	25	-1.00	-2.37 to 0.37	
		Satisfactory	4	-3.00	-9.87 to 3.87	0.472
		Pass	0	0	0	
		Fail	1	-7.00	0	
		Total	59	-1.64	-2.59 to -0.69	
	Sensing/ Intuitive	Excellent	1	-1.00	0	
		Very Good	28	-4.50	-5.79 to -3.21	
		Good	25	-3.24	-5.14 to -1.34	
		Satisfactory	4	-5.00	-9.50 to -0.50	0.687
		Pass	0	0	0	
		Fail	1	-3.00	0	
		Total	59	-3.92	-4.92 to -2.91	
	Visual / Verbal	Excellent	1	-5.00	.0	
		Very Good	28	-6.29	-7.46 to -5.11	
		Good	25	-5.48	-7.36 to -3.60	
		Satisfactory	4	-8.50	-13.27to -3.73	0.650
		Pass	0	0	0	
		Fail	1	-7.00	0	
		Total	59	-6.08	-7.06 to -5.11	
	Sequential / Global	Excellent	1	-3.00	0	
		Very Good	28	-0.79	-2.45 to 0.88	
		Good	25	0.12	-1.50 to 1.74	
		Satisfactory	4	0.00	-6.09 to 6.09	0.828
		Pass	0	0	0	
		Fail	1	-3.00	0	
		Total	59	-0.42	-1.47 to 0.62	

To explore the association of academic achievement 2 for academic year (2008/09) with the ILS mean scores (active/reflective, sensing/intuitive, visual/verbal, and sequential/global) for students in group B, ANOVA was also used. Table 5.29 demonstrates the significant findings for third and fifth year cohorts. The mean scores of ILS by academic achievement 2 (academic year 2008/09) for the remaining year cohorts in group B is illustrated in Appendix D.

There are significant differences (p=0.018) for the sensing / intuitive learning style and academic achievement 2 for the third year cohort (group B) for, but there are not enough subjects in the groups for post-hoc comparisons (Table 5.29). For the fifth year cohort, multiple comparison tests indicated that the mean scores for the sequential / global style for students with very good grades (M=-1.44, SD=3.19) are significantly different (p=0.031) from students with good grades (M=0.71, SD=4.35) (Table 5.29). Although students are balanced for this style, but those with good grades tend to be global while students with very good grades tend to score more towards the sequential learning style.

Table 5.29: ILS mean scores by Academic Achievement 2 (academic year 2008/09), 95% confidence interval of difference of means (95% CI) and p-value for year cohorts 3 and 5 (group B)

Year Cohort (Group)	ILS	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	p-value
3 (B)	Sensing / Intuitive	Excellent	2	-2.00	-90.94 to 86.94	
		Very Good	31	-5.39	-6.64 to -4.14	
		Good	37	-2.24	-3.47 to -1.01	
		Satisfactory	1	-3.00	0	0.018
		Pass	0	0	0	
		Fail	12	-4.67	-7.37 to -1.97	
		Total	83	-3.77	-4.65 to -2.90	
5 (B)	Sequential / Global	Excellent	2	-2.00	-40.12 to 36.12	
		Very Good	45	-1.44	-2.40 to -0.49	
		Good	41	0.71	-0.67 to 2.08	
		Satisfactory	0	0	0	0.031
		Pass	0	0	0	
		Fail	0	0	0	
		Total	88	-0.45	-1.28 to 0.37	

ANOVA was also used to explore the association of academic achievement 2 for academic year 2008/09 with the mean scores of active / reflective, sensing/intuitive, visual/verbal, and sequential/global learning styles for the fifth year cohort in group C. There are no significant differences between the academic grades and learning styles, the mean scores for the learning styles by academic achievement 2 (academic year 2008/09) for students in year cohort five group C is illustrated in Appendix D.

5.7.2. Comparative Data of the Approach to Learning and Studying (ALSI) by Academic Achievement:

A one–way between groups analysis of variance was conducted to explore the impact of students' academic achievement on the deep, surface, monitoring and organised / effort approach as measured by ALSI for the year cohorts in each group A, B, and C.

For group A, the academic achievement 1 for academic year 2007/08 was used to compare with the students' mean scores for ALSI as illustrated in Table 5.30.

There are significant differences for the surface approach in the fifth year cohort (p=0.040), but the numbers of subjects in the groups were not enough for post-hoc comparisons. A difference (p=0.039) was noted for the monitoring approach for students in the fifth year cohort as well, mean scores for students with excellent grades (M=10.00, SD=1.41) were significantly lower from students with very good (M=15.98, SD=2.68) and good grades (M=15.76, SD=2.54), indicating that students with very good and good academic achievements adopt a more monitoring approach to learning and studying (Table 5.30).

Significant difference for the organised / effort approach in the second year cohort was noted between students with excellent and passing grades [F (3, 95) =4.07, p=0.005] (Table 5.30). Post-hoc comparisons indicate that students with passing grade (M=12.94, SD=4.20) have a significantly lower mean score than students with excellent grades (M=17.23, SD=1.96), indicating that students with excellent grades adopt a more organised / effort approach to learning and studying. There are statistically significant differences in the fourth year cohort as well, students with very good academic grades have a higher organised / effort mean score (M=15.70, SD=2.73) than students with failing grades (M=12.62, SD=4.05) (p=0.013) (Table 5.30).

Table 5.30: ALSI mean scores by Academic Achievement 1 (academic year 2007/08), 95% confidence interval of mean difference (95% CI) and p-value for year cohorts 1 through 6 (group A)

Year Cohort (Group)	ALSI	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
	Total ALSI	Excellent	32	67.56	65.09 to 70.04	
		Very Good	29	68.93	66.48 to 71.38	
		Good	16	66.31	62.82 to 69.80	
		Satisfactory	0	0	0	0.374
		Pass	1	57.00	0	
		Fail	1	67.00	0	
		Total	79	67.67	66.18 to 69.16	
	Deep	Excellent	32	24.47	23.33 to 25.61	
		Very Good	29	24.59	23.21 to 25.96	
		Good	16	23.00	21.56 to 24.44	
		Satisfactory	0	0	0	0.359
		Pass	1	20.00	0	
		Fail	1	24.00	0	
		Total	79	24.15	23.42 to 24.88	
1 (A)	Surface	Excellent	32	12.38	11.17 to 13.58	
		Very Good	29	12.62	11.51 to 13.73	
		Good	16	13.31	11.54 to 15.08	
		Satisfactory	0	0	0	0.911
		Pass	1	12.00	0	
		Fail	1	13.00	0	
		Total	79	12.66	11.96 to 13.36	
	Monitoring	Excellent	32	15.63	14.63 to 16.62	
		Very Good	29	16.07	15.18 to 16.95	
		Good	16	16.94	15.41 to 18.46	
		Satisfactory	0	0	0	0.431
		Pass	1	14.00	0	
		Fail	1	14.00	0	
		Total	79	16.01	15.42 to 16.60	
	Organised/ Effort	Excellent	32	15.09	13.84 to 16.35	
		Very Good	29	15.66	14.64 to 16.67	
		Good	16	13.06	11.01 to 15.12	
		Satisfactory	0	0	0	0.098
		Pass	1	11.00	0	
		Fail	1	16.00	0	
		Total	79	14.85	14.09 to 15.60	

Continued from Table 5.30

Year (Group)	ALSI	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
	Total ALSI	Excellent	13	67.62	63.88 to 71.35	
		Very Good	31	66.16	63.56 to 68.76	
		Good	38	65.68	63.11 to 68.26	
		Satisfactory	0	0	0	0.692
		Pass	17	64.53	61.47 to 67.59	
		Fail	0	0	0	
		Total	99	65.89	64.48 to 67.30	
	Deep	Excellent	13	23.23	21.15 to 25.31	
		Very Good	31	23.48	22.26 to 24.70	
		Good	38	23.21	22.03 to 24.39	
		Satisfactory	0	0	0	0.951
		Pass	17	23.76	21.93 to 25.60	
		Fail	0	0	0	
		Total	99	23.39	22.71 to 24.08	
2 (A)	Surface	Excellent	13	11.92	9.32 to 14.53	
		Very Good	31	13.00	12.01 to 13.99	
		Good	38	13.13	12.23 to 14.03	
		Satisfactory	0	0	0	0.670
		Pass	17	13.00	11.23 to 14.77	
		Fail	0	0	0	
		Total	99	12.91	12.30 to 13.52	
	Monitoring	Excellent	13	15.62	13.79 to 17.44	
		Very Good	31	15.26	14.41 to 16.10	
		Good	38	14.97	14.19 to 15.76	
		Satisfactory	0	0	0	0.796
		Pass	17	14.82	13.62 to 16.00	
		Fail	0	0	0	
		Total	99	15.12	14.64 to 15.60	
	Organised/ Effort	Excellent	13	17.23	16.04 to 18.42	
		Very Good	31	14.42	13.23 to 15.61	
		Good	38	14.37	13.24 to 15.50	
		Satisfactory	0	0	0	**0.009**
		Pass	17	12.94	10.78 to 15.10	
		Fail	0	0	0	
		Total	99	14.52	13.81 to 15.22	

Continued from Table 5.30

Year Cohort (Group)	ALSI	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
		Excellent	12	66.50	62.12 to 70.88	
		Very Good	32	66.84	64.46 to 69.22	
		Good	19	63.37	58.28 to 68.46	
	Total ALSI	Satisfactory	0	0	0	0.365
		Pass	1	71.00	0	
		Fail	16	63.25	59.77 to 66.73	
		Total	80	65.30	63.57 to 67.03	
		Excellent	12	23.42	21.18 to 25.66	
		Very Good	32	23.94	22.92 to 24.96	
		Good	19	22.53	20.23 to 24.82	
	Deep	Satisfactory	0	0	0	0.542
		Pass	1	24.00	0	
		Fail	16	22.25	20.26 to 24.24	
		Total	80	23.19	22.38 to 24.00	
		Excellent	12	12.42	10.78 to 14.05	
		Very Good	32	12.53	11.23 to 13.83	
		Good	19	13.58	11.99 to 15.17	
3 (A)	Surface	Satisfactory	0	0	0	0.709
		Pass	1	15.00	0	
		Fail	16	13.44	11.58 to 15.29	
		Total	80	12.98	12.23 to13.72	
		Excellent	12	15.42	13.67 to 17.16	
		Very Good	32	15.47	14.68 to 16.26	
		Good	19	14.00	12.43 to 15.57	
	Monitoring	Satisfactory	0	0	0	0.367
		Pass	1	16.00	0	
		Fail	16	14.50	12.88 to 16.12	
		Total	80	14.93	14.32 to 15.53	
		Excellent	12	15.25	13.45 to 17.05	
		Very Good	32	15.06	13.95 to 16.18	
		Good	19	13.26	11.23 to 15.30	
	Organised/ Effort	Satisfactory	0	0	0	0.108
		Pass	0	0	0	
		Fail	16	13.06	11.22 to 14.90	
		Total	79	14.25	13.47 to 15.04	

Continued from Table 5.30

Year Cohort (Group)	ALSI	Academic Achievement (2007/08)	Number	Mean	95% CI		p-value
	Total ALSI	Excellent	0	0	0		
		Very Good	30	68.93	66.70	to 71.17	
		Good	30	69.80	66.27	to 73.33	
		Satisfactory	1	69.00	0		0.088
		Pass	0	0	0		
		Fail	21	64.24	60.68	to 67.80	
		Total	82	68.05	66.28	to 69.82	
	Deep	Excellent	0	0	0		
		Very Good	30	23.90	22.75	to 25.05	
		Good	30	24.57	23.17	to 25.96	
		Satisfactory	1	27.00	0		0.256
		Pass	0	0	0		
		Fail	21	22.76	21.10	to 24.43	
		Total	82	23.89	23.12	to 24.66	
4 (A)	Surface	Excellent	0	0	0		
		Very Good	30	13.57	12.21	to 14.92	
		Good	30	14.47	13.40	to 15.53	
		Satisfactory	1	10.00	0		0.395
		Pass	0	0	0		
		Fail	21	14.10	13.00	to 15.19	
		Total	82	13.99	13.31	to 14.66	
	Monitoring	Excellent	0	0	0		
		Very Good	30	15.77	14.86	to 16.67	
		Good	30	15.67	14.59	to 16.75	
		Satisfactory	1	17.00	0		0.498
		Pass	0	0	0		
		Fail	21	14.76	13.60	to 15.92	
		Total	82	15.49	14.91	to 16.06	
	Organised/ Effort	Excellent	0	0	0		
		Very Good	30	15.70	14.68	to 16.72	
		Good	29	15.10	13.86	to 16.35	
		Satisfactory	1	15.00	0		**0.013**
		Pass	0	0	0		
		Fail	21	12.62	10.77	to 14.47	
		Total	81	14.68	13.91	to 15.45	

Continued from Table 5.30

Year Cohort (Group)	ALSI	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
		Excellent	2	55.00	-84.77 to194.77	
		Very Good	41	67.00	64.46 to 69.54	
		Good	33	65.97	63.33 to 68.61	
	Total ALS	Satisfactory	4	67.50	55.00 to 80.00	0.288
		Pass	0	0	0	
		Fail	5	69.20	58.33 to 80.07	
		Total	85	66.47	64.74 to 68.20	
		Excellent	2	20.00	-94.36 to 134.36	
		Very Good	41	23.95	22.79 to 25.12	
		Good	33	23.15	21.95 to 24.36	
	Deep	Satisfactory	4	23.00	20.75 to 25.25	0.587
		Pass	0	0	0	
		Fail	4	22.50	14.87 to 30.13	
		Total	84	23.43	22.61 to 24.25	
		Excellent	2	11.00	-52.53 to 74.53	
		Very Good	41	12.20	11.20 to 13.19	
		Good	33	13.52	12.54 to 14.49	
5 (A)	Surface	Satisfactory	4	16.25	13.53 to 18.97	**0.040**
		Pass	0	0	0	
		Fail	4	14.50	11.74 to 17.26	
		Total	84	12.99	12.31 to 13.66	
		Excellent	2	10.00	-2.71 to 22.71	
		Very Good	41	15.98	15.13 to 16.82	
		Good	33	15.76	14.86 to 16.66	
	Monitoring	Satisfactory	4	14.00	6.10 to 21.90	**0.039**
		Pass	0	0	0	
		Fail	4	16.00	11.32 to 20.68	
		Total	84	15.65	15.04 to 16.27	
		Excellent	2	14.00	-62.24 to 90.24	
		Very Good	41	14.88	13.74 to 16.02	
		Good	33	13.58	12.21 to 14.94	
	Organised/ Effort	Satisfactory	4	14.25	6.52 to 21.98	0.720
		Pass	0	0	0	
		Fail	4	14.00	7.50 to 20.50	
		Total	84	14.27	13.44 to 15.11	

Continued from Table 5.30

Year Cohort (Group)	ALSI	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
	Total ALS	Excellent	1	60.00	0	
		Very Good	28	67.18	64.66 to 69.70	
		Good	25	64.72	59.85 to 69.59	
		Satisfactory	4	67.50	55.42 to 79.58	0.784
		Pass	0	0	0	
		Fail	1	61.00	0	
		Total	59	65.93	63.56 to 68.31	
	Deep	Excellent	1	23.00	0	
		Very Good	28	22.82	21.52 to 24.13	
		Good	25	22.72	21.06 to 24.38	
		Satisfactory	4	23.75	16.47 to 31.03	0.989
		Pass	0	0	0	
		Fail	1	22.00	0	
		Total	59	22.83	21.89 to 23.77	
6 (A)	Surface	Excellent	1	7.00	0	
		Very Good	28	12.86	11.56 to 14.16	
		Good	25	13.00	11.50 to 14.50	
		Satisfactory	4	13.25	7.24 to 19.26	0.481
		Pass	0	0	0	
		Fail	1	10.00	0	
		Total	59	12.80	11.89 to 13.71	
	Monitoring	Excellent	1	16.00	0	
		Very Good	28	15.68	14.80 to 16.56	
		Good	25	14.76	13.14 to 16.38	
		Satisfactory	4	16.50	13.74 to 19.26	0.568
		Pass	0	0	0	
		Fail	1	12.00	0	
		Total	59	15.29	14.49 to 16.09	
	Organised/ Effort	Excellent	1	14.00	0	
		Very Good	28	15.82	14.42 to 17.22	
		Good	25	13.56	11.82 to 15.30	
		Satisfactory	4	15.00	8.91 to 21.09	0.319
		Pass	0	0	0	
		Fail	1	17.00	0	
		Total	59	14.80	13.77 to 15.82	

ANOVA was used to assess the relationship of academic achievement 2 for academic year 2008/09 with the deep, surface, monitoring, and organised / effort approach to learning and studying as measured by ALSI for students in group B, results for the significant year cohorts is shown in Table 5.31.

Significant differences for the deep approach in the third year cohort was noted and shown in Table 5.31. Students with excellent academic grades have a higher mean deep score (M=26.00, SD=1.41) than students with very good (M=23.97, SD=3.16) and students with good grades (M=23.78, SD=2.31) (p=0.014). Indicating that students with excellent academic grades adopted a deep approach to learning and studying.

A significant difference for the surface approach was also noted in the first year cohort, students with excellent grades have a lower mean surface score (M=-12.68, SD=2.58) than students with good academic grades (M=14.78, SD=3.14) (p=0.044) (Table 5.31). The mean ALSI scores for all year cohorts by academic achievement 2 (academic year 2008/09) is demonstrated in Appendix D.

Table 5.31: ALSI mean scores by Academic Achievement 2 (Academic year 2008/09), 95% confidence interval of difference of means (95% CI) and p-value for year cohort 1and 3 (group B)

Year Cohort (Group)	ALSI	Academic Achievement (2008/09)	Number	Mean	95% CI	P-value
1 (B)	Surface	Excellent	28	12.68	11.68 to 13.68	0.044
		Very Good	51	12.90	11.95 to 13.86	
		Good	27	14.78	13.53 to 16.02	
		Satisfactory	5	14.40	10.51 to 18.29	
		Pass	0	0	0	
		Fail	5	15.20	11.33 to 19.07	
		Total	116	13.45	12.86 to 14.04	
3 (B)	Deep	Excellent	2	26.00	13.29 to 38.71	0.014
		Very Good	31	23.97	22.81 to 25.13	
		Good	36	23.78	23.00 to 24.56	
		Satisfactory	1	20.00	0	
		Pass	0	0	0	
		Fail	12	21.00	18.77 to 23.23	
		Total	82	23.45	22.79 to 24.11	

A one–way between groups analysis of variance was conducted to explore the impact of students' academic achievement 2 for academic year 2008/2009 on the approaches to learning and studying as measured by ALSI for the fifth year cohort group C. There are no significant differences between the academic achievement 2 and the ALSI mean scores, the mean scores for ALSI for the fifth year cohort group C by academic achievement 2 as illustrated in Appendix D.

5.7.3. Comparative Data of the Reflection in Learning Scale (RLS) by Academic Achievement:

A one–way between groups analysis of variance was conducted to explore the impact of students' academic achievement 1 for academic year 2007/08 on the reflective process as measured by RLS for all year cohorts in group A.

For group A, there is a significant difference for the total RLS mean score in the first year cohort (p=0.014) (Table 5.32), but post-hoc comparisons were not conducted because there are not enough subjects in the academic achievement groups to conduct the comparisons.

Table 5.32: Total RLS mean scores and RLS Difference (Total RLS – RLS Item 15) by Academic Achievement 1 (academic year 2007/08), mean, 95% confidence interval of mean difference (95% CI) and p-value for year cohorts 1 through 6 (group A)

Year Cohort (Group)	RLS	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
1 (A)	Total RLS	Excellent	32	64.06	60.08 to 68.04	
		Very Good	29	67.93	63.92 to 71.94	
		Good	16	58.81	52.50 to 65.12	
		Satisfactory	0	0	0	**0.014**
		Pass	1	91.00	0	
		Fail	1	57.00	0	
		Total	79	64.67	62.06 to 67.28	
	RLS Difference	Excellent	30	0.50	0.16 to 0.84	
		Very Good	27	0.48	0.04 to 0.93	
		Good	11	0.00	-0.74 to 0.74	
		Satisfactory	0	0	0	0.490
		Pass	0	0	0	
		Fail	1	1.00	0	
		Total	69	.42	0.18 to 0.67	
2 (A)	Total RLS	Excellent	13	66.23	59.96 to 72.50	
		Very Good	32	60.44	55.93 to 64.95	
		Good	37	58.24	53.19 to 63.30	
		Satisfactory	0	0	0	0.243
		Pass	15	63.27	57.87 to 68.67	
		Fail	0	00	0	
		Total	97	60.81	58.17 to 63.46	
	RLS Difference	Excellent	13	1.08	0.50 to 1.65	
		Very Good	32	0.47	0.07 to 0.87	
		Good	33	0.48	0.23 to 0.74	
		Satisfactory	0	0	0	0.157
		pass	17	0.71	0.40 to 1.01	
		Fail	0	0	0	
		Total	95	0.60	0.42 to 0.78	
3 (A)	Total RLS	Excellent	12	61.67	54.29 to 69.05	
		Very Good	31	61.77	57.96 to 65.59	
		Good	19	58.21	51.28 to 65.14	
		Satisfactory	0	0	0	0.823
		Pass	1	57.00	0	
		Fail	16	58.75	52.06 to 65.44	
		Total	79	60.23	57.56 to 62.89	

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Continued from Table 5.32

Year Cohort (Group)	RLS	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
3 (A)	RLS Difference	Excellent	12	0.42	-0.09 to 0.92	
		Very Good	31	0.23	-0.14 to 0.59	
		Good	19	0.47	0.07 to 0.88	
		Satisfactory	0	0	0	0.866
		Pass	1	0.00	0	
		Fail	16	0.31	-0.01 to 0.63	
		Total	79	0.33	0.14 to 0.52	
4 (A)	Total RLS	Excellent	0	0	0	
		Very Good	30	55.97	51.31 to 60.62	
		Good	30	59.57	54.87 to 64.26	
		Satisfactory	1	42.00	0	0.310
		Pass	0	0	0	
		Fail	21	54.90	49.74 to 60.07	
		Total	82	56.84	54.14 to 59.54	
	RLS Difference	Excellent	0	0	0	
		Very Good	29	0.21	-0.22 to 0.63	
		Good	27	0.67	0.30 to 1.03	
		Satisfactory	1	-1.00	0	0.171
		Pass	0	0	0	
		Fail	16	0.63	0.05 to 1.20	
		Total	73	.45	0.21 to 0.70	
5 (A)	Total RLS	Excellent	2	68.00	-173.42 to309.42	
		Very Good	41	62.73	59.51 to 65.96	
		Good	33	59.09	55.35 to 62.83	
		Satisfactory	4	56.00	35.83 to 76.17	0.392
		Pass	0	0	0	
		Fail	5	57.20	38.84 to 75.56	
		Total	85	60.80	58.41 to 63.19	
	RLS Difference	Excellent	2	0.00	-12.71 to 12.71	
		Very Good	41	0.41	0.11 to 0.72	
		Good	32	0.38	0.06 to 0.69	
		Satisfactory	4	0.00	-1.30 to 1.30	0.897
		Pass	0	0	0	
		Fail	5	0.40	-0.28 to 1.08	
		Total	84	0.37	0.17 to 0.56	

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Continued from Table 5.32

Year Cohort (Group)	RLS	Academic Achievement (2007/08)	Number	Mean	95% CI		p-value
		Excellent	1	68.00	0		
		Very Good	27	62.33	57.71 to 66.96		
		Good	25	59.24	53.87 to 64.61		
	Total RLS	Satisfactory	4	52.75	22.91 to 82.59		0.607
		Pass	0	0	0		
		Fail	1	65.00	0		
6		Total	58	60.48	57.16 to 63.81		
(A)		Excellent	1	0.00	0		
		Very Good	26	0.23	-0.14 to 0.60		
		Good	24	0.21	-0.07 to 0.49		
	RLS Difference	Satisfactory	3	0.33	-2.54 to 3.20		0.903
		Pass	0	0	0		
		Fail	1	1.00	0		
		Total	55	.24	0.02 to 0.45		

To assess the association of students' academic achievement 2 for academic year 2008/09 with the reflective process as measured by RLS for students in group B, a one–way between groups analysis of variance was conducted. There are no significant differences, except for the first and fifth year cohorts. For the first year cohort, a statistically significant difference for the total RLS mean score [$F_{(4, 111)}$ =3.62, p=0.008] was noted. Post-hoc comparisons demonstrate that students with very good grades (M=64.75, SD=14.49) have a higher RLS mean score (p=0.042) than students with good grades (M=56.29, SD=10.70) (Table 5.33). For the fifth year cohort [$F_{(2, 83)}$ =3.33, p=0.041], there are significant differences between the mean scores for students with excellent grades (M=87.00, SD=2.83) and students with very good (M=63.43, SD=14.49) and good grades (M=62.55, SD=11.53) (Table 5.33). Students with excellent grades have a higher RLS mean score than those with very good and good grades. The mean scores for the RLS across the year cohorts by academic achievement 2 are illustrated in Appendix D.

Table 5.33: RLS mean score by Academic Achievement 2 (academic year 2008/09), mean, 95% confidence interval of mean difference (95% CI) and significant p-values for year cohort 1 and 5 (group B):

Year Cohort (Group)	RLS	Academic Achievement (2008/09)	Number	Mean	95% CI	p-value
1 (B)	Total RLS	Excellent	28	65.57	61.36 to 69.78	
		Very Good	51	64.75	60.67 to 68.82	
		Good	28	56.29	52.14 to 60.44	
		Satisfactory	4	70.25	49.21 to 91.29	**0.008**
		Pass	0	0	0	
		Fail	5	52.60	37.95 to 67.25	
		Total	116	62.57	60.13 to 65.01	
5 (B)	Total RLS	Excellent	2	87.00	61.59 to 112.41	
		Very Good	44	63.43	59.03 to 67.84	
		Good	40	62.55	58.86 to 66.24	
		Satisfactory	0	0	0	**0.041**
		Pass	0	0	0	
		Fail	0	0	0	
		Total	86	63.57	60.69 to 66.45	

ANOVA was also used to assess the impact of students' academic achievement 2 for academic year 2008/2009 on the reflective process for students in group C. There are significant differences for first, second, and fifth year cohorts as illustrated in Table 5.34. A statistically significant difference for the total RLS score [F (4, 78) =3.49, p=0.011] in the first year cohort was noted (Table 5.34). Post-hoc comparisons indicate that students with good grades (M=55.14, SD=6.07) have a lower RLS score than those with excellent (M=66.79, SD=11.17) and very good academic grades (M=65.32, SD=14.14). Second (p=0.026) and fifth year (p=0.011) cohorts demonstrated significant differences between RLS mean scores and academic grades, because there are not enough subjects in the academic achievement groups, post-hoc comparisons were not performed (Table 5.34). Distribution of RLS total and RLS difference for the remaining year cohorts according to academic achievement 2 (academic year 2008/09) for students in group C is illustrated in Appendix D

Table 5.34: Total RLS mean scores by Academic Achievement 2 (2008/09), mean, 95% Confidence Interval of mean difference (95% CI) and significant p-values for year cohorts 1, 2 and 5 (group C):

Year Cohort (Group)	RLS	Academic Achievement (2008/09)	Number	Mean	95% CI	p-value
1 (C)	Total RLS	Excellent	19	66.79	61.40 to 72.17	0.011
		Very Good	38	65.32	60.67 to 69.96	
		Good	21	55.14	52.38 to 57.91	
		Satisfactory	3	58.33	37.65 to 79.02	
		Pass	0	0	0	
		Fail	2	56.50	-51.50 to 164.50	
		Total	83	62.61	59.91 to 65.32	
2 (C)	Total RLS	Excellent	12	66.08	61.76 to 70.41	0.026
		Very Good	28	55.79	50.75 to 60.82	
		Good	35	52.17	47.80 to 56.54	
		Satisfactory	11	59.64	47.30 to 71.97	
		Pass	18	54.28	48.79 to 59.76	
		Fail	1	71.00	0	
		Total	105	56.05	53.49 to 58.61	
5 (C)	Total RLS	Excellent	2	90.00	77.29 to 102.71	0.011
		Very Good	44	66.39	62.37 to 70.40	
		Good	36	61.83	57.17 to 66.50	
		Satisfactory	0	0	0	
		Pass	0	0	0	
		Fail	0	0	0	
		Total	82	64.96	61.89 to 68.04	

5.7.4. Comparative Data of the Dundee Ready Educational Environment

Measure (DREEM) by Academic Achievement:

To assess the impact of students' academic achievement 1 for academic year 2007/08 on the perception of the environment as measured by DREEM and subscales for all year cohorts in group A, a one–way between groups analysis of variance was conducted. The results are illustrated in Table 5.35. The only significant difference noted was for the fourth year cohort, students who failed (M=26.33, SD=4.44) had higher score for perception of their teachers than students with very good academic grades (M=23.07, SD=6.04) (p=0.049) (Table 5.35).

Table 5.35: DREEM and Subscale mean scores by Academic Achievement 1 (2007/08), 95% confidence interval of mean difference (95% CI) and p-value for year cohorts 1 through 6 students (group A):

Year Cohort (Group)	DREEM and Subscales	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
1 (A)	Total DREEM	Excellent	32	120.28	113.53 to127.04	0.876
		Very Good	29	119.14	112.19 to126.09	
		Good	16	116.00	107.56 to 124.44	
		Pass	1	133.00	0	
		Fail	1	119.00	0	
		Total	79	119.14	115.18 to 123.10	
	Perception of learning	excellent	32	27.72	25.73 to 29.70	0.696
		very good	29	28.79	26.88 to 30.70	
		good	16	27.13	24.67 to 29.58	
		pass	1	33.00	0	
		fail	1	27.00	0	
		Total	79	28.05	26.91 to 29.19	
	Perception of Teachers	Excellent	32	25.19	23.46 to 26.92	0.694
		Very Good	29	24.24	22.19 to 26.29	
		Good	16	24.56	21.67 to 27.45	
		Satisfactory	0	0	0	
		Pass	1	30.00	0	
		Fail	1	29.00	0	
		Total	79	24.82	23.68 to 25.96	
	Academic Perception	Excellent	32	20.50	19.22 to 21.78	0.968
		Very Good	29	20.59	19.04 to 22.13	
		Good	16	20.06	17.34 to 22.78	
		Satisfactory	0	0	0	
		Pass	1	21.00	0	
		Fail	1	18.00	0	
		Total	79	20.42	19.52 to 21.31	

Continued from Table 5.35

Year Cohort (Group)	DREEM and Subscales	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
1 (A)	Perception of Atmosphere	Excellent	32	29.69	27.65 to 31.73	
		Very Good	29	28.69	26.32 to 31.06	
		Good	16	27.19	24.45 to 29.93	
		Satisfactory	0	0	0	0.494
		Pass	1	35.00	0	
		Fail	1	32.00	0	
		Total	79	28.91	27.62 to 30.20	
	Social Self-Perception	Excellent	32	16.97	15.18 to 18.76	
		Very Good	29	17.10	15.84 to 18.37	
		Good	16	17.06	15.21 to 18.91	
		Satisfactory	0	0	0	0.828
		Pass	1	14.00	0	
		Fail	1	13.00	0	
		Total	79	16.95	16.04 to 17.86	
2 (A)	DREEM Total	Excellent	13	119.54	109.14 to 129.94	
		Very Good	32	111.34	104.66 to118.03	
		Good	38	109.24	103.22 to115.26	
		Satisfactory	0	0	0	0.290
		Pass	17	108.76	102.43 to 115.10	
		Fail	0	0	0	
		Total	100	111.17	107.70 to 114.64	
	Perception of Learning	Excellent	13	29.38	26.84 to 31.93	
		Very Good	32	26.00	24.41 to 27.59	
		Good	38	25.95	23.84 to 28.06	
		Satisfactory	0	0	0	0.093
		Pass	17	24.76	23.23 to 26.30	
		Fail	0	0	0	
		Total	100	26.21	25.18 to 27.24	
	Perception of Teachers	Excellent	13	25.38	22.73 to 28.04	
		Very Good	32	24.00	22.45 to 25.55	
		Good	38	23.76	22.38 to 25.14	
		Satisfactory	0	0	0	0.472
		Pass	17	22.82	20.21 to 25.43	
		Fail	0	0	0	
		Total	100	23.89	23.02 to 24.76	
	Academic Perception	Excellent	13	19.85	17.16 to 22.54	
		Very Good	32	18.44	16.78 to 20.10	
		Good	38	17.37	15.81 to 18.93	
		Satisfactory	0	0	0	0.292
		Pass	17	17.06	14.78 to 19.34	
		Fail	0	0	0	
		Total	100	17.98	17.06 to 18.90	
	Perception of Atmosphere	Excellent	13	27.15	23.33 to 30.97	
		Very Good	32	27.34	24.86 to 29.83	
		Good	38	26.13	24.34 to 27.92	
		Satisfactory	0	0	0	0.850
		Pass	17	26.76	24.50 to 29.03	
		Fail	0	0	0	
		Total	100	26.76	25.60 to 27.92	

Continued from Table 5.35

Year Cohort (Group)	DREEM and Subscales	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
2 (A)	Social Self-Perception	Excellent	13	17.54	15.72 to 19.36	
		Very Good	32	15.78	14.45 to 17.12	
		Good	38	15.87	14.94 to 16.80	
		Satisfactory	0	0	0	0.152
		Pass	17	17.24	16.21 to 18.26	
		Fail	0	0	0	
		Total	100	16.29	15.68 to 16.90	
3 (A)	DREEM Total	Excellent	12	120.42	107.15 to 133.68	
		Very Good	31	121.03	115.11 to 126.95	
		Good	19	114.11	105.91 to 122.30	
		Satisfactory	0	0	0	0.379
		Pass	0	0	0	
		Fail	16	113.25	102.8 to 123.7	
		Total	78	117.65	113.6 to 121.7	
	Perception of Learning	Excellent	12	27.58	24.08 to 31.09	
		Very Good	31	27.19	25.54 to 28.85	
		Good	19	25.58	23.00 to 28.16	
		Satisfactory	0	0	0	0.641
		Pass	1	22.00	0	
		Fail	16	26.25	23.33 to 29.17	
		Total	79	26.61	25.48 to 27.74	
	Perception of Teachers	Excellent	12	28.42	24.52 to 32.31	
		Very Good	31	27.06	25.10 to 29.03	
		Good	19	26.79	24.95 to 28.63	
		Satisfactory	0	0	0	0.650
		Pass	1	31.00	0	
		Fail	16	25.69	22.56 to 28.81	
		Total	79	26.97	25.81 to 28.14	
	Academic Perception	Excellent	12	18.25	15.5 to 20.96	
		Very Good	31	19.74	18.45 to 21.03	
		Good	19	19.05	16.85 to 21.26	
		Satisfactory	0	0	0	0.472
		Pass	1	14.00	0	
		Fail	16	18.25	16.08 to 20.42	
		Total	79	18.97	18.08 to 19.87	
	Perception of Atmosphere	Excellent	12	29.33	25.36 to 33.31	
		Very Good	31	29.97	27.83 to 32.11	
		Good	19	27.32	24.80 to 29.83	
		Satisfactory	0	0	0	0.210
		Pass	0	0	0	
		Fail	16	26.69	23.55 to 29.83	
		Total	78	28.55	27.24 to 29.87	
	Social Self-Perception	Excellent	12	16.83	14.76 to 18.91	
		Very Good	31	17.03	15.89 to 18.18	
		Good	19	15.26	13.98 to 16.55	
		Satisfactory	0	0	0	0.372
		Pass	1	16.00	0	
		Fail	16	16.50	14.91 to 18.09	
		Total	79	16.46	15.78 to 17.13	

Continued from Table 5.35

Year Cohort (Group)	DREEM and Subscales	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
4 (A)	DREEM Total	Excellent	0	0	0	0.404
		Very Good	30	113.13	104.60 to 121.67	
		Good	30	106.50	99.24 to 113.76	
		Satisfactory	0	0	0	
		Pass	0	0	0	
		Fail	21	111.67	105.08 to 118.25	
		Total	81	110.30	105.94 to 114.65	
	Perception of Learning	Excellent	0	0	0	0.681
		Very Good	30	26.97	24.55 to 29.38	
		Good	30	25.43	23.45 to 27.42	
		Satisfactory	1	23.00	0	
		Pass	0	0	0	
		Fail	21	26.05	24.25 to 27.85	
		Total	82	26.12	24.93 to 27.32	
	Perception of Teachers	Excellent	0	0	0	**0.049**
		very good	30	23.07	20.81 to 25.32	
		good	30	22.50	20.84 to 24.16	
		satisfactory	1	21.00	0	
		Pass	0	0	0	
		fail	21	26.33	24.45 to 28.22	
		Total	82	23.67	22.53 to 24.81	
	Academic Perception	Excellent	0	0	0	0.106
		very good	30	19.33	17.64 to 21.02	
		good	30	18.00	16.35 to 19.65	
		satisfactory	0	0	0	
		Pass	0	0	0	
		Fail	21	16.71	14.97 to 18.46	
		Total	81	18.16	17.19 to 19.13	
	Perception of Atmosphere	Excellent	0	0	0	0.589
		Very Good	30	27.40	24.81 to 29.99	
		Good	30	25.47	22.95 to 27.98	
		Satisfactory	1	22.00	0	
		Pass	0	0	0	
		Fail	21	27.00	24.52 to 29.48	
		Total	82	26.52	25.10 to 27.94	
	Social Self-Perception	Excellent	0	0	0	0.525
		Very Good	30	16.37	15.05 to 17.68	
		Good	30	15.17	13.93 to 16.41	
		Satisfactory	1	18.00	0	
		Pass	0	0	0	
		Fail	21	15.62	13.99 to 17.25	
		Total	82	15.76	15.00 to 16.51	
5 (A)	DREEM Total	Excellent	2	122.00	-233.77 to 477.77	0.308
		Very Good	41	111.07	105.39 to 116.76	
		Good	33	105.42	98.68 to 112.17	
		Satisfactory	4	101.75	79.01 to 124.49	
		Pass	0	0	0	
		Fail	4	120.50	103.59 to 137.41	
		Total	84	109.12	105.08 to 113.16	

Continued from Table 5.35

Year Cohort (Group)	DREEM and Subscales	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
5 (A)	Perception of Learning	Excellent	2	29.00	-72.65 to 130.65	
		Very Good	41	25.80	24.01 to 27.60	
		Good	33	24.39	22.58 to 26.21	
		Satisfactory	4	23.25	18.68 to 27.82	0.305
		Pass	0	0	0	
		Fail	4	29.25	25.97 to 32.53	
		Total	84	25.37	24.19 to 26.55	
	Perception of Teachers	Excellent	2	25.00	-25.82 to 75.82	
		Very Good	41	23.51	21.73 to 25.30	
		Good	33	23.70	21.68 to 25.71	
		Satisfactory	4	23.00	16.50 to 29.50	0.970
		Pass	0	0	0	
		Fail	4	25.25	19.99 to 30.51	
		Total	84	23.68	22.50 to 24.86	
	Academic Perception	Excellent	2	24.00	-39.53 to 87.53	
		Very Good	41	19.68	18.68 to 20.68	
		Good	33	18.85	17.34 to 20.36	
		Satisfactory	4	18.50	15.74 to 21.26	0.303
		Pass	0	0	0	
		Fail	4	20.75	16.99 to 24.51	
		Total	84	19.45	18.65 to 20.25	
	Perception of Atmosphere	Excellent	2	29.50	-103.92 to162.92	
		Very Good	41	26.61	24.73 to 28.49	
		Good	33	24.36	22.12 to 26.61	
		Satisfactory	4	22.25	9.23 to 35.27	0.170
		Pass	0	0	0	
		Fail	4	30.75	20.82 to 40.68	
		Total	84	25.79	24.37 to 27.20	
	Social Self-Perception	Excellent	2	14.50	8.15 to 20.85	
		Very Good	41	15.46	14.49 to 16.43	
		Good	33	14.21	12.95 to 15.47	
		Satisfactory	4	14.75	10.00 to 19.50	0.584
		Pass	0	0	0	
		Fail	4	14.50	11.74 to 17.26	
		Total	84	14.87	14.18 to 15.56	
6 (A)	DREEM Total	Excellent	1	124.00	0	
		Very Good	28	113.50	103.92 to 123.08	
		Good	25	110.36	100.23 to 120.49	
		Satisfactory	4	86.00	45.06 to 126.94	0.276
		Pass	0	0	0	
		Fail	1	130.00	0	
		Total	59	110.76	104.26 to 117.27	
	Perception of Learning	Excellent	1	29.00	0	
		Very Good	28	25.89	23.06 to 28.72	
		Good	25	26.60	23.86 to 29.34	
		Satisfactory	4	19.50	9.23 to 29.77	0.371
		Pass	0	0	0	
		Fail	1	31.00	0	
		Total	59	25.90	24.08 to 27.72	

Continued from Table 5.35

Year Cohort (Group)	DREEM and Subscales	Academic Achievement (2007/08)	Number	Mean	95% CI	p-value
6 (A)	Perception of Teachers	Excellent	1	24.00	0	
		Very Good	28	26.82	24.39 to 29.26	
		Good	25	24.80	22.28 to 27.32	
		Satisfactory	4	19.00	7.09 to 30.91	0.219
		Pass	0	0	0	
		fail	1	27.00	0	
		Total	59	25.39	23.73 to 27.05	
	Academic Self-Perception	Excellent	1	24.00	0	
		Very Good	28	19.21	17.33 to 21.10	
		Good	25	18.80	16.71 to 20.89	
		Satisfactory	4	15.25	6.40 to 24.10	0.374
		Pass	0	0	0	
		Fail	1	24.00	0	
		Total	59	18.93	17.63 to 20.24	
	Perception of Atmosphere	Excellent	1	29.00	0	
		Very Good	28	26.43	23.67 to 29.19	
		Good	25	25.40	22.10 to 28.70	
		Satisfactory	4	18.50	7.99 to 29.01	0.312
		Pass	0	0	0	
		fail	1	32.00	0	
		Total	59	25.59	23.63 to 27.56	
	Social Self-Perception	Excellent	1	18.00	0	
		Very Good	28	15.14	13.83 to 16.46	
		Good	25	14.52	12.82 to 16.22	
		Satisfactory	4	14.00	4.36 to 23.64	0.868
		Pass	0	0	0	
		Fail	1	16.00	0	
		Total	59	14.86	13.87 to 15.86	

An ANOVA was also conducted between groups to explore the impact of students' academic achievement 2 for academic year 2008/09 on the total DREEM and subscales scores for students in group C across first through fifth year cohorts, results for significant years are illustrated in Table 5.36. A statistically significant difference for total DREEM score [F (4, 78) = 3.36, p=0.014], in the first year cohort was noted. Multiple comparisons indicated that those students with good academic grades (M=108.95, SD=14.88) have significantly lower mean scores (p=0.013) than those with excellent grades (M=124.89, SD=12.77) indicating that students with excellent academic grades have a more positive view of their environment. First year cohort students' perception of atmosphere score was found to be significant [F (4, 78) = 3.43, p=0.010], in that the mean score for students with good academic grades (M=25.95, SD=5.75) is lower than students with excellent grades (M=31.32,

SD=4.52), indicating that students with excellent academic grades also have a more positive perception of their atmosphere. The second year cohort perception of learning (p=0.024) and academic self-perception (p=0.010) is significantly different in relation to their academic grades. There is also a statistically significant difference for the perception of teachers (p=0.016) in the third year cohort, for which likewise, there are not enough subjects for post-hoc comparisons between the groups.

Statistically significant differences for students' academic perception in the fifth year cohort [F (2, 78) = 7.75, p=0.001] was also noted. Post-hoc comparisons indicate that mean scores for academic perception for students with good academic grades (M=17.56, SD=4.12) are significantly lower (p=0.019) than those with excellent grades (M=26.00, SD=1.41), indicating that students with excellent academic grades have a more positive view of their academic environment (Table 5.36). The mean scores for the DREEM and subscales for year cohorts by academic achievement 2 (academic year 2008/09) in group C is illustrated in Appendix D.

Table 5.36: Mean DREEM and Subscale scores by Academic Achievement 2 (academic year 2008/09), 95% confidence interval of mean difference (95% CI) and p-values for significant year cohorts 1, 2, 3, and 5 (group C)

Year Cohort (Group)	DREEM	Academic Achievement (2008/09)	Number	Mean	95% CI	p-value
1 (C)	DREEM Total	Excellent	19	124.89	118.74 to 131.05	
		Very Good	38	119.26	114.14 to 124.39	
		Good	21	108.95	102.18 to 115.72	
		Satisfactory	3	107.00	32.93 to 181.07	**0.014**
		Pass	0	0	0	
		Fail	2	109.50	14.20 to 204.80	
		Total	83	117.27	113.74 to 120.79	
	Perception of Atmosphere	Excellent	19	31.32	29.14 to 33.50	
		Very Good	38	29.74	28.22 to 31.25	
		Good	21	25.95	23.34 to 28.57	
		Satisfactory	3	26.00	6.2 to 45.72	**0.012**
		Pass	0	0	0	
		Fail	2	27.50	-29.68 to 84.68	
		Total	83	28.95	27.79 to 30.12	
2 (C)	Perception of Learning	Excellent	12	23.08	18.77 to 27.40	
		Very Good	28	23.32	21.27 to 25.37	
		Good	35	22.83	21.28 to 24.38	
		Satisfactory	10	27.90	24.59 to 31.21	**0.024**
		Pass	18	20.28	17.37 to 23.19	
		Fail	1	24.00	0	
		Total	104	23.05	21.98 to 24.12	
	Academic Self-Perception	Excellent	12	18.92	15.50 to 22.34	
		Very Good	28	17.39	15.86 to 18.92	
		Good	35	16.57	15.10 to 18.04	
		Satisfactory	10	19.50	15.93 to 23.07	**0.010**
		Pass	18	13.67	11.11 to 16.22	
		Fail	1	21.00	0	
		Total	104	16.88	15.95 to 17.82	
3 (C)	Perception of Teachers	Excellent	2	23.50	17.15 to 29.85	
		Very Good	33	27.45	25.52 to 29.39	
		Good	39	24.95	23.66 to 26.24	
		Satisfactory	1	29.00	0	**0.016**
		Pass	4	18.75	12.21 to 25.29	
		Fail	11	26.27	22.54 to 30.00	
		Total	90	25.77	24.71 to 26.82	
5 (C)	Academic Self-Perception	Excellent	2	26.00	13.29 to 38.71	
		Very Good	43	20.63	19.30 to 21.96	
		Good	36	17.56	16.16 to 18.95	
		Satisfactory	0	0	0	**0.001**
		Pass	0	0	0	
		Fail	0	0	0	
		Total	81	19.40	18.39 to 20.40	

To summarise the significant comparative data of the assessment tools by academic achievement**;**

- <u>ILS:</u> students that scored very good and good grades have a more sensing learning style than students with failing grades. While students with very good grades score more towards the sequential style than students with good grades however, students with good and very good grades remain balanced.

- <u>ALSI:</u> students with very good and good academic achievements adopt a more monitoring approach. Students with excellent academic grades adopt a more deep and organised / effort approach and have lower surface approach to learning and studying.

- <u>RLS:</u> students with excellent and very good grades have a higher RLS mean score than students with good grades.

- <u>DREEM:</u> students who failed have a higher perception of their teachers than students with very good academic grades. Students with excellent academic grades have a more positive view of their environment, academic self-perception and atmosphere.

5.8. The Saudi Dental Undergraduate Student Model:

Standard multiple regression has been used to explore the dental students' characteristics for learning and to obtain an overall model of the characteristics of their learning. Significant and nearly significant independent variables were added to the model for each dependent variable and its subscales (ILS, ALSI, RLS, and DREEM), for all year cohorts in group A only to get an overall view of the students' learning. Table 5.37 illustrates the model for a Saudi dental undergraduate student as established in this study. The findings for an academic profile are described below:

5.8.1. Index of learning Styles (ILS):

<u>Sensing / Intuitive Learning Style:</u> approximately half of students are sensing (48%) and 45% are balanced between the sensing and intuitive domain. However, there is a trend for older students to shift towards the sensing learning style than younger students, while younger students (aged 17-20 years old) are more intuitive (p=0.000) (Table 5.37).

<u>Visual / Verbal Learning Style:</u> the majority of the undergraduate dental students (68%) are visual learners, and especially those whose fathers who do not have sufficient education (p=0.020) (Table 5.37).

<u>Sequential / Global Learning Style:</u> seventy per cent of the students are balanced between sequential / global learning styles, but a higher monthly income is related to a more sequential score (p=0.045) (Table 5.37).

5.8.2. Approach to Leaning and Studying (ALSI):

<u>Deep Approach:</u> students' with high academic achievement grades significantly (p=0.044) demonstrated a deep approach to learning and studying as measured by

ALSI. But students living in rented accommodations have a less deep approach score (p=0.036) (Table 5.37).

Surface Approach: students with lower academic achievement grades have a higher surface score as measured by ALSI (p=0.003) (Table 5.37).

Organised / Effort Approach: students with higher academic grades have a significantly higher organised / effort approach (p=0.000). Students whose fathers were educated at university or higher education standard have a lower score (p=0.008) in contrast to those who live in houses rather than flats (p=0.009) (Table 5.37).

5.8.3. Reflection in Learning Scale (RLS):

The ability of students to reflect as measured by Sobral's RLS is positively related to the students' overall academic achievement (p=0.002) (Table 5.37).

5.8.4. The Dundee Ready Educational Environment Method (DREEM):

Total DREEM: there are significant age differences when assessing the overall educational environment, younger students have a significantly (p=0.003) more positive perception of their dental educational environment as measured by DREEM (Table 5.37). The students' father education impacted on how they viewed their environment, students whose fathers who have a higher educational background also have an overall higher DREEM score (p=0.034), whilst their mothers' education impacted differently, in that those mothers with higher education have a lower total DREEM score (p=0.004); resulting in a less positive perception of their environment (Table 5.37).

Perception of Learning: the higher the academic year the lower the score of perception of learning (p=0.012) (Table 5.37). How students perceived their learning environment was also affected by mothers' education, for example those mothers

with higher degrees have a significantly lower score (p=0.002) for the perception of learning (Table 5.37).

Perception of Teachers: female students have a significantly (p=0.002) higher perception of their teachers than the male students (Table 5.37).

Academic Self-Perception: female students have a lower perception of their academic environment than male students (p=0.027). This was also affected by their academic achievement (p=0.000) and their mother's occupation (p=0.024). Students with higher academic achievement grades have higher academic perception, but if the mother had a professional occupation the overall score was negatively affected (p=0.024) (Table 5.37).

Perception of Atmosphere: the younger students had a significantly (p=0.000) more positive feeling about the educational atmosphere as measured by DREEM (Table 5.37).

Students' Social Self Perception: this is affected by several factors; such as academic year, mothers' occupation and where the family resides. Students in higher academic years and those with professional occupation mothers have a significantly lower social self perception (p=0.000 and p=0.015). Whereas students who live in houses rather than flats have a higher social self perception (p=0.010) (Table 5.37).

Table 5.37: Multivariable Analysis of ILS, ALSI, RLS, and DREEM with Different Independent Variables for years cohorts 1 through 6 (group A) (Coefficient, SE, 95% confidence interval of coefficient, p-value, and R^2):

Assessment Tools	Variable	Coefficient	SE	95% CI of Coefficient	p-value	R^2
ILS	Sensitive/Intuitive					
	‡Age (1)	1.54	0.38	0.79 to 2.29	**0.000**	0.032
	Visual/Verbal					
	•Father education (1)	-4.39	1.89	-8.10 to -0.68	**0.020**	0.014
	Sequential/Global					
	Monthly Income	-0.64	0.32	-1.27 to -0.01	**0.045**	0.011
ALSI	Deep					
	Type of residency	-0.94	0.45	-1.81 to -0.06	**0.036**	
	▼Academic Achievement	-0.28	0.14	-0.54 to -0.01	**0.044**	0.012
	Surface					
	▼Academic Achievement	0.36	0.12	0.12 to 0.59	**0.003**	0.023
	Organised/Effort					
	▼Academic Achievement	-0.63	0.13	-0.89 to -0.38	**0.000**	
	•Father Education	-0.53	0.20	-0.93 to -0.14	**0.008**	
	◊Residency	0.94	0.36	0.23 to 1.64	**0.009**	0.082
RLS	Total RLS ▼Academic Achievement	-1.39	0.44	-2.27 to -0.52	**0.002**	0.026
DREEM	DREEM Total					
	‡Age (1)	5.38	1.81	1.82 to 8.93	**0.003**	
	•Father Education	2.32	1.09	0.17 to 4.47	**0.034**	
	•Mother Education	-2.86	0.98	-4.79 to -0.93	**0.004**	0.046
	Perception of Learning					
	•Mother education (4)	-0.82	0.26	-1.34 to -0.31	**0.002**	
	Year Cohort	-0.47	0.19	-0.84 to -0.11	**0.012**	0.041
	Perception of Teachers					
	Gender	1.61	0.52	0.59 to 2.63	**0.002**	0.025

Continued from Table 5.37

Assessment Tools	Variable	Coefficient	SE	95% CI of Coefficient	p-value	R²
DREEM	Academic Self-Perception ▼Academic Achievement	-0.64	0.16	-0.97 to -0.32	**0.000**	
	■Mother Occupation (1, 2)	-0.96	0.43	-1.80 to -0.13	**0.024**	
	Gender	0.99	0.45	-1.88 to -0.12	**0.027**	0.057
	Perception of Atmosphere ‡Age (1)	-2.24	0.53	-3.28 to -1.20	**0.000**	0.016
	Social Self- Perception Year Cohort	-0.47	0.09	-0.65 to -0.28	**0.000**	
	◊Residency	0.82	0.32	0.20 to 1.45	**0.010**	
	■Mother Occupation (1, 2)	-0.78	0.32	-1.40 to -0.15	**0.015**	0.067

• Father/Mother Education: Cat=1: No education, 2=Less than high school, 3= high school, 4= University education,5= Higher education

■Father / Mother Occupation: Cat=1: Managers and Senior officials, Professional occupations, Professional Teaching occupations, 2: Associate professional and Science and technology occupations, Protective services, Artistic and literacy occupations, Media associate, and Transport professionals, 3 : Secretarial and related occupations, Skilled trade, 4:Elementary occupations, 5: Unemployed, and Housewife

‡ Age 1=17-20 years old, 2= 21-24 years old, 3 = 25-28 years old
▼Academic Achievement:
Cat=1: Excellent, 2: Very Good, 3: Good, 4: Satisfactory, 5: Pass, 6:Fail
◊Residency: Cat=1:Apartment, 2:Villa
Type of Residency: Cat=1:Own, 2: Rent
Gender: 1=females, 2:males

To summarise, undergraduate dental students at King AbdulAziz University (KAUFD) are sensing and visual. Older students are more sensing and students whose fathers' have no education are more visual. Students are balanced in the sequential / global style, but students with higher monthly family income are more sequential. Students who achieve higher academic achievement scores adopt a more deep and organised / effort approach to learning and studying and are not surface learners and have a higher reflective and academic self-perception score. Students living in owned houses or flats adopt a deep approach, and students living in houses rather than flats adopt an organised / effort approach. Younger students and students whose fathers have a higher education have a positive view of their

educational environment, while students with a higher mothers' education had a negative view on their overall environment and learning. Students in lower academic years have a more positive view of their learning and social aspect. Females have a more positive view of their teachers but a more negative view of their academic aspect than males. Students whose mothers have a professional occupation have a negative view of their academic and social aspect.

5.9. Hypothesis Testing

5.9.1. Hypothesis Question 1

The reflective process of the undergraduate students of KAUFD is not related to gender, age, socioeconomic status, learning styles, learning approaches, and the learning environment:

The first part of the question is illustrated in the comparative studies as mentioned earlier in the result sections for gender (5.4.3, Tables 5.20 and 5.21), age (5.5.3, Table 5.25), and socioeconomic status (5.6.1.3, Table 5.26 and 5.6.2.3, Table 5.27). The association of RLS with gender has shown that there are differences between students in group C (academic year 2008/09), where females have a significantly higher (p=0.018) RLS score than males (Table 5.20 and 5.21). For age, it was noted that older students have a lower reflective score as measured by RLS (Table 5.25). Socioeconomic status had an effect on the reflective process as measured by RLS, students who reside in houses rather than flats have a higher reflective score as shown in Table 5.26 and this was seen for all year cohorts and Table 5.27 and for the first year cohort as well (Table 5.28).

The association of the reflective process with learning styles as measured by ILS, approach to learning as measured by ALSI, and the students perception of his/her environment as measured by DREEM subscales, was investigated using standard multiple regression. The significant findings that are associated with reflection are described below in Table 5.38.

The reflective process as measured by Sobral's Reflection in Learning Scale (RLS) is positively associated with a deep approach to learning, organised / effort approach, positive students' academic self perception and perception of learning (Table 5.38). As this is expected in an effective learning environment; the students adopt a deep (p=0.000) or an organised / effort approach to learning and studying (p=0.011) and have positive views of their learning (p=0.012) and academic

environment (p=0.001) which provides good quality learning as demonstrated by reflection in learning. In contrast, the surface approach to learning is negatively associated with reflection (p=0.000), this demonstrated that when students adopt a surface approach to learning, the overall reflection score as measured by RLS will decrease and will lead to impairment of the reflective process as illustrated in Table 5.38.

Table 5.38: Multivariable Analysis of RLS with Different subscales of ILS, ALSI and DREEM for year cohorts 1 through 6 (group A) (Coefficient, SE, 95% confidence interval of coefficient, p-value, and R^2):

RLS	Variable	Coefficient	SE	95% CI of Coefficient	p-value	R^2
	Academic Self-Perception [3]	0.48	0.15	0.19 to 0.77	**0.001**	
	Deep Approach [2]	0.68	0.15	0.39 to 0.97	**0.000**	
RLS Total	Surface Approach [2]	-0.59	0.16	-0.90 to -0.29	**0.000**	
	Organised/Effort Approach [2]	0.40	0.16	0.09 to 0.70	**0.011**	
	Perception of Learning [2]	0.29	0.11	0.07 to 0.51	**0.012**	0.219

1. ILS: Learning Styles: active/reflective, sensing/intuitive, visual/verbal, and sequential/global
2. ALSI: Approach to Learning: deep, surface, monitoring, and organised/effort approach
3. DREEM and Subscales: perception of learning, perception of teachers, academic self perception, perception of atmosphere, and social self perception

5.9.2. Hypothesis Question 2

The reflective process does not change for the undergraduate students for any of the academic year cohorts from year one through six, and is not related to the students' academic achievement:

There are changes in the reflective process as measured by RLS across the year cohorts as illustrated in section 5.3.3.2 (Tables 5.9 and 5.10) and within the year cohorts as illustrated in section 5.3.3.3 (Table 5.11).

For change across the year cohorts, there are significant changes (p=0.002) between the first and fourth year cohorts in group A as illustrated in Tables 5.9 and 5.10 for academic year 2007/08. First year students have a higher reflective score as measured by Sobral's RLS than fourth year students (Table 5.10). For the year

cohort in group C (academic year 2008/09) there is a significant difference (p=0.000) (Table 5.9) between the year cohorts. The second year cohort have a significantly lower RLS mean score (p=0.001) than first and fifth year cohorts as illustrated in Table 5.10.

There are significant changes within the year cohorts as illustrated in Table 5.11. It was noted that as students in second year cohort in group A (academic year 2007/08) move towards the end of their third year group C (academic year 2008/09), there is a decrease in the overall reflective process as measured by RLS (p=0.004) (Table 5.11). The reflective process also decreases significantly for the third year cohort in group A (academic year 2007/08) as they move to the beginning (group B) (p=0.017) and the end of their fourth year (group C) (p=0.008) (academic year 2008/09) as illustrated in Table 5.11. While students in the fifth year cohort in group A (academic year 2007/08) move to sixth year group C (academic year 2008/09), there is a significant increase (p=0.050) in their reflective process as measured by RLS (Table 5.11), but there was a significant decrease (p=0.018) in RLS mean scores between group A and B as illustrated in Table 5.11.

The association of the reflective process with academic achievement was explored using ANOVA as presented in section 5.7.3 (Tables 5.32, 5.33, and 5.34). It was noted that students in the first year cohort (group A) (academic year 2007/08) with excellent and very good academic grades have a higher RLS scores than students with good academic achievement grades (p=0.014) (Table 5.32). In addition, first year students in group B (academic year 2008/09) have significantly different RLS scores (p=0.008) in relation to their academic achievement, those with good grades have a lower reflective process than students with very good and excellent academic achievements as illustrated in Table 5.33. In addition fifth year students in group B (academic year 2008/09), have significant differences (p=0.041) between the reflective process and academic achievements. Students with an excellent

academic achievement have a significantly higher score than students with very good and good academic achievements (Table 5.33). Similar findings between the reflective process and academic achievement were also noted for first (p=0.011), fifth (p=0.011), and second year cohorts (p=0.026) for students in group C, students with excellent grades have a significantly higher refection as measured by RLS (Table 5.34).

5.9.3. Hypothesis Question 3

Academic Achievement is not affected by the students' learning styles as measured by ILS, approach to learning as measures by ALSI, and the students' perception of his/her environment as measured by DREEM subscales:

Standard multiple regression was used to explore the association of academic achievement for academic year 2007/08 with learning styles as measured by ILS, approach to learning as measured by ALSI, and the students perception of his/her environment as measured by DREEM subscales.

Academic achievement for academic year 2007/08 as an outcome is affected by the approach students adopt to cope with the demands of the curriculum and the exam process. Students adopting an organised / effort approach to studying have higher academic achievements (p=0.000), while students adopting a surface approach have lower grades (p=0.010) as illustrated in Table 5.39.

Table 5.39: Multivariable Analysis of Academic Achievement (academic year 2007/08) with Different subscales of ILS, ALSI, RLS, and DREEM for students in group A across years 1 through 6 (Coefficient, SE, 95% confidence interval of coefficient, p-value, and R^2):

RLS	Variable	Coefficient	SE	95% CI of Coefficient	p-value	R^2
Academic Achievement[1] (Academic Year 2007/08)	Organised/Effort Approach [2]	-0.08	0.01	-0.11 to -0.05	**0.000**	
	Surface Approach [2]	0.05	0.02	0.01 to 0.09	**0.010**	0.063

1. Academic Achievement: Cat 1. Excellent, 2. Very good, 3. Good, 4. Satisfactory, 5. Pass, 6. fail
2. ALSI: Approach to Learning: deep, surface, monitoring, organised/effort approach

To explore the association of academic achievement for academic year 2008/09 with learning styles, approach to learning, and the students' perception of the environment, standard multiple regressions was also employed.

For academic year 2008/09 the academic achievement was also affected by the approach to learning that students adopt. When students adopt an organised / effort approach to their studies, they will achieve significantly better grades (p=0.000) as demonstrated in Table 5.40.

Table 5.40: Multivariable Analysis of Academic Achievement (academic year 2008/09) with different subscales of ILS, ALSI, RLS, and DREEM for students in group A across years 1 through 6 (Coefficient, SE, 95% confidence interval of coefficient, p-value, and R^2)

RLS	Variable	Coefficient	SE	95% CI of Coefficient	p-value	R^2
Academic Achievement[1](Academic Year 2008/09)	Organised/Effort Approach [2]	-0.07	0.02	-0.09 to -0.04	**0.000**	0.043

1. Academic Achievement: Cat 1. Excellent, 2. Very good, 3. Good, 4. Satisfactory, 5. Pass, 6. fail
2. ALSI: Approach to Learning: deep, surface, monitoring, organised/effort approach

In summary, the findings from this study reject the first null hypothesis stating that the reflective process of the undergraduate students of KAUFD is not related to gender, age, socioeconomic status, learning styles, learning approaches, and the learning environment, except for learning styles which was found not to be associated with the reflective process. The second null hypothesis, which states that the reflective process does not change for the undergraduate students for any of the academic year cohorts from year one through six, and is not related to the students' academic achievement was also rejected. The third null hypothesis states that academic achievement is not affected by the students' learning styles as measured by ILS, approach to learning and studying as measured by ALSI, and the students' perception of his / her environment as measured by DREEM was also rejected except for the learning styles which were not associated with students' academic achievement.

Chapter 6   Discussion

6.1. Introduction:

In this chapter, the results for learning styles (ILS), learning approaches (ALSI), reflective process (RLS), and the perception of the educational environment (DREEM) will be discussed for the main study that was conducted on dental undergraduate students from first through sixth year at King AbdulAziz University Faculty of Dentistry (KAUFD).   Then the overall dental student profile will be identified for students at KAUFD. Finally the hypothesis testing for the main study at KAUFD will be discussed.

6.2. The Main Study:

This study represents an important step forward in the Middle East, in that learning styles, approaches, reflection, and perception of the environment at a dental school in this region have not been fully investigated before. The pilot study demonstrated the feasibility and reliability of the chosen evaluation tools ILS, ALSI, RLS, and DREEM in measuring the stated outcomes. The pilot study has also provided a considerable amount of information on dental undergraduate students' learning styles, approaches, reflection, and the educational environment since studies of this nature are lacking, and therefore comparisons have been made between the main and the pilot study.

Six hundred and twenty four students (females=347, males=277) participated in the study, which was conducted over an 18 month period covering all year groups one through six. A good response rate between 79% and 89% was achieved for the three different occasions as illustrated in Table 5.1, and approximately fifty five percent of the students were female, and 53% of students were aged between 21 to 24 years old. Since there are no guidelines for socioeconomic status in Saudi

Arabia, this study the monthly income, housing status, mother and father occupation and education was collected as a surrogate of socioeconomic status.

6.2.1. The Learning Styles of Dental Undergraduate Students at KAUFD:

Identifying the learning styles of dental undergraduate students can direct academics in planning effective learning activities that address the needs of all their students, hence improving the quality of the teaching / learning environment (Felder, 2010). ILS was chosen because its ease of administration, description of multiple learning styles, and its availability for use at no cost (Zywno, 2003).

In this study, the reliability was (α =0.53, 0.57, and 0.62) and this was within the acceptable range for attitude and preference assessments (Table 5.3) (Tuckman, 1999, Cook, 2005).

Since studies on the learning styles of dental undergraduate students have been lacking and especially so in the Middle East, comparisons have therefore been to the pilot study at QMUL. The students demonstrated a balanced (70%) active / reflective style, sensing (48%) style in that they are practical and prefer to learn from real life situations, and are oriented towards facts and procedures, prefer visual representation of material such as pictures and are balanced in the sequential / global style. Hughes and colleagues described their associated findings whilst investigating the learning styles of orthodontic residents in North America where styles are sensing, highly visual, and balanced between the active / reflective and sequential / global learning styles (Hughes et al., 2009). The learning styles were also comparable to those students who choose disciplines such as civil engineering or nursing (sensing) (Zywno, 2003), unlike students who prefer subject areas such as mathematics or physics who are intuitive.

It was noted that certain academic years such as the third (p=0.029), fourth (p=0.008), and fifth (p=0.031) year cohorts score more towards the active dimension

for the active / reflective style (Table 5.4). However students remain balanced for this style, which might be explained by the fact that as students move from pre-clinical to clinical work, such as the third and fourth year cohorts, there are more opportunities for them to learn by doing and more group activities. While for the fifth year cohort, they score more towards the active style, since they experience more clinical work that is learning by doing towards the end of their studies at the end of sixth year (Table 5.6).

It was also noted that as students advance in their studies at KAUFD, they become significantly more sensing (p=0.001) and visual (p=0.026) with time (Table 5.4). This could reflect the students' ability to accommodate to the change in the learning / teaching environment that occurs with advanced academic years, in which there is an increased emphasis on dental clinical work which is more practical and demands problem solving in real life situations (sensing) and visualisation of material during clinical sessions (Felder and Brent, 2005).

The learning environment at KAUFD is separate for males and females as mentioned in the Introduction Chapter. Gender differences seen in the QMUL cohort where females are more sensing and males are more visual were not demonstrated in the Main study. Therefore, the learning styles for undergraduate dental students at KAUFD seems to be related more to the educational environment than gender and there is a long-term stability with time (Felder and Brent, 2005, Felder, 2010). Despite the fact that the learning style of males and females are balanced for the active / reflective style for all year cohorts (Table 5.17), females in the fourth year cohort scored more towards the active style with time, which might be a reflection of the demands of a more clinical year where active learning is required.

Since students in the first year cohort are fairly new to the educational environment and their learning styles are relatively unaltered or unaffected by the environment, the first year cohort learning styles were examined separately to detect any

significance with socioeconomic status. It was noted that students with masters or PhD educated mothers had a more reflective learning style, that is they prefer to learn by taking lecture notes and benefit from working alone and this was also noted with the remaining year cohorts (Table 5.26). Students with higher monthly income were found to be more sequential which was also similar to the remaining year cohorts as well, while a global style was associated with their father's occupation (Table 5.27). When comparing them to the results of QMUL pilot study students of a lower socioeconomic status tended to benefit from lectures and discussions (verbal) rather than visual representation of material (Table 4.17). These results are difficult to explain but it seems that mothers' education and high monthly income along with fathers' occupation does have an effect on the students, but looking at the students as a whole there were no significant changes in learning styles.

A sensing learning style was associated with better academic achievements for the third and fourth year cohorts (Table 5.28 and 5.29). This reflects the effect of the overall teaching / learning environment to the benefit of the students who are already sensing and visual learners, while students with other learning styles may experience academic difficulty.

One of the limitations of this study was that the learning styles of the faculty members had not been determined; therefore it is not known whether the faculty learning style preferences are affecting the teaching or indeed the learning environment at KAUFD. Mismatches between dental school faculty members' own learning style preferences has been shown to affect students' performance, as well as compromise student retention of study material (Felder and Henriques, 1995, Zywno, 2002, Felder, 2010). When it comes to learning styles it is important to apply teaching that is balanced between all dimensions of learning to provide the necessary skills which will help students develop as learners (Felder and Brent, 2005, Felder, 2010). Faculty members are encouraged to expand the range of

learning style capabilities and activities to facilitate students to become more aware of their learning strengths and weaknesses (Felder and Brent, 2005, Hawk and Shah, 2007). Felder argues that complete individualised instruction to cater for students' preferred learning styles is impractical and ineffective, and therefore the goal of academics should be to provide students with the skills akin with every learning style, regardless of the students' personal preference, since they require a combination of skills to function effectively as professionals and as lifelong learners (Felder and Spurlin, 2005, Felder and Brent, 2005, Felder, 2010).

6.2.2. The Approach to Learning and Studying of the Dental Undergraduate Students at KAUFD:

Assessing students' approach to learning and studying can provide a practical evaluation tool for student learning and encourage reflection by influencing self regulated learning.

The ALSI was administered on three separate occasions and found to be reliable (α=0.61, 0.62, and 0.71). These values are similar to the QMUL study and other studies conducted utilising the ALSI (Entwistle et al., 2000, Mattick et al., 2004).

The approaches that the dental undergraduate students adopted in this study for the three occasions that ALSI was administered are; 55 %, 58%, and 56% for the deep approach, 72%, 69%, and 56% for the surface approach, 52%, 61%, and 60% for the monitoring approach, and 50%, 51%, and 60% for the organised / effort approach (Figures 5.2 - 5.5). With the exception of the surface and organised / effort approach, the different approaches to learning and studying are fairly stable.

In spite of a densely packed curriculum at KAUFD that might increase a surface approach to learning, there was a decrease from 72% to 56% and no change for the deep approach (55% - 58%) (Figure 5.3). This was similar to that shown by Lindemann (Lindemann et al., 2001) who investigated the learning approaches of

first year dental students (n=91) in the United States where there was a similar reduction for the surface approach from 45% to 42% (Lindemann et al., 2001). An increase in the monitoring approach and organised / effort approach from 50% to 60% for the KAUFD cohort (Figure 5.5), may reflect the timing of data collection on the third occasion which corresponded with examination periods.

Students at KAUFD also displayed an overlap in the approaches adopted as with the QMUL cohort. Ideally, the various combination of approaches (orchestration) form a coherent whole, in which different approaches fit together, while adopting a variety of incompatible approaches is called dissonant orchestration (Lindblom-Ylänne and Lonka, 1998). The overlap in approaches found in this study may reflect a coping strategy by the students in which they change their approach from one course to another with a consistency that is related to their studying habits (Entwistle and Ramsden, 1983, Lonka and LindblomYlanne, 1996).

Lindblom Yläne and Lonka (Lindblom-Ylänne and Lonka, 1998) analysed the dissonance orchestration of senior medical students and found that half of them expressed dissonant orchestration, had problems with their study practice, and lacked understanding of the concepts behind self-regulated learning (metacognitive skills). That was thought to be the result of a mismatch between approach to learning and studying and perception of the learning environment (Lindblom-Ylänne and Lonka, 1998). However, for the KAUFD cohort, they adopted several approaches that are compatible with one another, which may reflect the demands of the KAUFD dental curriculum that require more memorisation with or without understanding. Students adopted a monitoring and organised / effort approach to achieve high academic grades. However, at the same time they demonstrated reflection and as a result regulated their learning by adopting a monitoring and deep approach.

The third year cohort are using good study habits and time management to cope with assessments (organised / effort approach) (p=0.022). While the fifth year cohort are using self-regulated learning strategies to control their own learning experiences according to the learning task (monitoring) (p=0.017) (Table 5.7) (Pintrich, 2000). This may well reflect the change in the educational environment at the time that the ALSI was administered which was mid-term examinations (Duff, 2002), thus affecting the approach the students adopt to deal with the demands and the requirements of the curriculum or assessments.

Third and fifth year females adopted a monitoring approach as seen throughout the study (Table 5.19) whereas the fifth year males adopted a deep approach (Table 5.19), which is similar to other studies investigating gender differences in higher education where male students have higher scores on deep approach and lower scores for the surface approach than females (Richardson, 1994a). However females in this study adopted a more monitoring approach to regulate their own learning which has previously been shown to be related to a deep approach to learning (Lonka and LindblomYlanne, 1996, Lonka et al., 2004).

Socioeconomic factors may play a role in the approaches to learning and studying that students adopt. In this study, it appears that mother's education (masters or PhD) has an effect in that it was noted the higher the parent education the lower the deep approach becomes (Tables 5.26 and 5.27). This is found to be different from Zhang's (2000) investigation involving American university students' learning approaches in which a higher parent's education was associated with the use of a deep approach to learning and studying using the Bigg's model. For the KAUFD cohort, the difference could be explained by the fact that educated parents impart their views on education to their children, which in turn, will affect the students' perception of their own environment and therefore the approach adopted by the students. While the organised / effort approach is positively affected by type of

housing (houses) (p=0.014) and negatively affected by highly educated mothers (p=0.023) (Table 5.26), this could be explained by those students living in houses have more private or personal space to study than students living in flats, and mothers who are educated may have higher expectation with concerns to the educational environment as mentioned above. For the first year cohort, a higher father's occupation is associated with deep and monitoring approach (Table 5.27), and this is similar to Zhang's results which indicate that American students' approaches were positively associated with father's education (Zhang, 2000). While a higher monthly income is associated with higher surface scores (p=0.034) (Table 5.27), this might be due to the intentions of these students, which may reflect their lack of concern to their studies or a coping strategy arising from certain feelings and interpretation of the educational environment. These results are difficult to explain; however mother's and father's education maybe indirectly related not only to the students' approaches to learning and studying, but the students' perception of their environment as well. Further qualitative studies are needed to explain the exact effect the parents' education has on students' perceptions.

It has been reported that there is a significant relationship between approaches to learning and academic achievement, in which students adopting a deep or an organised / effort approach have higher academic achievements and can be used to predict student academic success (Entwistle and Ramsden, 1983, Zhang, 2000, Duff et al., 2004). The positive correlation of academic achievement with a deep approach and negatively with the surface approach reflects Ramsden's (1997) view that students appreciate teaching and learning strategies that enable them to relate to the subject matter that they are studying in a meaningful way. The results from this study are similar to findings from a study conducted on first year medical students in the United Kingdom (Mattick et al., 2004) and a study conducted on final year medical students (McManus et al., 1998) where a deep and organised / effort

approach was related to success in final examinations. Students at KAUFD who adopt organised studying habits and monitor their learning (Tables 5.30 and 5.31) also achieve higher academic grades, while students adopting a surface approach have lower academic grades (Table 5.30). Therefore students have the ability to regulate their learning approaches according to the different circumstances of the environment, thus achieving academic success. While students who are dissatisfied with certain issues relating to their learning / teaching environment, will not be interested in regulating their learning and therefore adopt a surface approach to learning and studying, this in turn will affect their academic achievements. These results are different from the QMUL cohort, but concur with Mattick and Reid in which they found a positive correlation between students' assessment scores and the organised and deep approach, while assessment scores correlated negatively with a surface approach (Mattick et al., 2004, Reid et al., 2007).

6.2.3. The Reflective Process of the Dental Undergraduate Students at KAUFD:

Assessing the students reflective process may give insight on how students process knowledge and may influence the outcome of student academic activity.

The reliability was high for the three occasions that RLS was administered; (α=0.82, 0.86, and 0.87) (Table 5.3).

The mean overall score for the RLS for the three occasions that it was administered was; 60.59 (SD=12.35), 63.51(SD =13.00), and 60.41 (SD=12.92). These scores are similar to RLS scores obtained from QMUL cohort, but higher than scores for 101 Brazilian clinical medical students (Sobral, 2000), and lower than the mean score obtained in a study on 282 second year medical students (M=70.94, SD=10.83) at the University of Brasilia (Sobral, 2004).

The curriculum at KAUFD is a traditional one with few or no opportunities for reflective thinking such as problem based learning or reflective log books, however the RLS scores for the KAUFD cohort demonstrated stability on repeated measurements. This suggests that the dental students have a steady level of overall reflection in learning whether at the start, middle, or end of the year and under different conditions of learning, representing a stable characteristic of the learners, which is similar to the QMUL cohort (Sobral, 2005).

The majority of dental undergraduate students at KAUFD have autonomy in their ability to reflect in learning (56% - 58%). However, the overall perception of their own ability to reflect was partial (37% - 40%). Examining the year cohorts separately, first and second year cohorts perceive themselves as partial (40%-50%), while third, fourth, and fifth year cohorts were equally distributed between partial and ample (35%-50%) for their perception of their reflective process. Approximately fifty percent of students in the fifth year cohort described themselves as ample, while six year students demonstrated an equal distribution between partial and ample (40%). This indicates that The KAUFD students in the early academic years need to understand the rational and benefits of reflection (reflecting on an ongoing learning situation), they need encouragement as well as opportunities to reflect. Therefore, providing teaching strategies in an environment that supports reflective practice such as log books or portfolios, problem based learning, and feedback on both the content and the process of their reflection will help build up students' confidence and ability to think reflectively about their clinical practice (Mann et al., 2009).

There are significant differences between RLS scores and academic years, for example first year cohorts reflect more than the fourth year cohort (p=0.002), and the fifth years cohort as a group have a higher ability to reflect (p=0.001) (Table 5.10). This could mirror a personal commitment on behalf of the fifth year cohort to

take control of their learning and develop as learners or could represent their growing maturity as they prepare for graduation and a professional career and lifelong learning. Studies conducted on the reflective process of medical physicians in practice have found that reflection decreases with increasing years in practice, and was lower in practice settings where reflective thinking is not reinforced (Mamede and Schmidt, 2005). If we compare these results with the KAUFD cohort, there is an increase in the reflective process especially for the fifth year students, indicating that students have a safe atmosphere, peer support and time to reflect on complex problems or challenges, such as those faced in the dental clinic, which stimulate reflective thinking (Mann et al., 2009).

The majority of students aged 21 to 24 years of age (Table 5.25), females (Table 5.20), those of higher socioeconomic classes represented by monthly income and living status (Table 5.26 and 5.27) were able to reflect more on their learning experiences. Higher socioeconomic status was also associated with higher RLS scores in the QMUL cohort, but gender, or socioeconomic influences are not mentioned in other studies. Age differences were not observed in previous studies or in the pilot study, more studies are also needed to diffrentiate for example between students and practicing dentists, where age difference is more evident.

In this study, students with higher academic achievements had higher RLS scores, indicating a positive association with academic achievement for the first and fifth year cohorts (Table 5.32, 5.33, 5.34). This is consistent with studies conducted by Sobral on medical students, which also reported a positive association between RLS and academic achievement (Sobral, 2000). This finding demonstrates that when students take control of their learning and are able to integrate information in a supportive environment, it will increase meaningful learning and a deep approach to learning, thus enhancing their reflective abilities which in turn will lead to academic success (Sobral, 2004).

6.2.4. The Dental Undergraduate Students' Perception of Their Learning Environment at KAUFD:

DREEM is a useful tool to assess the educational environment and is recommended for internal quality assessment and comparisons with other institutions' educational environments (Zamzuri et al., 2004).

DREEM was found to be reliable on the two occasions (February/March 2008 and May/June 2009) it was administered (0.87 and 0.89), in accordance with studies investigating the learning environment (de Oliveira Filho et al., 2005).

In general, the overall dental educational environment was perceived to be acceptable by the student body, in comparison to an Asian study conducted on 73 dental technology students (125/200) (Zamzuri et al., 2004) and a further study conducted on 63 first year Indian dental students (116/200) (Thomas et al., 2009), the KAUFD DREEM scores were lower than the Malaysian dental technicians score but similar to the Indian dental students. The QMUL cohort scored higher (125.65/200), although the values for KAUFD were not dissimilar to scores obtained from other medical schools within the Middle East (Al-Hazmi et al., 2004a), where DREEM scores were reported to be 107/200 for King Faisal Medical School Umm Al-Qura University (Mecca, Saudi Arabia), 102/200 for the sister medical school King AbdulAziz (Saudi Arabia), and 99/200 for Al-Yemen University (Sana'a, Yemen) (Al-Hazmi et al., 2004a). These scores reflect the educational atmosphere of the region in which there is pressure from students for reform and educational development in order to facilitate development of their professional skills, especially in the rapidly changing learning environments of the 21st century. In comparison to medical schools around the world, for example, Nepal (130/200), the United Arab Emirates (125/200), UK (125/200), and Scotland (136/200), the total mean DREEM scores for this study were rather low (Al-Hazmi et al., 2004b). This suggests that there are many areas in the learning environment that could be improved. The

individual DREEM item scores provide the means to monitor and improve the quality of an educational environment, giving a clear indication of where changes might be of benefit to the school (Dunne et al., 2006).

Positive aspects of the school are few when compared to the negative factors, and are mainly to do with the students' social aspect as with the QMUL cohort. The highest score obtained was for item 15 (I have good friends in this school) for all the year cohorts and especially the third year cohort (M=3.58, SD=0.60) (Table 5.13). Indicating that the students are satisfied with their socialisation, as apparent by there being few or no conflicts with each other and that they are comfortable working together.

The negative aspects at KAUFD are many (Table 5.12), and found across all year cohorts and DREEM subscales. The dissatisfaction of the learning environment is represented by low scores for the following items; 7 (the teaching is often stimulating) (M=1.58, SD=0.93), 13 (the teaching is student centred) (M=1.62, SD=0.97), 24 (the teaching time is put to good use) (M=1.40, SD=0.85), , and item 44 (the teaching encourages me to be an active learner) (M=1.81, SD=1.14) (Table 5.12). Items 25 (the teaching over emphasises factual learning) (M=1.50, SD=0.80) and 48 (the teaching is too teacher-centred) (M=1.26, SD=0.98) (Table 5.12) are negative statements and are scored in reverse, therefore these items are interpreted as low scores across the different year cohorts as well, which means that the students are in agreement with the statement.

Low scores for these items 7, 13, 25, 44, and 48 across most of the year cohorts, indicate the need for change in the teaching / learning environment to a more student-centred approach, such as incorporating problem based learning, self assessments, peer review of students' work, discussion forums, and portfolios.

Item 25 reflects students' opinion concerning the amount of facts that is presented in the curriculum. This also relates to item 27 (I am able to memorise all I need)

(M=1.46, SD=1.07) which represents students' academic self-perception that also scored low for most of the year cohorts. Students at KAUFD are overwhelmed by the amount of facts given to them, which in turn reflects on their perception and ability to memorise all the information given. However, the wording of memorise in item 27 should be changed to give an indication of students ability to memorise and understand at the same time (deep approach to learning), because if we are only concerned with memorisation, it will give a wrong indication to students to adopt the wrong approach (surface approach to learning).

As with items 25 and 48 above, items 8 (the teachers ridicule the students) (M=1.61, SD=1.06), 9 (the teachers are authoritarian) (M=1.25, SD=0.89), 39 (The teachers get angry in class) (M= 1.67, SD=1.09), and item 50 (the students irritate the teachers) (M=1.29, SD=1.11) (Table 5.12) are also negatively stated items that are scored in reverse, therefore are interpreted as poor aspects of the environment. Item 29 (the teachers are good at providing feedback to students) (M=1.63, SD=1.12) also received a low score. Items 8, 9, 29, 39, and 50 represent students' perceptions of their teachers.

These scores reflect a problem with faculty and could be addressed by providing opportunities for staff to become more effective in their teaching roles by addressing the concepts of adult learning. As a means to understand student / teacher relationships, conducting focus groups in a safe environment will enable a better understanding of the relationship and therefore enable adjustments to promote a more student centred approach to learning.

Items 11 (the atmosphere is relaxing the clinical teaching) (M=1.57, SD=1.13), 12 (the school is well timetabled) (M=1.45, SD=1.17), 17 (cheating is a problem in this school) (M=1.75, SD=1.25), 42 (the enjoyment outweighs the stress of studying dentistry) (M=1.30, SD=1.20), and item 43 (the atmosphere motivates me as a learner) (M=1.56, SD=1.11) demonstrate the students' perception of atmosphere.

An important area of concern is the school timetable where the students' dissatisfaction may well be caused by a lack of coordination between staff and the school administration for the different courses, addressing this issue will lessen the anxiety and stress perceived by the students in which the administration could negotiate with students on the timetabling of lectures and clinics.

Another important issue is item 17 which reflects cheating at KAUFD, and was low for all year cohorts except year one. This issue raises a question as to whether this reflects students' dissatisfaction with the overall educational environment or knowledge of cases of cheating. Cheating is not tolerated in dental schools and there are strict codes of conduct which encourage students to adhere to high standards of professional behaviour in dental practice worldwide. Reasons for academic dishonesty may be caused by several factors, for example, a lack of respect for the need of professionalism, stress associated with workload, scepticism towards the dental school, students' laziness, and lack of zero tolerance on behalf of the dental school. Although there are Islamic courses for students at KAUFD, additional modules that encourage good ethical behaviour of dentists and good patient relationships into the curriculum are needed. Therefore the use of honour codes and the establishment of Professional Capabilities and Fitness to Practice Committees (QMUL, 2009, GDC, 2010) are ways in which cheating and dishonesty could be eliminated within the dental school.

Item 3 (There is a good support system for students who get stressed) (M=0.84, SD=1.16), 4 (I am too tired to enjoy the course) (M=1.02, SD=1.06), and item 14 (I am rarely bored on this course) (M=1.30, SD=1.06) (Table 5.12) also scored low. Lack of a student support system also scored low for the sister medical school, King AbdulAziz Medical school (Al-Hazmi et al., 2004a) and for a United Kingdom medical school (Dunne et al., 2006) as well. The students at KAUFD are overwhelmed and stressed with their teaching / learning environment which reflects

the need for a proper student support system that will help students cope with their studies. This issue can be addressed by implementing a mentoring system for junior students by senior students or by providing a more structured tutoring system with more accessibility to faculty members when needed. Since the KAUFD follows the traditions and examples of Islamic teaching, religious support could be used to improve the spiritual wellbeing and progress of the students'.

Item 4 (I am too tired to enjoy the course) also indicates a problem with physical and mental strain that the students are facing. The establishment of a student support system, in which students can access when they are faced with challenges or difficulties, might be ways to improve students' emotional strain. Low scores for item 14 (I am rarely bored on this course) across the year cohorts indicate the need for a stimulating educational environment for students such as more interactive and student centred approach to learning.

Examining individual year cohorts revealed that the second, fourth, and fifth year cohorts scored low for the above mentioned items, indicating a problem with these year cohorts that should be examined more closely. In general early academic year cohorts (first and second) had higher scores for the total DREEM (p=0.002), perception of learning (p=0.030), academic self-perception (p=0.002), perception of atmosphere (p=0.003), and social self-perception (p=0.001) (Table 5.14). The second year cohort demonstrated the most change over time for the total DREEM (p=0.000) and subscales except academic self-perception, which provides a clear indication that there are certain features related to learning, teachers, atmosphere, and social well being, that the students are dissatisfied with as mentioned earlier. Investigating further into the specific areas of concern by qualitative studies could provide more information and guidance on how to improve the overall satisfaction of the students which in turn will affect students' learning.

There are significant changes between males and females for the majority of the academic year cohorts, where females had higher scores for both occasions than males for the overall perception (p=0.046), perception of teachers (p=0.013), and perception of atmosphere (p=0.008 and p=0.004) (Table 5.22 and 5.23). This is similar to studies conducted on British, Spanish, Nigerian, and Nepalese students in which females had a more positive perception of their educational environment, teachers, and atmosphere. However the gender differences observed at KAUFD are different from other results obtained in the Middle East in which females were less satisfied with their educational environment (Al-Hazmi et al., 2004a, Mayya and Roff, 2004). This could be explained by the fact that in Saudi Arabia, females do not have the same social freedom that males have. Therefore as females have limited choices within society, they perceive the university environment to be an outlet and a means for them to become more independent and influential within their society. In addition, females who choose healthcare fields in Saudi Arabia are often driven by the desire to learn and to be productive, while the majority of the male students are often less serious or committed to their studies and have chosen their careers out of social expectations from their parents or relatives.

The majority of students between the age of 21 to 24 had a significantly lower perception of their overall environment (p=0.011), perception of teachers (p=0.006 and p=0.034), and perception of atmosphere (p=0.001 and p=0.040), but they had a more positive view of their learning (p=0.041) (Table 5.25). However they did not feel positive about the overall school environment which was a similar finding to QMUL, this could reflect the maturation of this group of students and their understanding of the learning concepts, but at the same time they are signalling certain issues in the environment that need to be addressed, such as a more student centred teaching, providing a good support system, and improving the school timetable.

Although several socioeconomic factors seem to have an effect on DREEM and its subscales, these factors are difficult to explain, with no clear picture or trend. However, mother's higher education (masters and PhD) and parents' occupation (manager or professional) seems to have an impact on students' perception of some aspects in the environment such as learning, atmosphere, and social well being (Table 5.26 and 5.27). This could be due to the higher expectations instilled in these students by their mothers as mentioned earlier in the approach to learning and studying discussion. The housing (house or villa) also had a positive influence on the academic self-perception (p=0.020) and social self-perception (p=0.041) (Table 5.26 and 5.27). This was also noticed in the first year cohort, in addition higher monthly income had a positive effect on students' social self-perception (p=0.030) (Table 5.27), this could be that these students are more comfortable economically therefore satisfied when it comes to their social aspect.

KAUFD students with higher academic achievements (excellent) are more satisfied with their environment as demonstrated by a more positive academic perception (p=0.010), atmosphere (p=0.012), and the overall educational environment (p=0.014) (Table 5.35 and 5.36). These results are similar to studies conducted on Chinese and Indian medical students using the DREEM questionnaire (Roff, 2005). There were also significant differences between perception of teachers and academic achievement for the fourth year cohort, where students with a failing grade (less than 60%) have a higher perception of their teachers (p=0.049) (Table 5.35). Although students were informed at the beginning of the study that only the principal investigator will have access to the questionnaires and this study is an independent study, it may be that some students thought that their teachers might have access to the questionnaire and therefore did not give honest answers. This might also reflect the attitude of students in the Middle East towards their teachers

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or professors, they usually look up to their teachers and respect them and hence they did not want to score low for items related to teachers.

6.3. The Overall Dental Student Profile for the QMUL and KAUFD undergraduate dental students:

In this section, the dental undergraduate student at KAUFD and the factors associated with their learning are presented:

- ILS: students are balanced for the active / reflective learning style and the majority of students are sensing. Older students are more likely to shift towards the sensing style than younger students (p=0.000) (Table 5.37), which could be explained by the fact that younger students are new to the learning environment of the dental school, and as students progress throughout their studies they become more sensing to accommodate to the educational environment. Most KAUFD undergraduate dental students are visual learners, especially those whose fathers are not university educated (p=0.020) (Table 5.37) and the majority are balanced for the sequential/global learning styles, however a higher monthly income was related to them being more sequential. However students still remain balanced for this style (p=0.045) (Table 5.37).

- ALSI: KAUFD students adopted a variety of approaches at the same time. These could be due to either a mismatch between the approaches to learning and studying and perception of the learning environment, for example a tension between personal intentions (understanding or achieving higher academic grades) and external pressures (assessment and examination requirements) (Entwistle et al., 2000). It could be a strategy employed by students to cope with their environment, where they change from one approach to another according to the circumstances and pressures

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they are faced with. Students' academic achievement correlated positively with a deep (p=0.044) and an organised / effort (p=0.000) approach and negatively with a surface approach to learning and studying (p=0.003) (Table 5.37). This supports the findings from previous studies conducted on medical students (Arnold and Feighny, 1995, Mattick et al., 2004, Reid et al., 2007) where there was a positive relation between a deep approach to learning and studying and academic success. Students living status affected the approaches adopted; students who lived in rented houses or flats had more understanding and engaged actively with the learning material (deep) (p=0.036), while students who lived in houses or villas rather than flats used their studying time wisely to achieve higher academic grades (organised / effort) (p=0.009) (Table 5.37). Higher fathers' education had a negative effect on the organised / effort approach (p=0.008) (Table 5.37). These findings are difficult to explain, however what is more important is the association of the deep and organised / effort approach with academic achievements.

- RLS: the students' ability to reflect was positively related to the students' overall academic achievement (p=0.002) (Table 5.37). This is the most important finding where it was demonstrated that when students reflect on their learning, they will succeed academically.

- DREEM: the overall educational environment at KAUFD was acceptable as demonstrated by the overall DREEM score, but there were certain areas for improvement. Younger students had a better perception of their university environment (p=0.003) and the educational atmosphere (p=0.000) (Table 5.37), this might be explained by the fact that the older students are in the higher academic years and expect more out of their educational environment, and they are able to distinguish the challenges they are faced

with from year to year more so than younger students. Students with fathers that have a higher educational background (masters and PhD) had a more positive perception of their dental school environment (p=0.034), while mothers' education (higher education) had a negative effect on students' perception of their overall environment (p=0.004) (Table 5.37). This finding is similar to the previously mentioned discussions in the approach to learning and studying and the perception of the environment sections. Higher academic years have a much lower view of their learning (p=0.012) and social environment (p=0.000) (Table 5.37), this might be explained by the fact that students in higher years are more acquainted with their educational environment especially when it comes to learning. They have a better understanding of the concepts of learning and what ways they can improve. Also they might feel stressed and therefore do not feel comfortable socially. Generally, the females at KAUFD had a more positive perception of their teachers (p=0.002), but negative view of their academic environment (p=0.027) (Table 5.37). Although one would expect the opposite in the Middle East, this is similar to the findings from studies conducted on Spanish, Nigerian, and Nepalese students (Roff et al., 1997). The females' dissatisfaction with the academic environment might be caused by the fact that male students have more access to the administration, male faculty staff, and clinic areas, while the females are not allowed into the male section without permission and a previously set appointment, but due to time constraints on part of faculty and female students, it is very difficult for them to discuss their views with the male staff or the administration. The academic perception correlated positively with higher academic achievement (p=0.000) and negatively with mothers' professional occupation (p=0.024) (Table 5.37). Students that are doing well academically will have positives views of their

academic perception as well, while students that are suffering with their grades will have negative views about their confidence in passing exams, their learning approaches, and their critical thinking skills. This reinforces the findings from previous studies that when students have positive views of their teaching / learning environment, they will adopt approaches such as deep approaches that will help them succeed academically (Roff, 2005). Students' social self-perception associated negatively with their mothers' professional occupation (p=0.015) and positively with students living in houses or villas rather than flats (p=0.010) (Table 5.37).

6.4. Null Hypothesis:

In this section the null hypothesis will be answered in light of the findings, which summarise the factors associated with the reflective process.

The overall outcomes of this study support the view that students' learning is multifaceted and involves a multitude of factors which combine to create the students overall learning experience. Such factors include the educational environment, student learning characteristics, and students' learning outcomes as represented by academic achievement and the reflective process (Figure 2.1).

6.4.1. Null Hypothesis 1:

The reflective process of the undergraduate students of KAUFD is not related to age, gender, socioeconomic status, learning styles, learning approaches, and the learning environment:

The findings from the main study reject the first null hypothesis, except for learning styles which was found not to be associated with the reflective process. Learning styles seem to be a characteristic of the student which remains stable as has been demonstrated in this study.

The reflective process is affected by gender, age, and higher socioeconomic status as mentioned previously.

It was also found that student reflective process as measured by RLS was associated with deep (p=0.000) and organised / effort approach to learning and studying (p=0.011) (Table 5.38) and is influenced by the educational environment. In addition, satisfaction with certain factors in the learning environment such as clear learning objectives (p=0.012) and emphasis on long-term learning has lead to enhanced reflection (p=0.001) (Table 5.38), therefore rejecting the first null hypothesis. These results is similar to previous studies that reported a positive relationship between a deep approach to study, academic achievement and RLS (Sobral, 2001).

In light of these findings, it is possible to interpret the statistical significance between reflection in learning and the teaching / learning environment, approach to learning and studying, and academic achievement by demonstrating that when students have a positive perception of their academic and learning environment, this will help to build integrated knowledge and monitor learning. Therefore, adopting a deep and organised / effort approach to learning and studying results in critical thinking and greater understanding (Mitchell, 1994, Entwistle, 2000), thus demonstrating reflective learning (Entwistle, 2008). While students who adopt a surface approach are unable to integrate new information with existing information, they also react negatively to the same environment and do not succeed academically (Entwistle, 2008).

Students should be aware of the opportunities available to them within their educational environment that could help them to think critically about evidence, and look for links between new and previous knowledge to adopt a deep approach to learning and develop their reflective process. Students using organised study methods and good time management adopt either a deep or surface approach

depending on what they feel would produce the most successful academic result. Some believe that these students do not really gain any meaningful understanding and are extrinsically motivated just to get through their studies (Snelgrove, 2004). However, in this study it has been demonstrated that an organised / effort approach leads to better reflection, while a surface approach has a negative effect on reflection. And the reason why students at KAUFD adopted an organised / effort approach was to adapt to the different circumstance in their educational environment such as a loaded curriculum and teacher-centred teaching.

6.4.2. Null Hypothesis 2:

The reflective process does not change for the undergraduate students from academic years one through six, and is not related to the student's academic achievement:

The second null hypothesis was also refuted. The results of this study demonstrate that the students' reflective process changes as the students progress from one year to another. There is an overall decrease in the reflective process with time for all year cohorts except for the fifth year cohort (Tables 5.9, 5.10, and 5.11). This could be explained by the students' personal commitment to perform critical thinking and become self-directed learners or could represent a growing maturity on behalf of the fifth year cohort as they prepare for a professional career in dentistry as previously mentioned. Ideally the Reflection In Learning Scale should measure changes in students' reflective process when using reflective methods such as problem based learning or reflective journals or diaries and other means of reflection. However, for the KAUFD cohort, there are no known reflective exercises or methods incorporated in the curriculum. Even though, a change in the reflective process was demonstrated, whether this is related to students' ability to become independent learners as they progress or to seek an understanding and meaning of

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what they are learning or a change in the educational environment. The teaching / learning environment for the fifth year cohort changes as they move into sixth year, they have more clinical hours in which they interact with patients and supervisors and less teacher-centred lectures. Introducing reflective practices into the curriculum earlier on such as group discussions, reflective journals or log books, and encouraging critical thinking will further enhance their reflection and academic success, especially for those that are struggling with the demands of the curriculum such as second, third, and fourth year cohorts.

It was also shown that the reflective process was positively associated with higher academic grades, demonstrating that when students undertake meaningful learning with the intention to understand, this will lead to academic success (Tables 5.32, 5.33, and 5.34).

6.4.3. Null Hypothesis 3:

Academic achievement is not affected by the students' learning styles as measured by ILS, approach to learning as measured by ALSI, and the students' perception of his/her environment as measured by DREEM subscales:

This null hypothesis was also rejected, except for learning styles which did not affect academic success, while the deep, organised / effort, and the surface approaches to learning and studying (Table 5.30 and 5.31), and DREEM and certain subscales (Table 5.35 and 5.36) are found to be associated with academic achievements of students at KAUFD.

A number of studies have found that when students adopt a deep approach, it is likely to lead to academic success, and when they adopt a surface approach it will lead to lower academic achievements (Van Rossum and Schenk, 1984, Norton and Dickens, 1995, Zhang, 2000, Duff et al., 2004).

For DREEM, it has been demonstrated that students who are failing have a higher perception of their teachers than students with very good academic grades; this could be explained by the fact that students in the Middle East are generally not comfortable or are afraid of expressing their feelings over the fear of being reprimanded. Students with excellent academic grades have positive views of their environment, academic self-perception and atmosphere. This reinforces Ramsden and Entwistle (1983, 1997) suggestions that effective learning is a combination of the learning environment and the student's preferred approach to learning. The students at KAUFD organised their studying through good time management, shifting between different approaches for the intention of doing well in the assessments or exams (organised / effort approach) and according to their perception of the environment, but at the same time the students are able to monitor their understanding and learning skills as indicated by their ability to reflect in learning. It has been demonstrated in previous studies that students who are reflective, obtain a greater benefit and enjoy their university studies (Sobral, 2000), while students who embark on their studies by memorising (rote learning) without understanding, adopt a surface approach to learning and studying, will have negative feelings about learning and this is evident in their academic grades.

It can be concluded that identifying certain factors within the educational environment and investigating the dynamics of students' characteristics can guide educators in understanding students' learning and the factors associated with effective learning.

Chapter 7 Way Forward

This study has revealed a number of interesting applications, and in order to gain a better understanding of students learning, these should be explored further. By doing this it will provide ways forward that will assist both KAUFD and similar dental schools to further promote student centred learning and teaching:

1. The clinical environment is crucial for dental schools since a substantial proportion of the teaching / learning is conducted in the dental clinic. Assessing this environment will facilitate better opportunities for reflective practice in the clinic that will contribute to a student centred approach to their learning.

2. Dental educators should assist learners to become reflective practitioners by taking steps to ensure that they reflect on their experiences, good or bad. These might include scheduling times, places, and incentives for reflection, ensuring that learners have the underlying principles and strategies for reflection. By having faculty members modelling reflective practices during teaching and clinical sessions which also includes learners, with the effect of demonstrating that reflection can be collaborative as well as an individual experience.

3. Engage learners in identifying new learning experiences and asking them to discuss how they intend to use this new knowledge are methods that can further improve learning (Westberg, 2001). The engagement of learners in reflection should be monitored by utilising tools such as Reflection in Learning Scale to detect those variations which are inevitable through a student's learning experience. Guidelines should be adopted to encourage this vital skill of reflection.

4. Academic dishonesty creates an atmosphere that is not conducive to the learning process, and negatively affects honest students as well. For that reason the practice of cheating should be scrutinized more closely by the stakeholders at KAUFD. When cheating escapes detection, it can affect student morale, and undermine the educational environment.

5. The richness of a qualitative approach should be harnessed, to gain more information on the undergraduate dental student's input or insight on their approaches to learning and studying which they adopt and how this relates to especially their perception of the educational environment.

Chapter 8 Conclusion

This study is the first to assess dental students' perception of their educational environment in the Middle East. The Dundee Ready Environment Education Method (DREEM) provided a snapshot of students' perception of their teaching / learning environment, and identified problematic areas within the school that require re-evaluation, such as a support system for students and methods to enhance student-centred learning. Students across the year cohorts also report a problem with cheating and the teachers' temper. Specific areas for improvement were highlighted within the learning and teaching atmosphere at KAUFD and addressing these issues will create a more favourable environment for the students' learning and influence the approach students adopt.

This study has also provided a means to describe the learning styles of dental undergraduate students at the Barts and the London School of Medicine and Dentistry, Institute of Dentistry and King AbdulAziz University Faculty of Dentistry. The learning styles are very similar and are mainly described as sensing and visual. Students' knowledge of his / her learning styles increases their self-confidence. It also motivates them to make the most out of their learning experience (Laight, 2004). One of the limitations of this study was the lack of information on the learning styles of faculty members, in order to demonstrate whether their learning styles influence those of the students'. However, the results have demonstrated that learning styles do not affect the students' reflective process or academic success and are basically considered to be a stable characteristic of the student.

Despite the problems in the environment that the students at KAUFD are faced with, they adopt the necessary approaches such as a deep and organised / effort. Consequently these students control their responses to the environment in order to

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enhance their own learning and to succeed academically through reflection and monitoring of their learning.

Reflection is a key element in health education (Schon, 1983) and is fundamental to lifelong learning and continuing professional development. This study confirms previously reported findings that a greater effort in reflection is associated with a more positive or meaningful learning experience (Mitchell, 1994) as characterised by a deep and an organised / effort approach to learning and studying, and a positive learning and academic perception which will lead to academic success.

It can be concluded that the Reflection in Learning Scale is a conscious measure of the reflection in learning, and therefore can be used to monitor students' progress in learning and induce readiness for self-regulated learning. Self-regulated learners undertake challenging tasks, observe their learning, and exert an effort to develop a deeper understanding of the subject matter, in order to succeed academically. Therefore gaining the necessary attributes or skills that will assist in the development of lifelong learning skills and continuous professional development. Consequently, assessing the reflective process and approaches to learning and studying that students adopt can provide pertinent information on students' learning development as well as monitoring their progress academically and identifying dental students who may require additional support or guidance to succeed.

Identifying students' approaches to learning and studying, their perception of their educational environmnet and the reflective process within an educational environment and investigating the dynamics of students' characteristics can guide educators in understanding students' learning and the factors associated with effective learning.

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Chapter 10   Appendices

Appendix A:

A.1. KAUFD Mission Statements and Goals

A.2. KAUFD Curriculum Distribution throughout academic years

A.3. Ethics Approval for the QMUL study (QMREC2007/39)

A.4. Letter to Saudi Cultural Attaché Office

A.5. Approval of Study from Cultural Attaché Office

A.6. Ethics Approval for the KAUFD study (QMREC2007/67)

A.7. Circular e-mail copy to students for information on the Reflective study

A.8. Response rates for the Saudi study throughout the academic years

Appendix A
A.1 KAUFD Mission Statements
and Goals

(Reproduced with Permission from KAUFD Accreditation
Committee):

The Faculty of Dentistry is an entity within King Abdulaziz University.

However, the faculty of dentistry has its own distinct mission statement. The

following four-part mission statement was approved and formally adopted by

the Faculty by the Dental Faculty Board at King Abdulaziz University (KAU)

on September 2008.

"The Faculty of Dentistry at King Abdulaziz University is a governmental

institution whose mission is to dedicate its resources to excellence in

education, research, patient care, and contribution to the improvement of oral

health across the Kingdom of Saudi Arabia."

Inherent in this mission are methods of instruction, research, extended

education, and public service designed to improve the oral health care at the

Kingdom of Saudi Arabia. KAUFD Goals and Objectives:

Fulfilling this mission requires the pursuit of these mutually reinforcing

academic goals:

Goal 1: To educate and train students and dentists who will play a leading

role in the promotion of dental health in their community, and is capable of

providing high quality primary dental care to patients, with special focus on

prevention of dental diseases.

Objectives:

1. Evaluate the basic science and clinical curricula assuring compliance with the commission on Dental Accreditation standards and encouraging responsiveness to evidenced-based advances in dental Education.

2. Provide educational experiences for students using a comprehensive patient care model.

3. Provide general dentists who are competent to practice dentistry.

4. Provide dental specialists/consultants who are proficient in the recognized areas of paediatric dentistry, restorative dentistry, oral and maxillofacial surgery, orthodontics, endodontic, prosthodontics, and periodontics.

Goal 2: To provide support and resources of dental research in order to contribute to the solution of dental health problems in the Kingdom in general and in the Western region in particular.

Objectives:

1. Obtain internal and external funding to support scientific research and research facilities.

2. Participate in organizations that promote, support the results of scientific research.

3. Increase students' opportunities for research.

4. Engage faculty to conduct research.

5. Strengthen research capabilities and resources.

Goal 3: To provide and maintain high level of community service on the level of continuous education to the practicing dentists and to educate the public.

Objectives

1. Provide lecture and clinical programs that are of interest to all components of the dental health team.

2. Participate as a school in organizations to affect change in health care.

3. Provide oral health education and health promotion in community dentistry division through field visits

Goal 4: To provide high quality dental services to the public in Jeddah and the Western region.

Objectives:

1. Maintain the school position as a major primary dental provider.

2. Expand the school position as a provider of specialty care.

3. Provide oral health care services to people with special needs.

Academic Program:

Duration of study in this college is six years followed by a one -year internship training. This program includes basic scientific and clinical courses presented by college of medicine and medical sciences, English language, university requirements as well as applied clinical and basic sciences of dentistry .Through learning them, students acquire manual information and skills necessary for practicing dentistry profession with all its therapeutic and preventive aspects.

Developed Academic Plan of Bachelor Degree:

In the academic year 1419 -1420 H, the college has finished the project of the developed academic plan to keep up with the increasing progress in teaching sciences of oral and dental medicine and to avoid passive aspects of application of the last academic plan in addition to reconsideration of distribution of academic courses within different years while taking into consideration the new available potentialities of the college after its transference from its earlier headquarters in the old university hospital to its new headquarters in the medical center which consists of similar buildings; some for boys, others for girls, for which the university council has approved according to decree No) .1 (in their second meeting for the academic year 1421 /1422H held on 15 /10 /1421 H.

Cooperation with universities inside and outside Saudi Arabia:

The academic plan has been designed in the college since it was established to keep up with the latest academic programs in this field where consultants from outside Saudi Arabia have participated in preparing this plan in collaboration with Harvard and Tufts Universities in Boston, U .S .A .The college has been completely interested in sending for visiting professors regularly to participate in training courses and final exams to enrich the academic process with all its aspects and to give specialists the

chance to give their views and positive comments for the sake of developing the academic and therapeutic course in the optimal way

Academic Plan

Requirements	No. of Courses	No. of Units
College Requirements	33	163
University Requirements	6	14
External Requirements	17	129
Total	**56**	**296**

University Requirements:

They are courses which university students study for which (14 academic units) are assigned distributed as follows;

Course	No.	Code	No. of Units
Islamic Studies (1)	101	ISLS	2
Islamic Studies (2)	201	ISLS	2
Islamic Studies (3)	301	ISLS	2
Islamic Studies (4)	401	ISLS	2
Arabic Language (1)	101	ARAB	3
Arabic Language (2)	201	ARAB	3
Total			**14**

External Requirements:

Course	No.	Code	No. of Units
Medical biology	101	BIOD	4
Medical Chemistry	101	CHED	4
Medical Physics	101	PHSD	3

English Language (1)	101	ELCD	6
English Language (2)	201	ELCD	4
Computer Science	100	DREQ	3
Foundation Course	101	FOND	4
Gross Anatomy	201	ANTD	5
Histology & Embryology	201	HIED	3
Physiology	201	PHYD	4
Biochemistry	201	BCHD	4
General & Systemic Pathology	301	PATD	4
Microbiology & Immunology & Parasitology	301	MICD	2
Pharmacology	301	PHAD	2
General Medicine	401	MEDD	2
General Surgery	401	SURD	2
Clinical Pharmacology	501	CPHD	2
Total			**122**

No. of Academic Units:

 They are taught by College of Medicine & Medical Sciences, College of Arts & Human Sciences, English Language Center according to academic plans of different years:

Academic Years	No. of Academic Units	
	College of Medicine & Medical Sciences	College of Arts & Human Sciences
1st year	69	7
2nd year	16	5

3rd year	8	2
4th year	4	//////////////////
5th year	2	//////////////////
6th year	//////////////////	//////////////////
Total	**99**	**14**

Total Academic Units & Teaching Hours Of Academic Plan:

Academic Years	No. of Academic Units	No. of Teaching Hours
1st year	35	35
2nd year	25	35
3rd year	46	62
4th year	41	45
5th year	76	78
6th year	40	40
Total in Teaching Hours	**263**	**295**

Academic Course

First year

Courses	Course Code	
First Semester		
Arabic Language (1)	ARAB	101
Islamic Studies (1)	ISLS	101
Computer Principles	DREQ	100
English Language (1)	ELCD	101
Medical Physics	PHSD	101
Second Semester		
Islamic Studies (2)	ISLS	201
English Language (2)	ELCD	201
General Biology	BIOD	101
Medical Chemistry	CHED	101
Foundation Course	FOND	101

Second Year

Courses	Course Code	
First Semester		
Arabic Language (2)	ARAB	201
Islamic Studies (3)	ISLS	301
Dental Anatomy & Occlusion	OBCS	223
Gross Anatomy	ANTD	201
Histology & Embryology	HIED	201
Physiology	PHYD	201
Biochemistry	BCHD	201

Second Semester		
Islamic Studies (4)	ISLS	401
Dental Anatomy & Occlusion	OBCS	223
Gross Anatomy	ANTD	201
Histology & Embryology	HIED	201
Physiology	PHYD	201
Biochemistry	BCHD	201
Commnucation Skills	COMM	101

Third Year

Courses	Course Code	
First Semester		
General & Systemic Pathology	PATD	301
Microbiology , Immunology & Parasitology	MICD	301
Pharmacology	PHAD	301
Oral Pathology	OBCS	334
Oral Histology	OBCS	322
Operative Dentistry	CDS	311
Removable Prosthodontics	OMR	323
Biomaterials	CDS	333
Second Semester		
Oral Radiology	OBCS	377
Biostatistics	PDS	334
General & Systemic Pathology	PATD	301
Microbiology , Immunology & Parasitology	MICD	301
Pharmacology	PHAD	301
Oral Pathology	OBCS	334

Oral Histology	OBCS	322
Operative Dentistry	CDS	311
Removable Prosthodontics	OMR	323
Biomaterials	CDS	333

Fourth Year

Courses	Course Code	
First Semester		
General Medicine	MEDD	401
General Surgery	SURD	401
Pain Control and Anesthestia	OMR	412
Diagnostic Oral Radiology	OBCS	477
Oral Diagnosis treatment Planning	OBCS	468
Operative Dentistry	CDS	411
Endodontics	CDS	422
Removable Prosthodontics	OMR	423
Fixed Prosthodontics	OMR	434
Periodontics	OBCS	445
Second Semester		
General Medicine	MEDD	401
General Surgery	SURD	401
Oral Biology & Nutrition	OBCS	411
Pedodontics	PDS	411
Orthodontics	PDS	422
Operative Dentistry	CDS	411
Endodontics	CDS	422
Removable Prosthodontics	OMR	423

| Fixed Prosthodontics | OMR | 434 |
| Periodontics | OBCS | 445 |
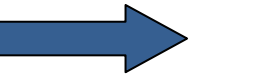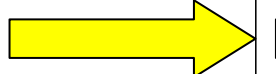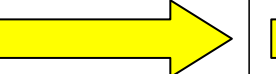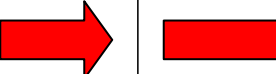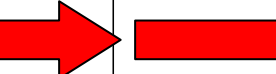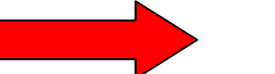
Fifth Year

Courses	Course Code	
First Semester		
Oral Surgery	OMR	511
Endodontics	CDS	522
Removable Prosthodontics	OMR	523
Fixed Prosthodontics	OMR	534
Pedodontics	PDS	511
Operative Dentistry	CDS	511
Orthodontics	PDS	522
Periodontics	OBCS	545
Oral Medicine	OBCS	556
Second Semester		
Oral Surgery	OMR	511
Endodontics	CDS	522
Removable Prosthodontics	OMR	523
Fixed Prosthodontics	OMR	534
Pedodontics	PDS	511
Operative Dentistry	CDS	511
Orthodontics	PDS	522
Periodontics	OBCS	545
Oral Medicine	OBCS	556
Pharmacology	PHAD	501

Sixth Year

Courses	Course Code	
First Semester		
Oral Surgery	OMR	611
Community Dental Practice	PDS	633
Pedodontics Comprehensive Care Clinics	PDS	615
Orthodontics Comprehensive Care Clinics	PDS	626
Comprehensive Care Clinics (Adults & Geriatric)	CCC	600
Second Semester		
Oral Surgery	OMR	611
Community Dental Practice	PDS	633
Pedodontics Comprehensive Care Clinics	PDS	615
Orthodontics Comprehensive Care Clinics	PDS	626
Comprehensive Care Clinics (Adults & Geriatric)		

A.2. KAUFD Curriculum Distribution throughout academic years

	1st Year *Foundation Year		2nd Year		3rd Year		4th Year		5th Year		6th Year	
	1st Semester	2nd Semester	1st Semester	2nd Semester	1st Semester	2nd Semester	1st Semester	2nd Semester	1st Semester	2nd Semester	1st Semester	2nd Semester
Knowledge	➡		➡		➡		➡		➡		➡	
Basic Medical Science**			➡		➡		➡ **					
Basic Dental Science			➡		➡		➡					
Clinical Skills Lab					➡		➡					
Clinical Skills Dental								➡	➡		➡	

*Foundation year: For Medical, Dental, and Allied Science students

** Basic Medical Sciences: Medicine, Surgery and Pharmacology

Queen Mary
University of London

Queen Mary, University of London
Joint R @ D Office
24-26 Walden Street
Whitechapel
London
E1 2AN

Queen Mary Research Ethics Committee
Hazel Covill
Research Ethics Committee Administrator
Tel: +44 (0) 20 7882 2207
Email: h.covill@qmul.ac.uk

c/o Professor Elizabeth Davenport
Institute of Dentistry
QMUL
Whitechapel Campus
London

4th September 2007

To Whom It May Concern:

Re: QMREC2007/39 - The Reflective Process Among Undergraduate Dental Students: The Impact of Age, Gender, Learning Styles, Learning Approaches and the Dental Environment.

The above study was conditionally approved by the Queen Mary Research Ethics Committee on the 11th July 2007; the full approval was ratified by the Chairman on 28th August 2007.

This approval is valid for a period of two years, (if the study is not started before this date then the applicant will have to reapply to the Committee).

This approval is also conditional upon the researcher supplying a progress report to the Committee either on completion; or if the study takes longer than a year to complete; annually.

Yours faithfully

Dr. Richard Nicholson – QMREC Chairman.

A.4. Letter to Saudi Cultural Attaché Office

Barts and The London
Queen Mary's School of Medicine and Dentistry

His Excellency, Mr. Abdullah Al Nasser
Saudi Cultural Attaché
Saudi Arabian Cultural Office, London
29 Belgrave Square
London SW1X 8QB

July 20th 2007

Dear Mr. Abdullah Al Nasser

Re: Amal Sindi (number: K629)
Amal Sindi is registered as an internal PhD student at Barts and
The London Queen Mary's School of Medicine and Dentistry. She applied
to come and work with myself to complete a PhD in dental education, after
meeting me during the ADEE visitation to King Abdul Aziz University, faculty
of Dentistry in 2005.

She is in the process of obtaining ethical approval for pilot work here in the United
Kingdom (Ref. number: QMREC2007/39 - The Reflective Process among Undergraduate
Dental Students: The Impact of Age, Gender, Learning Styles, Learning Approaches and
the Dental Environment). However, the bulk of the study will be conducted in KAUFD.
It is our intention investigating the students during the academic year 2007-08.

Dr Jamila Farsi (Assistant Professor in the department of Oral Basic & Clinical Sciences
Department, Faculty of Dentistry King Abdul Aziz University) has agreed to supervise
the collection of the data. The analysis and continuing discussion about design will be
carried out in the UK.

We would therefore very much appreciate it if you would contact Dr. Ali Al-Ghamdi
(Chairman of Oral Basic & Clinical Sciences Department) at the Dental Faculty in King
Abdul Aziz University so that permission is granted to carry out the study amongst the
entire dental undergraduate student body. The study will investigate the students' learning
styles, how they approach studying, and how they reflect and finally the effect of the
learning environment on their learning using DREEM (see study design outline attached).

I look forward to your reply and your continuing support of Ms Sindi.

Yours sincerely

Elizabeth S Davenport
Professor Dental Education
Oral Growth and development
Institute of Dentistry
Turner Street
London E1 2AD

Cc: Prof W Marcenes
     Dr Jamila Farsi

A.5. Approval of Study from Cultural Attaché Office

بسم الله الرحمن الرحيم

Royal Embassy of Saudi Arabia

Cultural Bureau

London

المملكة العربية السعودية

وزارة التعليم العالي

المكتب الثقافي في بريطانيا

الأكاديمية

رقم الملف : K 629

الأخت المكرمة المبتعثة / أمل بنت محمد بكر سندي   المحترمة

السلام عليكم ورحمة الله وبركاته، وبعد،

نود إفادتك بصدور قرار جامعة الملك عبدالعزيز رقم ١٢٤٦٧/ق في ١٤٢٨/١٠/٢٢هـ القاضي بالموافقة على طلب قيامك برحلة علمية إلى المملكة لمدة ثلاثة أشهر لغرض جمع المعلومات المتعلقة ببحثك لدرجة الدكتوراه وتكليف الدكتور/ جميلة بنت محمد علي فارس بالإشراف الداخلي عليك أثناء قيامك بالرحلة العلمية، على أن يتم رفع تقرير عما تم إنجازه خلال هذه الرحلة بعد استكمالها.

للإحاطة بذلك، علماً بأن تاريخ بدء الرحلة العلمية سيكون في شهر مايو ٢٠٠٨م بناءً على الطلب المقدم منك.

مع تمنياتنا لك بالتوفيق،،،

الملحق الثقافي في بريطانيا

عبدالله بن محمد الناصر

اص / ح ي

A.6. Ethics Approval for the KAUFD study (QMREC2007/67)

Queen Mary
University of London

Queen Mary, University of London

Joint R & D Office

24-26 Walden Street

Whitechapel

London

E1 2AN

Queen Mary Research Ethics Committee

Hazel Covill

Research Ethics Committee Administrator

Tel: +44 (0) 20 7882 2207

Email: h.covill@qmul.ac.uk

c/o Professor Elizabeth Davenport
Centre for Oral Growth & Development (Paediatric Dentistry)
Institute of Dentistry
Queen Mary's School of Medicine & Dentistry
Turner Street
Whitechapel
London, E1   14th January 2008

To Whom It May Concern:

Re: QMREC2007/67 – The Reflective Process Among Saudi Dental Students: The impact of Age, Gender, Learning Approaches and the Dental Environment.

The above study was approved in full by The Queen Mary Research Ethics Committee on the 21st November 2007.

This approval is valid for a period of two years, (if the study is not started before this date then the applicant will have to reapply to the Committee).

Yours faithfully

Ms Elizabeth Hall – QMREC Chair.

A.7. Circular e-mail copy to students for information on the Reflective study

Barts and The London
Queen Mary's School of Medicine and Dentistry

Circular email for recruitment of volunteers for a research study to investigate the reflective process among undergraduate dental students at Barts and The London, Queen Mary's School of Medicine and Dentistry (QMUL) and King AbdulAziz University Faculty of Dentistry (KAUFD)

Title:

The Reflective Process among Undergraduate Dental Students: the Impact of Age, Gender, Learning styles, Learning Approaches and the Dental Environment

This research project contributes to the College's role in conducting research, and teaching research methods. You are under no obligation to reply to this email, however if you choose to, participation in this research is voluntary and you may withdraw at anytime.

We would like to invite you to participate in this postgraduate research project. Please take time to read the following information carefully and discuss it with others if you wish. Please feel free to ask us if there is anything that is not clear or if you would like more information.

The main aim of this research is to investigate the effect of age, gender, socioeconomic status, learning styles, learning approaches and learning environment on the students' knowledge and their reflective process. The reflective process has been shown to encourage learners to gain new insights and understanding about themselves and their environment. In addition, there is also a positive correlation between the students' perception of their environment and their achievements and success. The duty of educators is to provide a suitable learning environment to enable the student to benefit in his/her clinical practice through reflection. It is also to promote lifelong learning and continuing professional development.

If you decide to take part in this study you will be asked to participate in one session lasting up to 45 minutes, during which:

- We will ask you to record your demographic data.

- We will ask you to fill out four structured questionnaires to explore your 1) learning styles, 2) learning approaches, 3) reflection and 4) your opinion on your education/learning environment.

And we will seek your permission to obtain your academic achievement from your records.

Your participation will lead to a better understanding of students' learning styles, learning approaches, reflective process and the learning environment.

Primary Investigator: Prof. Elizabeth S. Davenport
e.s.davenport@qmul.ac.uk
Researcher: Amal M. Sindi
a.m.sindi@qmul.ac.uk

A.8. Response rates for the Saudi study throughout the academic years

1. Response Rates for the Reflection Questionnaire February/March 2008 (Group A)

Year Cohort		Females	Males	Overall
1	**Number**	44/56	39/46	83/102
	Response rate	78.6%	84.8%	81.4%
2	**Number**	50/68	53/63	103/131
	Response rate	73.6	84%	78.6%
3	**Number**	50/61	33/44	83/105
	Response rate	82%	75%	79%
4	**Number**	42/51	41/45	83/96
	Response rate	82.3%	91%	86.5%
5	**Number**	50/59	36/47	86/106
	Response rate	84.7%	76.6%	81%
6	**Number**	39/56	20/28	59/84
	Response rate	69.6%	71.4%	70%
Overall	**Number**	275/351	222/273	
	Response rate	78.3%	81.3%	

Overall Students:
Number: 497/624

Response rate: 79.6%

Questionnaires:

1 through 6 year cohorts responded: 1. Index of learning Styles (44 items) ILS
                            2. Approach to learning and studying (18 items) ALSI
                            3. Reflection in learning questionnaire (15 items) RLS
                            4. DREEM (50 items)

2. Response Rates for the Reflection Questionnaire October/November 2008 (Group B)

Year Cohort		Females	Males	Overall
1	Number	62/66	58/62	120/128
	Response rate	94%	93.5%	94%
2	Number	65/67	47/60	112/127
	Response rate	97%	78.3%	88%
3	Number	51/62	33/39	84/101
	Response rate	82%	84.6%	83%
4	Number	48/52	38/44	86/96
	Response rate	92%	86%	89.6%
5	Number	52/58	42/46	94/104
	Response rate	89.6%	91.3%	90.4%
Overall	Number	278/305	218/251	
	Response rate	91%	86.9%	

Overall Students:
Number: 496/556

Response rate: 89.2%

Questionnaires:

1, 3 and 5 year cohorts responded to:1. Index of learning Styles (44 items) ILS
2. Approach to learning and studying (18 items) ALSI
3. Reflection in learning questionnaire (15 items) RLS

2 and 4 year cohorts responded to: . Index of learning Styles (44 items) only ILS.

3. Response Rates for the Reflection Questionnaire May/June 2009 (Group C)

Year Cohort		Females	Males	Overall
1	Number	41/66	47/62	88/128
	Response rate	62%	75.8%	68.75%
2	Number	57/67	51/60	108/127
	Response rate	85%	85%	85%
3	Number	57/62	33/39	90/101
	Response rate	93%	84.6%	89%
4	Number	39/52	38/44	77/96
	Response rate	75%	86%	80%
5	Number	51/58	40/46	91/104
	Response rate	88%	87%	87.5%
Overall	Number	245/305	209/251	
	Response rate	80%	83%	

Overall Students:
Number: 454/556

Response rate: 85.65%

Questionnaires:

1 through 4 year cohorts responded: 1. Reflection in learning questionnaire (15 items) RLS
      2. DREEM questionnaire (50 items)

5 year cohort responded: 1. Index of learning Styles (44 items) ILS
      2. Approach to learning and studying (18 items) ALSI
      3. Reflection in learning questionnaire (15 items) RLS
      4. DREEM questionnaire (50 items)

Appendix B:

B.1. Information sheet for the pilot and main study

B.2.Demographic data collection for the questionnaire (pilot and main study)

B.3. Occupation guide for Saudi Study

B.4. List of Variables for the pilot and main study

B.5. ILS questionnaire and scoring guide

B.6. ALSI questionnaire and scoring guide

B.7. RLS questionnaire

B.8. DREEM questionnaire and scoring guide

B.1. Information sheet for the pilot and main study

Barts and The London
Queen Mary's School of Medicine and Dentistry

Participants Information sheet

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

The Reflective Process Among Undergraduate Dental Students: The Impact of Age, Gender, Learning styles, Learning Approaches and the Dental Environment

We would like to invite you to participate in this postgraduate research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way and will not affect your progress through the course in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

The main aim of this study is to investigate the effect of age, gender, socioeconomic status, learning styles, learning approaches and learning environment on the students' knowledge and their reflection. The reflective process has been shown to encourage learners to gain new insights and understanding about themselves and their environment. In addition, it will promote lifelong learning and continuous professional development.

If you decide to take part in this study you will be asked to participate in one session lasting up to 45 minutes, during which: 1. You will be asked to record your personal data. 2. With your permission your academic achievement will be obtained. 3. You will be asked to fill out four questionnaires which explore your learning styles, learning approaches, reflection and your opinion on the education/learning environment

Your participation will lead to a better understanding of your learning styles, learning approaches, reflective process and the learning environment.

All efforts will be made to insure confidentiality of your name and data by use of a special coding system and only the primary investigator and researcher will have access to this information.

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. A decision to withdraw at any time, or a decision not to take part, will not affect your progress through the course in any way.

In the event of you suffering any adverse effects as a consequence of your participation in this study, you will be compensated through Queen Mary University of London's 'No Fault Compensation Scheme'.

B.2.Demographic data collection for the questionnaire (pilot and main study)

![Barts and The London - Queen Mary's School of Medicine and Dentistry]

Questionnaire For the Research Project: The Reflective Process among Undergraduate Dental students: The Impact of Age, Gender, Learning Styles, Learning Approaches and the Dental Environment

These questionnaires are a follow up to the previous questionnaires, and should take no more than 20 minutes to complete, are constructed to investigate the effect of age, gender, socioeconomic status, learning styles, learning approaches and learning environment on your knowledge and reflective process.

If you have any questions about these questionnaires please free to contact Dr. Amal Sindi or Prof. Liz Davenport or Dr. Jamila Farsi (contact details below).

The questionnaires will be coded and in some cases a follow up interview will take place for some of the participants and with their approval their comments can be quoted. All precautions will be taken to ensure confidentiality of your name and personal data. The information obtained will be used only for the research purpose and will be stored in a secure place and only the principal investigator and researcher will have access to the data. You have a right to withdraw if you leave the course/programme, in case of deferment, illness or simply if you do not wish to participate in this research

'I consent to the processing of my personal information for the purposes of this research study. I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.'

To begin the questionnaires, would you please answer some questions about yourself:

A. Computer number: ☐☐☐☐☐☐

B. Year of study: 1   2   3   4   5   6   **(please circle)**

C. Gender: Female / Male   **(please circle)**

D. My age: 17-20   21-24   25-28   **(please circle)**

E. Please choose from one of the following:

1. Residency: ☐ Apartment   ☐ Villa

2. Ownership: ☐ Own   ☐ Rent

3. Monthly Income:

Less than 2,000 SR ☐

2,000 – 5,000 SR   ☐

5,000 – 10,000 SR   ☐

More than 10,000 SR ☐

F. <u>Please provide the following:</u>

A. Education of Father/Guardian: Education of Mother/Guardian:

B. Occupation of Father/Guardian: Occupation of Mother/Guardian:

 Specify: Specify:

Thank you for your participation and assistance in our evaluation of the learning styles, learning approaches, reflective process and the learning environment.

Professor Elizabeth S. Davenport

Professor of Dental Education

Queen Mary, University of London
e.s.davenport@qmul.ac.uk

Dr. Amal M. Sindi

Postgraduate research student

Queen Mary, University of London

a.m.sindi@qmul.ac.uk

Dr. Jamila Farsi

Head Oral Biology/ Oral

Oral Histology Division

KAU Faculty of Dentistry

Ext. 23289

B.3 Occupation Guide for Saudi Study

1. Managers and Senior Officials

Corporate managers and senior officials (self owned)   تجار و اصحاب محلات تجارية
Production managers
Purchasing managers
Advertising and public relations managers
Personnel, training and industrial relations managers
Information and communication technology managers
Quality assurance managers
Managers in distribution, storage and retailing
Health and social services managers
Hotel and accommodation mangers
Restaurant and catering managers
Travel agency managers
Property, housing and land managers
Shopkeepers and wholesale/retail dealers

2. Professional Occupations (A):
  • Civil city worker (موظف بلدية) executive – Inspection – Other
  • Non-Government engineering Professionals:
       Civil engineer
       Mechanical engineer
       Electronic engineer
       Electrical engineer
       Chemical engineer
       Design and development engineer
       Engineer professional
  • IT strategy and planning professionals
       Software professionals
  • Health Professionals
       Medical practitioner
       Pharmacist
       Ophthalmic opticians
       Dental practitioner
       Veterinarian
  • Lab technicians
  • Research Professionals
  • Lawyer and Judge Professions
  • Accountants
  • Social workers
  • Librarians

2. Continued from Professional Occupations (B):

Teaching Professionals
    Higher education teaching professionals
    Further education teaching professionals
    Education officers, school inspectors'   موجهة
    Secondary education teaching professionals
    Primary and nursery education teaching professionals
    Special needs education teaching professionals
    Registrars and senior administrators of educational establishment
    Teaching profession

3. Associate professional and Science and Technology Occupations

    Technicians (specify)
    Nurses
    Midwives
    Paramedics
    Ambulance staff (excluding paramedics)
    Medical radiographer
    Medical and dental technicians
    Therapist (specify)
    Social welfare associate professionals

4. Protective service Occupations

    Police Officers الشرطة و قوة الامن
    رئيس رقباء — ملازم أول — نقيب — مقدم — عقيد — عميد — لواء — فريق — فريق أول
    جندي — جندي أول — عريف — وكيل رقيب - رقيب

5. Artistic and Literary Occupations

    Artist
    Author, writer
    Musicians

6. Media Associate Professionals
    اللأعلام

7. Transport Professionals

    Air traffic controllers
    Aircraft pilots and flight engineers
    Ship and hovercraft officers

8. Secretarial and Related Occupations

Medical secretary
Legal secretary
School secretary
Company secretaries
Personal assistants and other secretaries
Receptionist
Typist

9. Skilled Trades

Textile, garments and related trades
Chefs and cooks
Furniture makers and other craft woodworks
Fishing and agriculture related occupations

10. Elementary Administration Occupations

Postal worker
Mail sorter

11. Transport and Mobile Machine Drivers and Operatives

Heavy goods vehicle drivers
Bus and coach drivers
Taxi, cab drivers and chauffeurs
Driving instructors

B.4 List of Variables for the Pilot and Main Study:

Independent Variables:
1. Gender (Male, Female)
2. Age (3 categories)
3. Ethnicity (as before 3 categories)
4. Socioeconomic status (as before 4 categories)
5. Academic Achievement (5 categories)

Outcome Variables:

1. Learning Styles: active/reflective; sensitive/intuitive; visual/verbal/; sequential/global

2. Learning approach: deep ; surface ; monitoring ; organized effort

Low	Medium	High
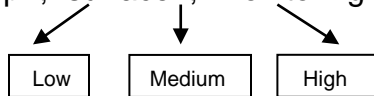
3. Reflection: questions from 1-14: score from: 14-44: restricted

45-59: partial

60-73: ample

74-98: maximal

Question 15: self efficacy student rates himself or herself: restricted, partial, ample or maximal

4. DREEM and Subscales: questions 1-50,

Overall DREEM: 0-50: very poor

51-100: plenty of problems

101-150: more positive than negative

151-200: excellent

DREEM Subscales:

1. Perceptions of learning scale:
 Scores from: 0-12   very poor

13-24   teaching is viewed negatively

25-36   a more positive perception

37-48   teaching is highly thought of

2. Perceptions of teachers scale:
Scores form: 0-11   abysmal
12-22   in need of some retraining
23-33   moving in the right direction
34-44 model course organizers

3. Academic self-perception scale:
Scores from: 0-8   feeling of total failure
9-16   many negative aspects
17-24 feeling more on positive side
25-32 confident

4. Perceptions of atmosphere scale:
Scores from: 0-12: a terrible environment
13-24   there are many issues which need changing
25-36   a more positive attitude
37-48   a good feeling overall

5. Social self-perceptions scale:
Scores from: 0-7   miserable
8-14   not a nice place
15-21   not too bad
22-28   very good socially

5. Academic achievement:
Fail: below 44%
Borderline: 45-49%
Pass: 50-59%
Merit :60-69%
Distinction 70 % over

INDEX OF LEARNING STYLES[*]

DIRECTIONS

Enter your answers to every question on the ILS scoring sheet. Please choose only one answer for each question. If both "a" and "b" seem to apply to you, choose the one that applies more frequently.

1. I understand something better after I
a) try it out.
b) think it through.

2. I would rather be considered
a) realistic.
b) innovative.

3. When I think about what I did yesterday, I am most likely to get
a) a picture.
b) words.

4. I tend to
a) understand details of a subject but may be fuzzy about its overall structure.
b) understand the overall structure but may be fuzzy about details.

5. When I am learning something new, it helps me to
a) talk about it.
b) think about it.

6. If I were a teacher, I would rather teach a
course **a)** that deals with facts and real life
situations. **b)** that deals with ideas and theories.

7. I prefer to get new information in
a) pictures, diagrams, graphs, or maps.
b) written directions or verbal information.

8. Once I understand
a) all the parts, I understand the whole thing.
b) the whole thing, I see how the parts fit.

9. In a study group working on difficult material, I am more likely to
a) jump in and contribute ideas.
b) sit back and listen.

---

10. I find it easier
a) to learn facts.
b) to learn concepts.

11. In a book with lots of pictures and charts, I am likely to
a) look over the pictures and charts carefully.
b) focus on the written text.

12. When I solve math problems
a) I usually work my way to the solutions one step at a time.
b) I often just see the solutions but then have to struggle to figure out the steps to get to them.

13. In classes I have taken
a) I have usually gotten to know many of the students.
b) I have rarely gotten to know many of the students.

14. In reading nonfiction, I prefer
a) something that teaches me new facts or tells me how to do something.
b) something that gives me new ideas to think about.

15. I like teachers
a) who put a lot of diagrams on the board.
b) who spend a lot of time explaining.

16. When I'm analyzing a story or a novel
a) I think of the incidents and try to put them together to figure out the themes.
b) I just know what the themes are when I finish reading and then I have to go back and find the incidents that demonstrate them.

17. When I start a homework problem, I am more likely to
a) start working on the solution immediately.
b) try to fully understand the problem first.

18. I prefer the idea of
a) certainty.
b) theory.

19. I remember best
a) what I see.
b) what I hear.

20. It is more important to me that an instructor
a) lay out the material in clear sequential steps.
b) give me an overall picture and relate the material to other subjects.

21. I prefer to study
a) in a study group.
b) alone.

22. I am more likely to be considered
a) careful about the details of my work.
b) creative about how to do my work.

23. When I get directions to a new place, I prefer
a) a map.
b) written instructions.

24. I learn
a) at a fairly regular pace. If I study hard, I'll "get it."
b) in fits and starts. I'll be totally confused and then suddenly it all "clicks."

25. I would rather first
a) try things out.
b) think about how I'm going to do it.

26. When I am reading for enjoyment, I like writers to
a) clearly say what they mean.
b) say things in creative, interesting ways.

27. When I see a diagram or sketch in class, I am most likely to remember
a) the picture.
b) what the instructor said about it.

28. When considering a body of information, I am more likely to
a) focus on details and miss the big picture.
b) try to understand the big picture before getting into the details.

29. I more easily remember
a) something I have done.
b) something I have thought a lot about.

30. When I have to perform a task, I prefer to
a) master one way of doing it.
b) come up with new ways of doing it.

31. When someone is showing me data, I prefer
a) charts or graphs.
b) text summarizing the results.

32. When writing a paper, I am more likely to
a) work on (think about or write) the beginning of the paper and progress forward.
b) work on (think about or write) different parts of the paper and then order them.

33. When I have to work on a group project, I first want to
a) have "group brainstorming" where everyone contributes ideas.
b) brainstorm individually and then come together as a group to compare ideas.

34. I consider it higher praise to call someone
a) sensible.
b) imaginative.

35. When I meet people at a party, I am more likely to remember
a) what they looked like.
b) what they said about themselves.

36. When I am learning a new subject, I prefer to
a) stay focused on that subject, learning as much about it as I can.
b) try to make connections between that subject and related subjects.

37. I am more likely to be considered
a) outgoing.
b) reserved.

38. I prefer courses that emphasize
a) concrete material (facts, data).
b) abstract material (concepts, theories).

39. For entertainment, I would rather
a) watch television.
b) read a book.

40. Some teachers start their lectures with an outline of what they will cover. Such outlines are
a) somewhat helpful to me.
b) very helpful to me.

41. The idea of doing homework in groups, with one grade for the entire group,
a) appeals to me.
b) does not appeal to me.

42. When I am doing long calculations,
a) I tend to repeat all my steps and check my work carefully.
b) I find checking my work tiresome and have to force myself to do it.

43. I tend to picture places I have been
a) easily and fairly accurately.
b) with difficulty and without much detail.

44. When solving problems in a group, I would be more likely to
a) think of the steps in the solution process.
b) think of possible consequences or applications of the solution in a wide range of areas.

ILS SCORING SHEET

1. Put "1"s in the appropriate spaces in the table below (e.g. if you answered "a" to
Question 3, put a "1" in Column A by Question 3).

2. Total the columns and write the totals in the indicated spaces.

3. For each of the four scales, subtract the smaller total from the larger one. Write the difference (1 to 11) and the letter (a or b) for which the total was larger on the bottom line.

For example, if under "ACT/REF" you had 4 "a" and 7 "b" responses, you would write "3b" on the bottom line under that heading..

4. On the next page, mark "X"s above your scores on each of the four scales.

ACT/REF			SNS/INT			VIS/VRB			SEQ/GLO		
Q	a	b	Q	a	b	Q	a	b	Q	a	b
1	___	___	2	___	___	3	___	___	4	___	___
5	___	___	6	___	___	7	___	___	8	___	___
9	___	___	10	___	___	11	___	___	12	___	___
13	___	___	14	___	___	15	___	___	16	___	___
17	___	___	18	___	___	19	___	___	20	___	___
21	___	___	22	___	___	23	___	___	24	___	___
25	___	___	26	___	___	27	___	___	28	___	___
29	___	___	30	___	___	31	___	___	32	___	___
33	___	___	34	___	___	35	___	___	36	___	___
37	___	___	38	___	___	39	___	___	40	___	___
41	___	___	42	___	___	43	___	___	44	___	___

Total (sum X's in each column)

ACT/REF		SNS/INT		VIS/VRB		SEQ/GLO	
a	b	a	b	a	b	a	b
___	___	___	___	___	___	___	___

(Larger – Smaller) + Letter of Larger (see below[*])

*Example: If you totaled 3 for a and 8 for b, you would enter 5b in the space below.

Transfer your scores to the ILS report form by placing X's at the appropriate locations on the four scales.

ILS REPORT FORM

ACT												REF
	11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b

SEN												INT
	11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b

VIS												VRB
	11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b

SEQ												GLO
	11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b

If your score on a scale is 1-3, you are fairly well balanced on the two dimensions of that scale.

If your score on a scale is 5 or 7, you have a moderate preference for one dimension of the scale and will learn more easily in a teaching environment which favors that dimension.

If your score on a scale is 9 or 11, you have a very strong preference for one dimension of the scale. You may have real difficulty learning in an environment which does not support that preference.

See "Learning Styles and Strategies" by Richard Felder and Barbara Soloman for explanations of your preferences on the individual scales.

1   Approaches to learning and studying   ▲

You may have already filled out a longer questionnaire about your *general* approaches to studying, but this time we want you to relate your answers directly to **this particular course unit or module**. Please give your immediate reaction to **every** comment, indicating how you really have been studying.

Put a cross in the box to indicate how strongly you agree with **each** of the following statements.

✓ = *agree*   ✓? = *agree somewhat*   ✗? = *disagree somewhat*   ✗ = *disagree*

Try not to use **??** = *unsure* unless you really have to, or if it cannot apply to you or your course unit.

	✓	✓?	??	✗?	✗
1. I've often had trouble in making sense of the things I have to remember.	☐	☐	☐	☐	☐
2. I've been over the work I've done to check my reasoning and see that it makes sense.	☐	☐	☐	☐	☐
3. I have usually set out to understand for myself the meaning of what we had to learn.	☐	☐	☐	☐	☐
4. I have generally put a lot of effort into my studying.	☐	☐	☐	☐	☐
5. Much of what I've learned seems no more than lots of unrelated bits and pieces in my mind.	☐	☐	☐	☐	☐
6. In making sense of new ideas, I have often related them to practical or real life contexts.	☐	☐	☐	☐	☐
7. On the whole, I've been quite systematic and organised in my studying.	☐	☐	☐	☐	☐
8. Ideas I've come across in my academic reading often set me off on long chains of thought.	☐	☐	☐	☐	☐
9. I've looked at evidence carefully to reach my own conclusion about what I'm studying.	☐	☐	☐	☐	☐
10. When I've been communicating ideas, I've thought over how well I've got my points across.	☐	☐	☐	☐	☐
11. I've organised my study time carefully to make the best use of it.	☐	☐	☐	☐	☐
12. It has been important for me to follow the argument, or to see the reasons behind things.	☐	☐	☐	☐	☐
13. I've tended to take what we've been taught at face value without questioning it much.	☐	☐	☐	☐	☐
14. I've tried to find better ways of tracking down relevant information in this subject.	☐	☐	☐	☐	☐
15. Concentration has not usually been a problem for me, unless I've been really tired.	☐	☐	☐	☐	☐
16. In reading for this course unit, I've tried to find out for myself exactly what the author means.	☐	☐	☐	☐	☐
17. I've just been going through the motions of studying without seeing where I'm going.	☐	☐	☐		
18. If I've not understood things well enough when studying, I've tried a different approach.					

Key to Scales and Items

Unreflective studying   (2 items)

19. I'm just going through the motions of studying without seeing where I'm going.
31. I tend to just learn things without thinking about the best way to work.

Fragmented knowledge (2 items)

4. Topics are presented in such complicated ways I often can't see what is meant.
21. Much of what I've learned seems no more than lots of unrelated bits and pieces in my mind.

Unthinking acceptance   (2 items)

11. I tend to take what we are taught at face value without questioning it much.
29. I don't think through topics for myself, I just rely on what we're taught.

Monitoring studying   (8 item scale)

Monitoring study effectiveness   (2 items)

5.   When I've finished a piece of work, I check to see it really meets the requirements.
23. I think about what I want to get out of my studies so as to keep my work well focused.

Monitoring understanding   (3 items)

14. If I'm not understanding things well enough when I'm studying, I try a different approach.
26. I go over the work I've done to check my reasoning and see that it makes sense.
36. I pay careful attention to any advice or feedback I'm given, and try to improve my understanding.

Monitoring generic skills   (3 items)

2.   When I'm communicating ideas, I think over how well I've got my points across.
12. For an essay or report, I don't just focus on the topic, I try to improve my writing skill.
34. I try to find better ways of tracking down relevant information in my subject.

Organised studying   (6 item scale)

Study organisation   (2 items)

8.   On the whole, I'm quite systematic and organised in my studying.
10. I'm quite good at preparing for classes in advance.

Time management   (4 items)

3.   I'm pretty good at getting down to work whenever I need to.
16. I carefully prioritise my time to make sure I can fit everything in.
25. I organise my study time carefully to make the best use of it.
32. I work steadily during the course, rather than just leaving things until the last minute.

Effort management   (6 item scale)

Effort   (4 items)

7.   I try really hard to do just as well as I possibly can.
18. I generally keep working hard even when things aren't going all that well.
22. I generally put a lot of effort into my studying.
28. Whatever I'm working on, I generally push myself to make a good job of it.

Concentration   (2 items)

20. Concentration is not usually a problem for me, unless I'm really tired.
30. When I find something boring, I can usually force myself to keep focused.

ALSI questionnaire Scoring guide for the Reflective Study

Experiences of Teaching and Learning Questionnaire

Approaches to learning and studying   (ETLQ)

(The sub-scales indicate the origins of the items, but are not long enough to be scored separately.)

agree = 5, agree somewhat = 4, unsure = 3, disagree somewhat = 2, disagree = 1

Deep approach   (6 item scale)

Intention to understand for oneself   (2 items)

3. I have usually set out to understand for myself the meaning of what we had to learn.
16. In reading for this course, I've tried to find out for myself exactly what the author means.

Relating ideas (including constructivist learning)   (2 items)

6.   In making sense of new ideas, I have often related them to practical or real life contexts.
8.   Ideas I've come across in my academic reading often set me off on long chains of thought.

Use of evidence   (2 items)

9.   I've looked at evidence carefully to reach my own conclusion about what I'm studying.
12. It has been important for me to follow the argument, or to see the reasons behind things.

Surface approach   (4 item scale)

Memorising without understanding   (1 item)

1.   I've often had trouble in making sense of the things I have to remember.

Unreflective studying   (1 item)

17. I've just been going through the motions of studying without seeing where I'm going.

Fragmented knowledge   (1 item)

5.   Much of what I've learned seems no more than lots of unrelated bits and pieces in my mind.

Unthinking acceptance   (1 item)

13. I've tended to take what we've been taught at face value without questioning it much.

Monitoring studying   (4 item scale)

Monitoring study effectiveness   (0 items)

Monitoring understanding   (2 items)

2.   I've been over the work I've done to check my reasoning and see that it makes sense.

18. If I've not understood things well enough when studying, I've tried a different approach.

Monitoring generic skills   (2 items)

10. When I've been communicating ideas, I've thought over how well I've got my points across.

14. I've tried to find better ways of tracking down relevant information in this subject.

Organised studying and effort management   (4 item scale)

Organised studying   (1 item)

7.   On the whole, I've been quite systematic and organised in my studying.

Time management (1 item)

11. I've organised my study time carefully to make the best use of it.

Effort   (1 item)

4.   I have generally put a lot of effort into my studying.

Concentration   (1 item)

15. Concentration has not usually been a problem for me, unless I've been really tired.

Perceptions of the teaching-learning environment   (ETLQ)

agree = 5, agree somewhat = 4, unsure = 3, disagree somewhat = 2, disagree = 1

Organisation, structure and content   (3 item scale)

1.   It was clear to me what I was supposed to learn in this course unit.

2. The topics seemed to follow each other in a way that made sense to me.

4. The course unit was well organised and ran smoothly.

Alignment   (3 item scale)

6.   What we were taught seemed to match what we were supposed to learn.

18. How this unit was taught fitted in well with what we were supposed to learn.

33. I could see how the set work fitted in with what we were supposed to learn.

Integration of teaching and learning materials   (3 item scale)

9.   The handouts and other materials we were given helped me to understand the unit

14. The different types of teaching (lectures, tutorials, labs, etc.) supported each other well.

15. Plenty of examples and illustrations were given to help us to grasp things better.

Choice   (2 item scale)

3.   We were given a good deal of choice over how we went about learning.

5.   We were allowed some choice over what aspects of the subject to concentrate on.

Encouraging high quality learning (5 item scale)

10. On this unit I was prompted to think about how well I was learning and how I might improve.

12. We weren't just given information; staff explained how knowledge is developed in this subject.

13. The teaching encouraged me to rethink my understanding of some aspects of the subject.

16. This unit has given me a sense of what goes on 'behind the scenes' in this subject area.

17. The teaching in this unit helped me to think about the evidence underpinning different views.

Clarity and feedback about assessment   (5 item scale)

31. It was clear to me what was expected in the assessed work for this course unit.

32. I was encouraged to think about how best to tackle the set work.

35. The feedback given on my work helped me to improve my ways of learning and studying.

37. Staff gave me the support I needed to help me complete the set work for this course unit.

40. The feedback given on my set work helped to clarify things I hadn't fully understoo

B.7. RLS questionnaire:

Reference: Advanced in Health Science Education 10, pages 303-314

Appendix A

Table A.I. The Scale of Reflection-in-Learning

Please answer the items below in relation to your learning experiences in the medical programme. Draw a circle around the scale number closer to your usual behaviour

h	To what extent have I:	[1=Never 7=Always]
1.	Carefully planned my learning tasks in the courses and training activities of the medical program	1 2 3 4 5 6 7
2.	Talked with my colleagues about learning and methods of study	1 2 3 4 5 6 7
3.	Reviewed previously studied subjects during each term	1 2 3 4 5 6 7
4.	Integrated all topics in a course with each other and with those of other courses and training activities	1 2 3 4 5 6 7
5.	Mentally processed what I already knew and what I needed to know about the topics or procedures	1 2 3 4 5 6 7
6.	Been aware of what I was learning and for what purposes	1 2 3 4 5 6 7
7.	Sought out interrelations between topics in order to construct more comprehensive notions about some theme	1 2 3 4 5 6 7
8.	Pondered over the meaning of the things I was studying and learning in relation to my personal experience	1 2 3 4 5 6 7
9.	Conscientiously sought to adapt myself to the varied demands of the diferent courses and training activities	1 2 3 4 5 6 7
10.	Systematically reflected on how I was studying and learning in different contexts and circumstances	1 2 3 4 5 6 7
11.	Mindfully summarised what I was learning day in, day out, in my studies	1 2 3 4 5 6 7
12.	Exerted my capacity to reflect during a learning experience	1 2 3 4 5 6 7
13.	Diligently removed negative feelings in relation to aims, objects, behaviours, topics or problems pertaining to my studies	1 2 3 4 5 6 7
14.	Constructively self-assessed my work as a learner	1 2 3 4 5 6 7

F   Taking into account the perceptions previously referred, I consider that my personal skill or efficacy to practice the reflective process is

( )   Restricted. I actually require extensive additional preparation (orientation, support, evolvement, practice, and feedback).
( )   Partial. I just need incentives and opportunities.
( )   Ample. I have autonomy under favourable conditions.
( )   Maximal. I have full autonomy even under negative pressure (adverse context, no time).
      (Material reproduced from Medical Education. Permission granted from Blackwell Science.)

B.8. DREEM questionnaire and scoring guide

Dundee Ready Education Environment Measure

Please indicate whether you:
Strongly agree (SA), Agree (A), Unsure (U), Disagree (D), Strongly Disagree (SD) with the following statements. Circle the appropriate response.

1	I am encouraged to participate in class	SA	A	U	D	SD
2	The teachers are knowledgeable	SA	A	U	D	SD
3	There is a good support system for students who get stressed	SA	A	U	D	SD
4	I am too tired to enjoy this course	SA	A	U	D	SD
5	Learning strategies which worked for me before continue to work for me now	SA	A	U	D	SD
6	The teachers are patient with patients	SA	A	U	D	SD
7	The teaching is often stimulating	SA	A	U	D	SD
8	The teachers ridicule the students	SA	A	U	D	SD
9	The teachers are authoritarian	SA	A	U	D	SD
10	I am confident about my passing this year	SA	A	U	D	SD
11	The atmosphere is relaxed during the ward teaching	SA	A	U	D	SD
12	This school is well timetabled	SA	A	U	D	SD
13	The teaching is student centered	SA	A	U	D	SD
14	I am rarely bored on this course	SA	A	U	D	SD
15	I have good friends in this school	SA	A	U	D	SD
16	The teaching is sufficiently concerned to develop my competence	SA	A	U	D	SD
17	Cheating is a problem in this school	SA	A	U	D	SD
18	The teachers have good communications skills with patients	SA	A	U	D	SD
19	My social life is good	SA	A	U	D	SD
20	The teaching is well focused	SA	A	U	D	SD

21	I feel I am being well prepared for my profession	SA	A	U	D	SD
22	The teaching is sufficiently concerned to develop my confidence	SA	A	U	D	SD
23	The atmosphere is relaxed during lectures	SA	A	U	D	SD
24	The teaching time is put to good use	SA	A	U	D	SD
25	The teaching over-emphasises factual learning	SA	A	U	D	SD
26	Last year's work has been a good preparation for this year's work	SA	A	U	D	SD
27	I am able to memorise all I need	SA	A	U	D	SD
28	I seldom feel lonely	SA	A	U	D	SD
29	The teachers are good at providing feedback to students	SA	A	U	D	SD
30	There are opportunities for me to develop interpersonal skills	SA	A	U	D	SD
31	I have learned a lot about empathy in my profession	SA	A	U	D	SD
32	The teachers provide constructive criticism here	SA	A	U	D	SD
33	I feel comfortable in class socially	SA	A	U	D	SD
34	The atmosphere is relaxed during seminars/tutorials	SA	A	U	D	SD
35	I find the experience disappointing	SA	A	U	D	SD
36	I am able to concentrate well	SA	A	U	D	SD
37	The teachers give clear examples	SA	A	U	D	SD
38	I am clear about the learning objectives of the course	SA	A	U	D	SD
39	The teachers get angry in class	SA	A	U	D	SD
40	The teachers are well prepared for their classes	SA	A	U	D	SD
41	My problem solving skills are being well developed here	SA	A	U	D	SD
42	The enjoyment outweighs the stress of studying medicine	SA	A	U	D	SD

43	The atmosphere motivates me as a learner	SA	A	U	D	SD
44	The teaching encourages me to be an active learner	SA	A	U	D	SD
45	Much of what I have to learn seems relevant to a career in medicine	SA	A	U	D	SD
46	My accommodation is pleasant	SA	A	U	D	SD
47	Long term learning is emphasised over short term	SA	A	U	D	SD
48	The teaching is too teacher-centered	SA	A	U	D	SD
49	I feel able to ask the questions I want	SA	A	U	D	SD
50	The students irritate the teachers	SA	A	U	D	SD

A practical guide to using the Dundee Ready Education Environment Measure (DREEM)

Sean McAleer and Sue Roff

The DREEM

The DREEM contains 50 statements relating to a range of topics directly relevant to educational climate (Appendix 1). The inventory can be administered by postal survey or face-to-face in the classroom. Students are asked to read each statement carefully and to respond using a 5 point Likert-type scale ranging from strongly agree to strongly disagree. It is important that each student applies the items to his/her own current learning situation and responds to all 50.

Scoring the DREEM

Items should be scored as follows:

- 4 Strongly Agree
- 3 Agree
- 2 Uncertain
- 1 Disagree
- 0 Strongly Disagree

However, 9 of the 50 items (numbers 4, 8, 9, 17, 25, 35, 39, 48, and 50) are negative statements (in italics in Table 1) and should be scored:

- 0 Strongly Agree
- 1 Agree
- 2 Uncertain
- 3 Disagree
- 4 Strongly Disagree

The 50-item DREEM has a maximum score of 200 indicating the ideal educational environment as perceived by the student. A score of 0 is the minimum and would be a very worrying result for any medical educator.

The following is an approximate guide to interpreting the overall score:

0-50	very poor
51-100	plenty of problems
101-150	more positive than negative
151-200	excellent

Interpret a score of 100 as an environment which is viewed with considerable ambivalence by the students and as such needs to be improved.

345

As well as the total DREEM score there are five subscales:

- Students 'perceptions of learning
- Students' perceptions of teachers
- Students' academic self-perceptions
- Students' perception of atmosphere
- Students' social self-perceptions.

The items within each subscale:

Table 1

The DREEM - items grouped by subscale (negative items in italics). I

Students' perception of learning:
1   I am encouraged to participate in class
7   The teaching is often stimulating
13 The teaching is student centered
16 The teaching helps to develop my competence
20 The teaching is well focused
22 The teaching helps to develop my confidence
24 The teaching time is put to good use
25 *The teaching over-emphasizes factual learning*
38 I am clear about the learning objectives of the course
44 The teaching encourages me to be an active learner
47 Long-term learning is emphasized over short term learning
48 *The teaching is too teacher-centered*
    i.e. 12 items/max score 48 for this subscale

II   Students' perceptions of teachers:
2   The teachers are knowledgeable
6   The teachers are patient with patients
8   *The teachers ridicule the students*
9   *The teachers are authoritarian*
18 The teachers have good communications skills with patients
29 The teachers are good at providing feedback to students
32 The teachers provide constructive criticism here
37 The teachers give clear examples
39 *The teachers get angry in class*
40 The teachers are well prepared for their classes
50 *The students irritate the teachers*
    i.e. 11 items/max score 44 for this subscale

III Students' academic self-perceptions:
5   Learning strategies which worked for me before continue to work for me now
10 I am confident about passing this year

21 I feel I am being well prepared for my profession
26 Last year's work has been a good preparation for this year's work
27 I am able to memorize all I need
31 I have learned a lot about empathy in my profession
41 My problem-solving skills are being well developed here
45 Much of what I have to learn seems relevant to a career in healthcare
i.e. 8 items/max score 32 for this subscale

IV Students' perceptions of atmosphere:
11 The atmosphere is relaxed during the ward teaching
12 This school is well timetabled
17 *Cheating is a problem in this school*
23 The atmosphere is relaxed during lectures
30 There are opportunities for me to develop interpersonal skills
33 I feel comfortable in class socially
34 The atmosphere is relaxed during seminars/tutorials
35 *I find the experience disappointing*
36 I am able to concentrate well
42 The enjoyment outweighs the stress of studying medicine
43 The atmosphere motivates me as a learner
49 I feel able to ask the questions I want
i.e. 12 items/max score 48 for this subscale

V. Students' social self-perceptions:
3 There is a good support system for students who get stressed
4 *I am too tired to enjoy this course*
14 I am rarely bored on this course
15 I have good friends in this school
19 My social life is good
28 I seldom feel lonely
46 My accommodation is pleasant
i.e. 7 items/max score 28 for this subscale

An approximate guide to interpreting the subscales is shown below.

Students' Perception of Learning
0-12 Very Poor
13-24 Teaching is viewed negatively
25-36 A more positive perception
37-48 Teaching highly thought of

Students' Perception of Teachers
0-11 Abysmal
12-22 In need of some retraining
23-33 Moving in the right direction
34-44 Model Teachers

Students' academic self-perceptions

0-8 Feelings of total failure

9-16 Many negative aspects

17-24 Feeling more on the positive side

25-32 Confident

Students' perception of atmosphere

0-12 A terrible environment

13-24 There are many issues which need changing

25-36 A more positive atmosphere

37-48 A good feeling overall

Students' social self-perceptions

0-7 Miserable

8-14 Not a nice place

15-21 Not too bad

22-28 Very good socially

Appendix C

Results for the QMUL study for year cohort 3 and 4

1.1. Comparative Data of the Assessment Tools Related to Year:

1.1.1. Comparative Data of Index of Learning Styles (ILS) with Year:

142 students completed the ILS questionnaire with a response rate of 79.3%. Distribution

of ILS for third and fourth year cohorts is shown in Table 1 and Figure 1. Table 2 shows

the paired t-test for third and fourth year cohorts groups A, B, and C

Table 1: Number of Active/Reflective, Sensing/Intuitive, Visual/Verbal and
Sequential/Global (ILS) among year cohorts 3 and 4 (groups A, B, and C):

Year Cohort	ILS	ILS (A) (Sept 07/08)		ILS (B) (July 07/08)		ILS (C) (Nov 08/09)	
		Number	Percent	Number	Percent	Number	Percent
	Active	24	24%	21	34.40%	11	24.40%
	Balanced	65	65%	33	54.10%	27	60%
	Reflective	12	12%	7	11.50%	7	15.6
	Total	101	100%	61	100%	45	100%
	Missing	25					
	Total	126					
	Sensitive	41	41%	27	44.30%	21	46.70%
	Balanced	46	45%	32	52.50%	20	44.40%
	Intuitive	14	14%	2	3.30%	4	8.90%
3	Total	101	100%	61	100%	45	100%
	Missing	25					
	Total	126					
	Visual	41	40.60%	29	47.50%	23	51.10%
	Balanced	58	57.40%	29	47.50%	19	42.20%
	Verbal	2	2%	3	4.90%	3	6.70%
	Total	101	100%	61	100%	45	100%
	Missing	25					
	Total	126					

Continued from Table 1:

Year Cohort	ILS	ILS (A) (Sept 07/08) Number	Percent	ILS (B) (July 07/08) Number	Percent	ILS (C) (Nov 08/09) Number	Percent
3	Sequential	38	37.60%	24	39.30%	18	40%
	Balanced	58	57.40%	35	57.40%	24	53.30%
	Global	5	5%	2	3.30%	3	6.70%
	Total	101	100%	61	100%	45	100%
	Missing	2					
	Total	126					
4	Active	8	19.50%			8	34.80%
	Balanced	28	68.30%			11	47.80%
	Reflective	5	12.20%			4	17.40%
	Total	41	100%			23	100%
	Sensitive	21	51.20%			15	65.20%
	Balanced	17	41.50%			6	26.10%
	Intuitive	3	7.30%			2	8.70%
	Total	41	100%			23	100%
	Visual	22	53.70%			14	60.90%
	Balanced	19	46.30%			8	34.80%
	Verbal	0	0%			1	4.30%
	Total	41	100%			23	100%
	Sequential	14	34%			2	8.70%
	Balanced	23	56%			19	82.60%
	Global	4	10%			2	8.70%
	Total	41	100%			23	100%

Figure 1: Radar Charts of mean ILS scores for Year Cohort 3 (group B):

Active/Reflective (B)

3 to -3:Balanced
-5 to -11: Active
5 to 11: Reflective

Sensing/Intuitive (B)

3 to -3:Balanced
-5 to -11: Sensitive
5 to 11: Reflective

Visual/Verbal (B)

3 to -3 Balanced
-5 to -11: Visual
5 to 11: Verbal

Sequential/Global (B)

3 to -3: Balanced
-5 to -11: Sequential
5 to 11: Global
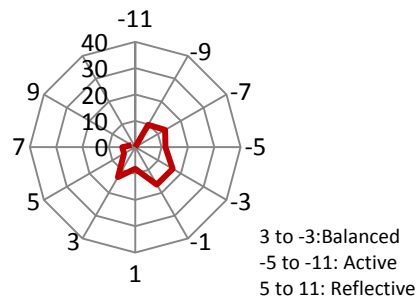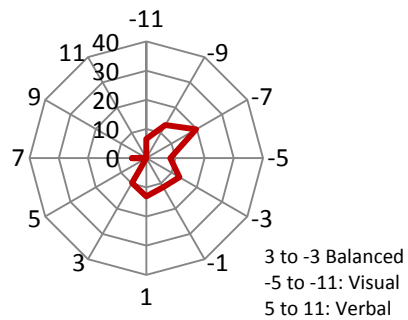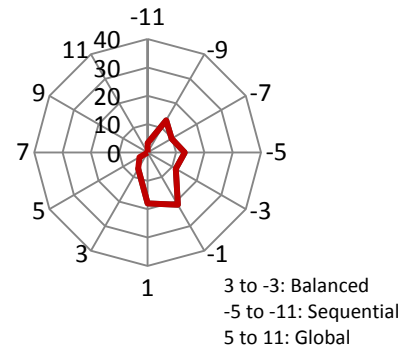
Table 2: Mean differences for paired t-test (groups A-C) and (groups B-C), 95% Confidence Interval of difference of mean (95% CI), and p-value for year cohorts 3 and 4

Year Cohort	ILS and Group	Number	Mean	95% CI	p-value
3	Active/Reflective A-C	36	0.083	-0.99 to 1.16	0.876
	Sensing/Intuitive A -C	36	0.278	-1.28 to 1.84	0.720
	Visual/Verbal A -C	36	0.528	-0.64 to 1.70	0.366
	Sequential/Global A -C	36	0.278	-1.16 to 1.72	0.698
4	Active/Reflective A- C	23	0.87	-0.38 to 2.12	0.162
	Sensing/Intuitive A - C	23	0.17	-1.39 to 1.74	0.820
	Visual/Verbal A - C	23	0.44	-1.31 to 2.18	0.611
	Sequential/Global A - C	23	-0.096	-2.18 to 0.26	0.118
3	Active/Reflective B- C	29	-0.41	-1.57 to 0.74	0.470
	Sensing/Intuitive B - C	29	0.55	-1.33 to 2.44	0.553
	Visual/Verbal B - C	29	-0.28	-1.68 to 1.13	0.691
	Sequential/Global B - C	29	0	-1.59 to 1.59	1.000

Table 3 shows the independent t-test results for the learning styles (ILS) to detect differences between third and fourth year cohorts.

Table 3: Mean score of ILS (Active/Reflective, Sensing/Intuitive, Visual/Verbal, and Sequential/Global), 95% confidence of interval of difference of means (95% CI) and p-value for Independent t-test for the year cohorts 3 and 4

ILS	Group	Year Cohort	Number	Mean	95% CI	p-value
Active/Reflective		3	101	-1.05	-1.72 to 1.32	0.799
		4	41	-0.85		
Sensing/Intuitive		3	101	-2.92	-1.12 to 2.25	0.508
	A	4	41	-3.49		
Visual/Verbal		3	101	-3.09	-0.91 to 2.10	0.436
		4	41	-3.68		
Sequential/Global		3	101	-2.54	-2.04 to 0.99	0.499
		4	41	-2.02		
Active/Reflective		3	61	-1.82	0	0
		4	0	0		
Sensing/Intuitive		3	61	-3.39	0	0
	B	4	0	0		
Visual/Verbal		3	61	-3.43	0	0
		4	0	0		
Sequential/Global		3	61	-2.9	0	0
		4	0	0		
Active/Reflective		3	45	-0.51	-1.39 to 3.07	0.457
		4	23	-1.35		
Sensing/Intuitive		3	45	-3.09	-1.63 to 3.89	0.417
	C	4	23	-4.22		
Visual/Verbal		3	45	-3.36	-1.30 to 3.72	0.339
		4	23	-4.57		
Sequential/Global		3	45	-2.91	-3.95 to 0.30	0.091
		4	23	-1.09		

1.2. Comparative Data of Approach to Learning and Studying (ALSI) with Year:

A total of 123 third and 40 fourth year students answered the ALSI and the distribution of

the approach to learning and studying is shown in Table 4.

Table 4: Distribution of Deep. Surface, Monitoring, and Organised/Effort Approach to
Learning and Studying (ALSI) among year cohorts 3 and 4 (groups A, B, and C)

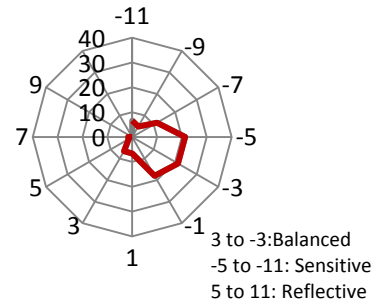| Year Cohort	ALSI		ALSI A(Sept 07/08) Frequency/Percent		ALSI B (July 07/08) Frequency/Percent		ALSI B (Nov 08/09) Frequency/Percent	
3	Deep	Low	0	0%	0	0%	0	0%
		Medium	73	73.70%	40	64.50%	33	75%
		High	26	26.30%	22	35.50%	11	25%
		Total	99	100%	62	100%	44	100%
		Missing	24					
		Total	123					
	Surface	Low	5	51%	6	9.70%	2	4.50%
		Medium	62	62.60%	45	72.60%	36	81.80%
		High	32	32.30%	11	17.70%	6	13.60%
		Total	99	100%	62	100%	44	100%
		Missing	24					
		Total	123					
	Monitoring	Low	0	0%	1	1.60%	0	0%
		Medium	35	35.40%	34	54.80%	30	68.20%
		High	64	64.60%	27	43.50%	14	31.80%
		Total	99	100%	62	100%	44	100%
		Missing	24					
		Total	123					
	Organised/Effort	Low	0	0%	3	4.80%	1	2.30%
		Medium	44	44.40%	26	41.90%	26	59.10%
		High	55	55.60%	33	53.20%	17	38.60%
		Total	99	100%	62	100%	44	100%
		Missing	24					
		Total	123					

Continued from Table 4:

Year Cohort	ALSI		ALSI A(Sept 07/08) Frequency/Percent		ALSI B (July 07/08) Frequency/Percent	ALSI B (Nov 08/09) Frequency/Percent
4	Deep	Low	2	5%		
		Medium	30	75%		
		High	8	20%		
		Total	40	100%		
	Surface	Low	1	2.50%		
		Medium	26	65%		
		High	13	32.50%		
		Total	40	100%		
	Monitoring	Low	0	0%		
		Medium	16	40%		
		High	24	60%		
		Total	40	100%		
	Organised/Effort	Low	1	2.50%		
		Medium	18	45%		
		High	21	52.50%		
		Total	40	100%		

1.3. Comparative Data of Reflection in Learning and Studying (RLS) with Year:

The sample size consisted of 120 third and 40 fourth year dental undergraduate students with a 75% response rate. The mean scores are shown in Table 5, there was no difference between the third and fourth year cohorts in the three groups as seen in Table 6. Table 7 represents the distribution of item 15 of the RLS inventory for the third and fourth year cohorts, groups A, B, and C. To detect differences between students in group A, B, and C, a paired t-test for year cohorts 3 and 4 was conducted, there was no difference between the groups as presented in Table 8.

Table 5: Mean and Standard Deviation (SD) of RLS mean scores for year cohorts 3 and 4 (groups A, B, and C)

Year Cohort	RLS and Group	Number	Mean	SD
3	Total RLS (A)	96	59.23	14.31
	Total RLS (B)	60	59.32	14.64
	Total RLS (C)	42	59.67	12.87
4	Total RLS (A)	38	62.39	12.07
	Total RLS (B)	0	0	0
	Total RLS (C)	22	65.18	20.19

Table 6: Distribution of RLS Scale (Restricted, Partial, Ample, and Maximal) for 3 and 4 year cohorts (groups A, B, and C)

Year Cohort	RLS Scale	RLS (A)		RLS (B)		RLS (C)	
		Number	Percent	Number	Percent	Number	Percent
3	Restricted (14-34)	5	5.20%	2	3.3%	2	4.8%
	Partial (35-55)	32	33.30%	20	33.3%	11	26.2%
	Ample (56-76)	52	54.20%	30	50%	26	61.9%
	Maximal (77-98)	7	7.30%	8	13.3%	3	7.1%
	Total	96	100%	60	100%	42	100%
	Missing	28					
	Total	124					
4	Restricted (14-34)	1	2.6%	0	0%	0	0%
	Partial (35-55)	7	18.4%	0	0%	9	40.9%
	Ample (56-76)	25	65.8%	0	0%	12	54.5%
	Maximal (77-98)	5	13.2%	0	0%	1	4.5%
	Total	38	100%	0	0%	22	100%
	Missing	4					
	Total	42					

Table 7: Distribution of RLS Item 15 self assessment question (Restricted, Partial, Ample, and Maximal) for year cohorts 3 and 4 (groups A, B, and C)

Year Cohort	RLS 15 Scale	RLS 15 (Group A)		RLS 15 (Group B)		RLS 15 (Group C)	
		Number	Percent	Number	Percent	Number	Percent
	Restricted	8	10.4%	4	8.3%	2	5.6%
	Partial	26	33.8%	19	39.6%	11	30.6%
	Ample	31	40.3%	17	35.4%	20	55.6%
3	Maximal	12	15.6%	8	16.7%	3	8.3%
	Total	77	100%	48	100%	36	100%
	Missing	42					
	Total	119					
	Restricted	3	8.8%	0	0%	3	17.6%
	Partial	9	26.5%	0	0%	5	29.4%
	Ample	16	47.1%	0	0%	6	35.3%
4	Maximal	6	17.6%	0	0%	3	17.6%
	Total	34	100%	0	0%	17	100%
	Missing	6					
	Total	40					

Table 8: Mean RLS difference between (Group A-B, A-c, and B-C), 95% Confidence Interval of mean difference, and p-values for Paired t-test for year cohorts 3

RLS Difference (Group)	Mean RLS Differences	95% CI	p-value
RLS Diff (A –B)	0.03	-0.41 to 0.47	0.882
RLS Diff (A -C)	0.23	-0.10 to 0.57	0.168
RLS Diff (B –C)	0	-0.39 to 0.39	1.00

Table 9: Mean RLS difference, 95% confidence interval of difference of mean (95% CI), and p-values for Independent t-test for year cohorts 3 and 4 (groups A, B, and C)

	Group	Year Cohort	Number	Mean	95% CI	p-value
RLS Difference	A	3	77	0.07	-0.49 to 0.27	0.564
		4	34	0.18		
	B	3	48	0.17		
		4	0	0		
	C	3	36	0	-0.69 to 0.45	0.681
		4	17	0.12		

1.4 Comparative Data of Dundee Ready Environment Educational Method (DREEM) with Year:

The sample size consisted of 120 third and 40 fourth year dental undergraduate students with a 75% response rate. The mean of the different DREEM items are shown in Table 10, along with the total mean scores for the different subscales; perception of learning, perception of teachers, students; academic self-perception, perception of atmosphere, and social self-perception. Items in red represent low items that have a mean score of less than two (negative items), while items labelled in green represent positive items that have a mean score of three or more.

Table 10: Distribution of Mean DREEM Items score and Subscales and standard deviation (SD) for year cohorts 3 and 4 (groups A, B, and C) weak items (≤ 2) are labelled in red, positive items (≥ 3) are labelled in green:

Item No.	DREEM items	DREEM 1 Year 3rd n(97)	4th n(42)	Mean n(139)	SD	DREEM 2 Mean 3rd n(61)	SD	DREEM 3 Year 3rd n(45)	4th n(24)	Mean n(69)	SD
	Students' Perception of Learning										
1	I am encouraged to participate in class	2.75	2.55	2.69	0.92	2.38	0.97	2.51	2.75	2.59	0.83
7	The teaching is often stimulating	2.68	2.40	2.60	0.92	2.35	0.90	2.33	2.62	2.43	0.85
13	The teaching is student centred	2.43	2.45	2.44	0.91	2.11	0.95	2.18	2.42	2.26	1.04
16	The teaching helps to develop my competence	**3.13**	**3.05**	**3.11**	0.63	2.78	0.77	2.69	**3.12**	2.84	0.63
20	The teaching is well focused	2.72	2.43	2.63	0.81	2.20	1.00	2.29	2.67	2.42	0.76
21	The teaching helps to develop my confidence	2.87	2.90	2.88	0.74	2.46	0.91	2.51	2.75	2.59	0.85
24	The teaching time is put to good use	2.35	**1.98**	2.24	1.05	**1.89**	1.08	2.09	2.25	2.14	0.93
25	The teaching over-emphasizes factual learning	**1.87**	**1.88**	**1.87**	1.01	**1.69**	0.90	**1.87**	2.08	**1.94**	0.94
38	I am clear about the learning objectives of the course	2.36	2.00	2.25	1.08	2.08	1.11	2.07	2.22	2.12	0.91
44	The teaching encourages me to be an active learner	2.60	2.29	2.50	1.01	2.21	0.97	2.41	2.75	2.53	0.87
47	Long-term learning is emphasized over short term learning	2.43	2.40	2.42	1.00	2.39	0.82	2.45	2.67	2.53	0.84
48	The teaching is too teacher-centred	2.07	2.19	2.11	0.98	2.02	0.87	2.14	2.17	2.15	0.74
	Total	**30.3**	**28.52**	**29.7**	**5.41**	**25.93**	**6.67**	**26.80**	**30.29**	**28.03**	**5.75**
	Students' Perception of Teachers										
2	The Teachers are knowledgeable	**3.23**	**3.12**	**3.19**	0.59	2.95	0.64	**3.05**	**3.25**	**3.12**	0.53
6	The teachers are patient with patients	2.95	2.62	2.85	0.86	2.78	0.72	2.58	2.83	2.67	0.87
8	The teachers ridicule the students	2.29	2.12	2.24	1.08	**1.97**	1.03	2.29	2.08	2.22	0.94
9	The teachers are authoritarian	**1.71**	**1.81**	**1.74**	1.05	**1.61**	0.92	**1.82**	2.00	**1.88**	0.96

Item No.	DREEM items	DREEM 1				DREEM 2		DREEM 3			
		Year		Mean n(139)	SD	Mean 3rd n(61)	SD	Year		Mean n(69)	SD
		3rd n(97)	4th n(42)					3rd n(45)	4th n(24)		
	Students' Perception of Teachers										
18	The teachers have good communications skills with patients	**3.00**	2.86	2.96	0.78	2.92	0.60	2.71	**3.12**	2.86	0.65
29	The teachers are good at providing feedback to students	2.20	1.57	2.01	1.14	2.10	1.12	2.09	2.08	2.09	0.99
32	The teachers provide constructive criticism here	2.70	2.48	2.63	0.98	2.48	0.91	2.63	2.71	2.66	0.75
37	The teachers give clear examples	2.54	2.24	2.45	0.89	2.56	0.76	2.52	2.54	2.53	0.72
39	The teachers get angry in class	2.44	2.55	2.47	1.06	2.31	1.10	2.41	2.62	2.49	0.92
40	The teachers are well prepared for their class	2.61	2.67	2.63	0.84	2.43	0.90	2.41	2.74	2.52	0.70
49	The students irritate the teachers	2.30	**1.79**	2.14	1.07	2.13	0.99	2.11	2.37	2.21	0.80
	Total	**27.96**	**25.8**	**27.3**	**5.16**	**26.49**	**4.89**	**26.73**	**28.12**	**27.22**	**4.69**
	Students' Academic Self-Perception										
5	Learning strategies which worked for me before continue to work for me now	2.70	**3.00**	2.79	0.96	2.73	0.80	2.53	**3.00**	2.70	0.81
10	I am confident about passing this year	2.61	2.76	2.65	0.88	2.54	0.77	2.38	2.79	2.52	0.90
22	I feel I am being well prepared for my profession	2.65	2.50	2.60	0.96	2.05	1.01	2.07	2.79	2.32	0.98
26	Last year's work has been a good preparation for this year's work	2.46	2.48	2.47	0.95	2.48	0.87	2.42	2.79	2.55	0.88
27	I am able to memorise all I need	2.12	2.05	2.10	1.09	2.13	1.01	2.00	2.29	2.10	1.03
31	I have learned a lot about empathy in my profession	2.87	3.05	2.92	0.89	2.84	0.66	2.84	**3.08**	2.93	0.72
41	My problem-solving skills are being well developed here	2.52	2.45	2.50	0.94	2.38	0.90	2.34	2.96	2.56	0.78
45	Much of what I have to learn seems relevant to a career in healthcare	2.96	2.76	2.90	0.93	2.70	0.88	2.68	**3.08**	2.82	0.60
	Total	**20.89**	**21.05**	**20.94**	**4.32**	**20.21**	**4.16**	**19.55**	**22.75**	**20.68**	**3.89**

Continued from Table 10:

Item No.	DREEM items	DREEM 1 Year 3rd (97)	DREEM 1 Year 4th (42)	DREEM 1 Mean (139)	SD	DREEM 2 Mean 3rd (61)	SD	DREEM 3 Year 3rd (45)	DREEM 3 Year 4th (24)	DREEM 3 Mean N (69)	SD
	Students' Perceptions of Atmosphere										
11	The atmosphere is relaxed during the ward (clinical) teaching	2.24	2.17	2.22	1.06	2.15	0.95	2.09	2.62	2.28	0.86
12	The school is well timetabled	**1.60**	**1.50**	**1.57**	1.20	**1.27**	1.07	**1.42**	**1.71**	**1.52**	1.11
17	Cheating is a problem in this school	2.18	2.62	2.31	1.16	**1.78**	1.15	2.13	2.09	2.12	1.02
23	The atmosphere is relaxed during lectures	2.90	2.95	2.91	0.64	2.57	0.85	2.80	2.96	2.86	0.58
30	There are opportunities for me to develop interpersonal skills	2.66	2.71	2.68	0.87	2.69	0.72	2.63	2.88	2.72	0.69
33	I feel comfortable in class socially	2.90	**3.10**	2.96	0.85	2.93	0.68	2.84	3.04	2.91	0.62
34	The atmosphere is relaxed during seminars/tutorials	2.90	2.90	2.90	0.78	2.74	0.71	2.98	**3.04**	**3.00**	0.63
35	I find the experience disappointing	2.49	2.52	2.50	1.06	2.34	1.02	2.20	2.67	2.37	0.93
36	I am able to concentrate well	2.36	2.38	2.37	1.030	2.43	0.92	2.16	2.75	2.37	0.81
42	The enjoyment outweighs the stress of studying dentistry	2.47	2.24	2.40	1.01	2.31	0.90	2.32	2.71	2.46	0.85
43	The atmosphere motivates me as a learner	2.64	2.26	2.53	0.97	2.21	0.95	2.40	2.62	2.48	0.82
50	I feel able to ask the questions I want	2.53	2.31	2.46	1.02	2.61	0.84	2.48	2.88	2.62	0.77
	Total	**29.86**	**29.67**	**29.8**	**6.30**	**27.44**	**6.04**	**27.75**	**31.50**	**29.07**	**5.43**
	Students' Social Self-Perception										
3	There is a good support system for students who get stressed	**1.86**	**1.69**	**1.81**	1.05	**1.88**	1.12	**1.96**	2.42	2.12	1.01
4	I am too tired to enjoy the course	2.13	2.07	2.12	1.20	1.93	1.04	**1.91**	2.21	2.01	0.95
14	I am rarely bored on this course	2.21	**1.88**	2.11	1.13	2.20	0.88	2.24	2.29	2.26	0.97
15	I have good friends in this school	**3.24**	**3.31**	**3.26**	0.72	**3.11**	0.78	**3.07**	**3.08**	**3.07**	0.79
19	My social life is good	**3.10**	**3.14**	**3.12**	0.75	**3.00**	0.73	2.80	**3.00**	2.87	0.87
28	I seldom feel lonely	2.44	2.50	2.46	1.20	2.54	0.94	2.53	2.83	2.64	0.91
46	My accommodation is pleasant	2.96	**3.10**	**3.00**	1.02	2.92	0.75	2.95	**3.21**	**3.04**	0.78
	Total	**17.94**	**17.69**	**17.86**	**3.61**	**17.39**	**3.21**	**17.27**	**18.92**	**17.85**	**3.18**
	Total DREEM	**126.9**	**122.7**	**125.7**	**20.48**	**117.7**	**21.12**	**118.8**	**131.7**	**123.3**	**19.69**

Table 11 represents the paired t-test results to detect the differences within the fourth year cohort, for groups A and C.

Table 11: Mean differences for DREEM and Subscales scores for year cohort 4 (Group A-C), 95% confidence interval of mean of differences and p-value for Paired t-test

Year Cohort	DREEM and Group	Number	Mean Difference	95% CI	p-value
4	Total DREEM A - C	24	-4.29	-18.70 to10.12	0.544
	Perception of Learning A - C	24	-1.46	-4.00 to 1.08	0.247
	Perception of Teachers A - C	24	-2.13	-5.05 to 0.80	0.147
	Academic Self Perception A - C	24	-2.46	-5.03 to 0.11	0.060
	Perception of Atmosphere A - C	24	-0.88	-4.06 to 2.31	0.576
	Student Social Self Perception A - C	24	-6.13	-15.97 to 3.72	0.211

2. Comparative Data of the Assessment Tools Related to Gender:

2.1. Comparative Data of Index of Learning Styles (ILS) with Gender:

There were significant differences between genders for the learning styles. An independent t-test was conducted to compare the ILS scores for females and males in group A. The results are shown in Table 12. For the sensitive/intuitive score, there was a significant difference (p=0.007) with females (M=-4.05, SD=4.36) scoring a more sensing score than males (M=-1.97, SD=4.6). There is also a significant difference (p=0.009) for the visual/verbal score with males (M=-4.21, SD=4.04) tending to be more visual than females (M=-2.43, SD=3.9). For group C, males and females showed a significant difference for the active / reflective score, with females (M=0.41, SD=3.89) scoring more towards the balanced dimension than males who scored more towards the active style (M=-2.00, SD=4.5) (p=0.021). The females in group C are also more sensing (M=-5.18,

SD=5.2) than males (M=-1.76, SD=5.00) (p=0.008) who are more balanced. Females (M=-

2.53, SD=5.95) tend to be more balanced on the visual / verbal scale while the males (M=-

5, SD=3.78) (p=0.037) were more visual.

Table 12: The Mean ILS scores and 95% confidence interval of difference of means for the Independent T-test for ILS according to gender for QMUL students (groups A, B, and C):

ILS and Group	Gender	Mean	95 % CI	p-value
Active/Reflective (A)	Females	-0.38	-0.59 to -1.35	0.059
	Males	-1.70	-0.73 to -2.66	
Sensitive/Intuitive (A)	Females	-4.05	-3.06 to -5.05	**0.007**
	Males	-1.97	-0.83 to -3.11	
Visual/Verbal (A)	Females	-2.43	-1.52 to -3.35	**0.009**
	Males	-4.21	-3.22 to -5.21	
Sequential/Global (A)	Females	-3.08	-2.05 to -4.10	**0.034**
	Males	-1.61	-0.73 to -2.48	
Active/Reflective (B)	Females	-1.72	-0.30 to -3.14	0.824
	Males	-2.00	0.37 to -4.37	
Sensitive/Intuitive (B)	Females	-3.97	-2.86 to -5.09	0.127
	Males	-2.36	-0.31 to -4.42	
Visual/Verbal (B)	Females	-2.59	-0.91 to -4.27	0.073
	Males	-4.91	-3.19 to -6.63	
Sequential/Global (B)	Females	-3.56	-2.29 to -4.83	0.099
	Males	-1.73	0.24 to -3.69	
Active/Reflective (C)	Females	0.41	-0.95 to 1.77	**0.021**
	Males	-2.00	-0.43 to -3.57	
Sensitive/Intuitive (C)	Females	-5.18	-3.36 to -7.00	**0.008**
	Males	-1.76	0.00 to -3.53	
Visual/Verbal (C)	Females	-2.53	-0.58 to -4.48	**0.037**
	Males	-5.00	-3.68 to -6.32	
Sequential/Global (C)	Females	-3.12	-1.45 to -4.78	0.108
	Males	-1.47	-0.27 to -3.31	

2.2. Comparative Data of the Approach to Learning and Studying (ALSI) with gender.

The results for the independent t-test for the ALSI and the third and fourth year dental students at QMUL are shown in Table 13, there was no difference between the cohorts.

Table 13: Mean ALSI scores, 95% confidence interval of difference of means, and p-values for Independent T-test for year cohorts 3 and 4 for males and females (group A, B, and C):

Gender	ALSI and Group	Year Cohort	Number	Mean	95% CI	p-value
	Total ALSI (A)	3	57	67.65	-3.38 to 5.73	0.608
		4	17	66.47		
	Deep (A)	3	57	21.33	-1.36 to 2.97	0.462
		4	17	20.53		
	Surface (A)	3	57	13.98	-1.02 to 2.75	0.364
		4	17	13.12		
	Monitoring (A)	3	57	16.16	-1.39 to 1.58	0.895
		4	17	16.06		
	Organised/Effort (A)	3	57	16.18	-2.37 to .95	0.399
		4	17	16.88		
	Total ALSI (B)		40	65.75		
Female	Deep (B)		40	22.22		
	Surface (B)	3	40	13.41		
	Monitoring (B)		40	14.70		
	Organised/Effort (B)		40	15.42		
	Total ALSI (C)		24	63.25		
	Deep (C)		24	21.92		
	Surface (C)	3	24	12.33		
	Monitoring (C)		24	14.88		
	Organised/Effort (C)		24	15.00		

Continued from Table 13

Gender	ALSI and Group	Year Cohort	Number	Mean	95% CI	p-value
	Total ALSI (A)	3	42	65.21	-2.58 to 6.92	0.365
		4	23	63.04		
	Deep (A)	3	42	21.55	-0.16 to 3.86	0.070
		4	23	19.7		
	Surface (A)	3	42	13.12	-2.28 to 1.13	0.502
		4	23	13.7		
	Monitoring (A)	3	42	15.64	-1.52 to 1.24	0.840
		4	23	15.78		
	Organised/Effort (A)	3	42	15.02	-1.81 to 1.95	0.943
		4	23	14.96		
Male	Total ALSI (B)		22	64.05		
	Deep (B)		22	22.23		
	Surface (B)	3	22	11.64		
	Monitoring (B)		22	14.77		
	Organised/Effort (B)		22	15.41		
	Total ALSI (C)		20	61.05		
	Deep (C)		20	20.91		
	Surface (C)	3	20	12.32		
	Monitoring (C)		20	14.15		
	Organised/Effort (C)		20	12.95		

2.3. Comparative Data of Reflection in Learning and Studying (RLS) with Gender:

In the last item in the questionnaire (item 15), the subjects rated their personal efficacy in

the reflective process into restricted, partial, ample or maximal according to descriptions

for each efficacy, the distribution of item 15 for groups A, B, and C is shown in Table 14.

Most of the students in both 3rd and 4th year students viewed themselves as being ample in

their ability to reflect when excluding the missing subjects for item 15. There were no

differences between the males and females in their personal efficacy rating.

Table 14: Distribution of Item 15 (RLS Inventory) for Females and Males year cohorts 3
and 4 (groups A, B, and C)

Gender	Year Cohort	Item 15 Scale	RLS 15 (A)		RLS 15 (B)		RLS 15 (C)	
			Number	Percent	Number	Percent	Number	Percent
Female	3	Restricted	6	8.30%	2	2.80%	1	1.40%
		Partial	14	19.50%	10	13.90%	5	6.90%
		Ample	17	23.60%	13	18.10%	14	19.50%
		Maximal	5	6.90%	6	8.30%	2	2.80%
		Total	42		31		22	
		Missing	30	41.70%	41	56.90%	50	69.40%
		Total	72	100%	72	100%	72	100%
	4	Restricted	1	5.90%	0	0%	2	11.80%
		Partial	3	17.60%	0	0%	0	0%
		Ample	8	47.10%	0	0%	3	17.60%
		Maximal	4	23.50%	0	0%	2	11.80%
		Total	16		0	0%	7	
		Missing	1	5.90%	0	0%	10	58.80%
		Total	17	100%	0	0%	17	100%
Male	3	Restricted	2	4.20%	2	4.20%	1	2.10%
		Partial	12	25%	9	18.80%	6	12.50%
		Ample	14	29.20%	4	8.30%	7	14.60%
		Maximal	7	14.60%	2	4.20%	1	2.10%
		Total	35		17		15	
		Missing	13	27%	31	64.50%	33	68.80%
		Total	48	100%	48	100%	48	100%
	4	Restricted	2	8.70%	0	0%	1	4.30%
		Partial	6	26.10%	0	0%	5	21.70%
		Ample	8	34.80%	0	0%	3	13.00%
		77-98 Maximal	2	8.70%	0	0%	1	4.30%
		Total	18		0	0%	10	
		Missing	5	21.70%	0	0%	13	56.50%
		Total	23	100%	0	0%	23	100%

2.4 Comparative Data of Dundee Ready Environment Educational Method (DREEM)

with Gender:

There were no gender differences for the total DREEM and subscales as seen in Table 15.

Table 15: Mean DREEM and Subscales scores, 95% Confidence Interval of difference of means, and p-values for Independent T-test according to Gender for year cohorts 3 and 4 (group A, B, and C)

DREEM and Subscales (Group)	Gender	Number	Mean	95% CI	p-value
Total DREEM (A)	Female	74	126.07	-6.01 to 7.81	0.797
	Male	65	125.17		
Perception of Learning (A)	Female	74	30.08	-1.095 to 2.55	0.431
	Male	65	29.35		
Perception of Teaching (A)	Female	74	27.12	-1.99 to 1.53	0.794
	Male	65	27.35		
Academic Self Perception (A)	Female	74	21.19	-1.10 to 1.85	0.616
	Male	65	20.82		
Perception of Atmosphere (A)	Female	74	29.81	-2.10 to 2.15	0.981
	Male	65	29.78		
Student Social Self Perception (A)	Female	74	17.86	-1.21 to 1.22	0.996
	Male	65	17.86		
Total DREEM (B)	Female	39	115.03	-18.58 to 3.82	0.192
	Male	22	122.41		
Perception of Learning (B)	Female	39	25.77	-4.04 to 3.13	0.799
	Male	22	26.23		
Perception of Teachers (B)	Female	39	25.69	-4.78 to 0.35	0.089
	Male	22	27.91		
Academic Self Perception (B)	Female	39	19.77	-3.45 to 0.98	0.271
	Male	22	21.00		
Perception of Atmosphere (B)	Female	39	26.9	-4.74 to 1.72	0.352
	Male	22	28.41		
Student Social Self Perception (B)	Female	39	16.79	-3.33 to 0.01	0.052
	Male	22	18.45		
Total DREEM (C)	Female	33	124.06	-6.18 to 15.85	0.384
	Male	35	119.23		
Perception of Learning (C)	Female	33	28.67	-1.36 to 4.24	0.309
	Male	35	27.23		
Perception of Teaching (C)	Female	33	28.21	-0.06 to 4.49	0.056
	Male	35	26.00		
Academic Self Perception (C)	Female	33	21.61	-0.61 to 3.48	0.166
	Male	35	20.17		
Perception of Atmosphere (C)	Female	33	29.42	-1.48 to 3.88	0.376
	Male	35	28.23		
Student Social Self Perception (C)	Female	33	25.67	-2.34 to 18.59	0.126
	Male	35	17.54		

An independent-sample- t-test was conducted to compare the total DREEM score and the five DREEM subscales for males and females. There was no significant difference in scores for males and females for all the three occasions the DREEM inventory was conducted.

3. Comparative Data of the Assessment Tools Related to Ethnicity:

3.1 Comparative Data of Index of Learning Styles (ILS) with Ethnicity:

A one –way between groups analysis of variance was conducted to explore the impact of ethnicity on the active / reflective, sensing / intuitive, visual / verbal and sequential / global as measured by the ILS for all the three occasions that the questionnaire was conducted. Subjects were placed into three ethnic groups for statistical analysis; (Asian, Others and Whites). Distribution of ILS according to ethnicity is shown in Table 16.

Table 16: ANOVA results of Mean scores of ILS, 95% confidence interval of difference of means, and p-value for ILS distribution according to Ethnicity (groups A, B, and C):

ILS (Group)	Ethnicity	Number	Mean	95% CI	p-value
Active/Reflective (A)	Asian	68	-1.71	-2.62 to -0.79	0.106
	Other	48	-0.06	-1.27 to 1.14	
	White	26	-0.85	-2.77 to 1.08	
	Total	142	-0.99	-1.68 to -0.31	
Sensitive/Intuitive (A)	Asian	68	-2.85	-3.97 to -1.74	0.440
	Other	48	-3.75	-5.19 to -2.31	
	White	26	-2.46	-4.02 to -0.90	
	Total	142	-3.08	-3.85 to -2.32	
Visual/Verbal (A)	Asian	68	-2.91	-3.92 to -1.90	0.546
	Other	48	-3.4	-4.61 to -2.18	
	White	26	-3.92	-5.44 to -2.40	
	Total	142	-3.26	-3.94 to -2.58	
Sequential/Global (A)	Asian	68	-3.15	-4.07 to -2.22	0.080
	Other	48	-2	-3.06 to -0.94	
	White	26	-1.15	-3.32 to 1.01	
	Total	142	-2.39	-3.08 to -1.71	
Active/Reflective (B)	Asian	25	-2.44	-4.38 to -0.50	0.589
	Other	25	-1.08	-2.84 to 0.68	
	White	11	-2.09	-6.00 to 1.82	
	Total	61	-1.82	-3.03 to -0.61	

Continued from Table 16

ILS and Group	Ethnicity	Number	Mean	95% CI	p-value
Sensitive/Intuitive (B)	Asian	25	-3.64	-5.39 to -1.89	
	Other	25	-3.32	-4.82 to -1.82	0.901
	White	11	-3.00	-5.88 to -0.12	
	Total	61	-3.39	-4.40 to -2.38	
Visual/Verbal (B)	Asian	25	-2.20	-4.37 to -0.03	
	Other	25	-4.68	-6.47 to -2.89	0.198
	White	11	-3.36	-6.53 to -0.19	
	Total	61	-3.43	-4.67 to -2.18	
Sequential/Global (B)	Asian	25	-3.56	-5.24 to -1.88	
	Other	25	-2.12	-3.68 to -0.56	0.468
	White	11	-3.18	-6.71 to 0.35	
	Total	61	-2.90	-3.97 to -1.83	
Active/Reflective (C)	Asian	30	-1.60	-2.90 to -0.30	
	Other	26	-0.62	-2.49 to 1.26	0.255
	White	12	0.83	-2.61 to 4.28	
	Total	68	-0.79	-1.85 to 0.26	
Sensitive/Intuitive (C)	Asian	30	-2.6	-4.73 to -0.47	
	Other	26	-3.85	-5.72 to -1.97	0.437
	White	12	-4.83	-8.68 to -0.98	
	Total	68	-3.47	-4.77 to -2.17	
Visual/Verbal (C)	Asian	30	-4.07	-5.78 to -2.35	
	Other	26	-3.38	-5.55 to -1.22	0.876
	White	12	-3.83	-6.97 to -0.70	
	Total	68	-3.76	-4.95 to -2.58	
Sequential/Global (C)	Asian	30	-3.33	-4.49 to -2.17	
	Other	26	-2.31	-3.89 to -0.73	**0.037**
	White	12	0.33	-3.55 to 4.22	
	Total	68	-2.29	-3.31 to -1.27	

3.2 Comparative Data of The Approach to Learning and Studying (ALSI) with Ethnicity:

Subjects were placed into three ethnic groups for statistical purposes; (Asian, Others and Whites). Table 17 shows the distribution of the mean values for the different approaches of learning for the fourth year cohort (group A).There are no differences between the different ethnic groups.

Table 17: ALSI Mean scores, 95% Confidence Interval of difference of means, and p-value for ANOVA according to Ethnicity for year cohort 4 (group A)

ALSI	Ethnicity	Number	Mean	95% CI	P-value
Total ALSI	Asian	19	65.32	61.30 to 69.33	0.827
	Other	11	64.55	55.51 to 73.58	
	White	10	62.9	56.87 to 68.93	
Deep	Asian	19	20.21	18.33 to 22.09	0.961
	Other	11	20.09	16.19 to 23.99	
	White	10	19.7	16.31 to 23.09	
Surface	Asian	19	13.58	12.04 to 1 5.11	0.303
	Other	11	14.45	12.26 to 16.65	
	White	10	12.1	9.13 to 15.07	
Monitoring	Asian	19	16.05	14.80 to 17.30	0.916
	Other	11	15.91	14.36 to 17.45	
	White	10	15.6	13.09 to 18.11	
Organised /Effort	Asian	19	16.84	15.26 to 18.43	0.184
	Other	11	14.18	10.88 to 17.48	
	White	10	15.5	13.26 to 17.74	

3.3 Comparative Data of Reflection in Learning and Studying (RLS) with Ethnicity:

A one –way between groups analysis of variance was conducted to explore the impact of ethnicity on the reflective process as measured by the RLS for the third year cohort for all the three groups as seen in Table 18. Subjects were placed into three ethnic groups; Asian, Others, and Whites. There were no differences between the different ethnic groups and the RLS score or item 15 (groups A, B, and C).

Table 18: Distribution of Total RLS mean scores for the different ethnic groups, 95% confidence interval of difference of means (95% CI), and p-value for ANOVA for year cohort 3 (groups A, B, and C):

RLS (Group)	Ethnicity	Number	Mean	95% CI	p-value
Total RLS (A)	Asian	63	58.76	55.16 to 62.36	
	Other	46	62.89	58.98 to 66.80	0.243
	White	25	58.48	53.07 to 63.89	
Total RLS (B)	Asian	26	59.96	52.56 to 67.36	
	Other	24	61.33	56.53 to 66.14	0.293
	White	10	52.8	46.32 to 59.28	
Total RLS (C)	Asian	27	61.33	56.22 to 66.45	
	Other	27	60.67	55.47 to 65.87	0.514
	White	9	55.78	48.04 to 63.52	

Table 19: Distribution of Item 15 in the RLS Inventory According to Ethnicity for year cohort 3 (groups A, B, and C)

RLS 15 Scale (Group)		Ethnicity			
		Asian	Other	White	Total
RLS 15 (A)	Restricted	6	3	2	11
	Partial	19	14	2	35
	Ample	17	17	13	47
	Maximal	12	3	3	18
	Total	54	37	20	111
RLS 15 (B)	Restricted	2	0	2	4
	Partial	8	9	2	19
	Ample	6	8	3	17
	Maximal	6	0	2	8
	Total	22	17	9	48
RLS 15 (C)	Restricted	1	2	2	5
	Partial	7	7	2	16
	Ample	13	11	2	26
	Maximal	1	3	2	6
	Total	22	23	8	53

3.4 Comparative Data of Dundee Ready Environment Educational Method (DREEM) with Ethnicity:

Table 20 shows the distribution of the mean values for the different ethnic groups and total DREEM scores and subscales for third and fourth year students for groups A and C.

Table 20: Mean DREEM and subscales scores, 95% confidence interval of difference of means, and p-value for year cohort 3 and 4 according to Ethnicity (groups B and C)

Year Cohort	DREEM and Subscales (Group)	Ethnicity	Number	Mean	95% CI	p-value
3	Total DREEM (B)	Asian	25	114	106.30 to 121.70	
		Other	25	123.36	114.24 to 132.48	0.218
		White	11	113.18	97.70 to 128.67	
		Total	61	117.69	112.28 to 123.10	
	Perception of Learning (B)	Asian	25	25.48	22.98 to 27.98	
		Other	25	27.44	24.52 to 30.36	0.249
		White	11	23.55	18.99 to 28.11	
		Total	61	25.93	24.23 to 27.64	
	Perception of Teachers (B)	Asian	25	25.2	23.73 to 26.67	
		Other	25	27.96	26.0 to 29.92	0.131
		White	11	26.09	21.37 to 30.81	
		Total	61	26.49	25.24 to 27.74	
	Academic Self Perception (B)	Asian	25	19.4	17.65 to 21.15	
		Other	25	21.4	19.73 to 23.07	0.184
		White	11	19.36	16.74 to 21.99	
		Total	61	20.21	19.15 to 21.28	
	Perception of Atmosphere (B)	Asian	25	27.28	25.12 to 29.44	
		Other	25	28.28	25.58 to 30.98	0.555
		White	11	25.91	21.34 to 30.48	
		Total	61	27.44	25.89 to 28.99	
	Student Social Self Perception (B)	Asian	25	16.64	15.23 to 18.05	
		Other	25	17.72	16.46 to 18.98	0.271
		White	11	18.36	16.39 to 20.34	
		Total	61	17.39	16.57 to 18.22	

Continued from Table 20:

Year Cohort	DREEM and Subscales Group	Ethnicity	Number	Mean	95% CI	p-value
3	Total DREEM (C)	Asian	17	115.24	104.64 to 125.83	0.178
		Other	19	123.89	115.94 to 131.85	
		White	7	109.86	92.11 to 127.60	
		Total	43	118.19	112.34 to 124.03	
	Perception of Learning (C)	Asian	17	26	22.74 to 29.26	0.191
		Other	19	28.47	26.19 to 30.76	
		White	7	24.14	17.98 to 30.31	
		Total	43	26.79	25.00 to 28.59	
	Perception of Teachers (C)	Asian	17	25.47	23.03 to 27.91	0.354
		Other	19	27.42	25.74 to 29.10	
		White	7	26.43	23.46 to 29.39	
		Total	43	26.49	25.25 to 27.72	
	Academic Self Perception (C)	Asian	17	19.12	17.38 to 20.85	0.176
		Other	19	20.53	18.88 to 22.17	
		White	7	17.57	13.21 to 21.94	
		Total	43	19.49	18.35 to 20.62	
	Perception of Atmosphere (C)	Asian	17	27.65	24.68 to 30.61	0.181
		Other	19	28.42	26.26 to 30.58	
		White	7	24.29	20.52 to 28.05	
		Total	43	27.44	25.88 to 29.00	
	Student Social Self Perception (C)	Asian	17	17	15.28 to 18.72	0.526
		Other	19	24.42	9.57 to 39.27	
		White	7	17.43	14.10 to 20.76	
		Total	43	20.35	13.99 to 26.70	

Continued from Table 20:

Year Cohort	DREEM and Subscales (Group)	Ethnicity	Number	Mean	95% CI	p-value
4	Total DREEM (C)	Asian	12	120.5	98.69 to 142.31	0.494
		Other	7	131.86	122.28 to 141.43	
		White	5	137	101.74 to 172.26	
		Total	24	127.25	115.44 to 139.06	
	Perception of Learning (C)	Asian	12	29.83	26.57 to 33.09	0.975
		Other	7	30.29	26.13 to 34.45	
		White	5	30.4	21.21 to 39.59	
		Total	24	30.08	27.87 to 32.30	
	Perception of Teachers (C)	Asian	12	25.75	21.69 to 29.81	0.184
		Other	7	29.43	26.23 to 32.63	
		White	5	31	23.00 to 39.00	
		Total	24	27.92	25.42 to 30.42	
	Academic Self Perception (C)	Asian	12	23.83	20.84 to 26.82	0.814
		Other	7	23	21.31 to 24.69	
		White	5	22.4	14.92 to 29.88	
		Total	24	23.29	21.49 to 25.09	
	Perception of Atmosphere (C)	Asian	12	29.75	25.91 to 33.59	0.338
		Other	7	30.71	27.39 to 34.04	
		White	5	34.2	26.13 to 42.27	
		Total	24	30.96	28.60 to 33.32	
	Student Social Self Perception (C)	Asian	12	28.83	6.91 to 50.75	0.617
		Other	7	18.43	15.37 to 21.49	
		White	5	19	15.96 to 22.04	
		Total	24	23.75	13.41 to 34.09	

4. Comparative Data of the Assessment Tools Related to Academic Achievement:

The students' academic achievements were obtained from their record twice during the study; Academic Achievement 1 (BDS part 1: sections A and B for the academic year 2005/06), and Academic Achievement 2 (BDS part 3: sections A and B for the academic year 2007/08).

4.1. Comparative Data of the Index of Learning Styles (ILS) with Academic

Achievement:

To detect differences in learning styles with academic achievement, ANOVA was administered and there were significant differences (p=0.021) for the active/reflective learning style for third year cohort (group A) (Table 21), and for the sequential/global scale for group C as well (p=0.023) (Table 22).

Table 21: ILS distribution, Academic Achievement 1, mean, 95% confidence interval of difference of means (95% CI) and p-value for year cohort 3 (group A)

ILS	Year (Group)	Academic Achievement 1	Number	Mean	95% CI	p-value
Active/ Reflective		Fail ≤44	2	-1.00	-51.82 to 49.82	
		Borderline 45-49	3	-3.67	-6.54 to -0.80	
		Pass 50-59	23	-3.09	-4.86 to -1.31	**0.021**
		Merit 60-69	59	-0.68	-1.75 to 0.40	
		Distinction ≥70	14	1.29	-0.93 to 3.50	
		Total	101	-1.05	-1.88 to -0.22	
Sensing/ Intuitive		Fail ≤ 44	2	-1.00	-26.41 to 24.41	
		Borderline 45-49	3	-3.67	-21.11 to 13.78	
		Pass 50-59	23	-3.09	-4.88 to -1.29	0.918
		Merit 60-69	59	-2.69	-4.00 to -1.39	
		Distinction ≥70	14	-3.71	-6.30 to -1.13	
	3 (A)	Total	101	-2.92	-3.85 to -1.99	
Visual/ Verbal		Fail ≤ 44	2	-4.00	-67.53 to 59.53	
		Borderline 45-49	3	-3.67	-21.11 to 13.78	
		Pass 50-59	23	-4.91	-6.35 to -3.47	0.155
		Merit 60-69	59	-2.61	-3.66 to -1.56	
		Distinction ≥70	14	-1.86	-4.45 to 0.73	
		Total	101	-3.09	-3.91 to -2.27	
Sequential / Global		Fail ≤ 44	2	-4.00	-92.94 to 84.94	
		Borderline 45-49	3	0.33	-5.40 to 6.07	
		Pass 50-59	23	-2.39	-4.11 to -0.67	0.778
		Merit 60-69	59	-2.69	-3.84 to -1.55	
		Distinction ≥70	14	-2.57	-4.28 to -0.87	
		Total	101	-2.54	-3.36 to -1.73	

Table 22: ILS distribution mean scores according to Academic Achievement 2, mean, 95% confidence interval of difference of means (95% CI) and p-value for year cohort 3 (group B):

ILS	Year (Group)	Academic Achievement 2	Number	Mean	95% CI	p-value
Active/ Reflective		Fail ≤44	0	0	0	
		Borderline 45-49	0	0	0	
		Pass 50-59	2	-4.00	-16.71 to 8.71	0.491
		Merit 60-69	37	-1.27	-2.90 to 0.36	
		Distinction ≥70	22	-2.55	-4.57 to -0.52	
		Total	61	-1.82	-3.03 to -0.61	
Sensing/ Intuitive		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
		Pass 50-59	2	-9.00	-34.41 to 16.41	0.120
		Merit 60-69	37	-3.11	-4.47 to -1.75	
		Distinction ≥70	22	-3.36	-4.93 to -1.80	
	3 (B)	Total	61	-3.39	-4.40 to -2.38	
Visual / Verbal		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
		Pass 50-59	2	-4.00	-92.94 to 84.94	0.973
		Merit 60-69	37	-3.32	-4.94 to -1.71	
		Distinction ≥70	22	-3.55	-5.65 to -1.44	
		Total	61	-3.43	-4.67 to -2.18	
Sequential / Global		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
		Pass 50-59	2	-8.00	-46.12 to 30.12	**0.023**
		Merit 60-69	37	-1.86	-3.18 to -0.55	
		Distinction ≥70	22	-4.18	-5.97 to -2.39	
		Total	61	-2.90	-3.97 to -1.83	

Table 23: ILS distribution mean scores according to Academic Achievement 2, mean, 95% confidence interval of difference of means (95% CI) and p-value for year cohort 3 (group C)

ILS	Year (Group)	Academic Achievement 2	Number	Mean	95% CI	p-value
Active/ Reflective		Fail ≤44	0	0	0	
		Borderline 45-49	0	0	0	
		Pass 50-59	2	-3.00	-28.41 to 22.41	0.498
		Merit 60-69	27	-0.78	-2.40 to 0.84	
		Distinction ≥70	16	0.25	-1.95 to 2.45	
		Total	45	-0.51	-1.73 to 0.71	
Sensing/ Intuitive		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
		Pass 50-59	2	-3.00	-53.82 to 47.82	0.857
		Merit 60-69	27	-3.44	-5.28 to -1.60	
		Distinction ≥70	16	-2.50	-5.93 to 0.93	
	3 (C)	Total	45	-3.09	-4.67 to -1.50	
Visual / Verbal		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
		Pass 50-59	2	-4.00	-16.71 to 8.71	0.772
		Merit 60-69	27	-3.74	-5.84 to -1.65	
		Distinction ≥70	16	-2.63	-5.18 to -0.07	
		Total	45	-3.36	-4.85 to -1.86	
Sequential / Global		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
		Pass 50-59	2	-6.00	-18.71 to 6.17	0.311
		Merit 60-69	27	-2.19	-3.86 to -0.51	
		Distinction ≥70	16	-3.75	-6.18 to -1.32	
		Total	45	-2.91	-4.21 to -1.61	

There were significant differences for the fourth year cohort for the active/reflective

learning style (group B) (p=0.023) (Table 24).

Table 24: ILS distribution, Academic Achievement 1, mean, 95% confidence interval of difference of means (95% CI) and p-value for 4th year students (group A):

ILS	Year (Group)	Academic Achievement 1	Number	Mean	95% CI	p-value
Active/ Reflective		Fail ≤44	0	0	0	**0.023**
		Borderline 45-49	0	0	0	
		Pass 50-59	3	-2.33	-9.92 to 5.26	
		Merit 60-69	21	-2.24	-4.24 to -0.23	
		Distinction ≥70	17	1.12	-0.22 to -2.45	
		Total	41	-0.85	-1.75 to 0.40	
Sensing/ Intuitive		Fail ≤ 44	0	0	0	0.260
		Borderline 45-49	0	0	0	
		Pass 50-59	3	-3.67	-6.54 to -0.80	
		Merit 60-69	21	-2.43	-4.53 to -0.33	
		Distinction ≥70	17	-4.76	-6.88 to -2.65	
	4 (A)	Total	41	-3.49	-4.85 to -2.12	
Visual / Verbal		Fail ≤ 44	0	0	0	0.832
		Borderline 45-49	0	0	0	
		Pass 50-59	3	-3.67	-22.11 to 13.78	
		Merit 60-69	21	-4.05	-5.99 to -2.10	
		Distinction ≥70	17	-3.24	-4.94 to -1.53	
		Total	41	-3.68	-4.95 to -2.42	
Sequential / Global		Fail ≤ 44	0	0	0	0.976
		Borderline 45-49	0	0	0	
		Pass 50-59	3	-1.67	-7.40 to 4.07	
		Merit 60-69	21	-1.95	-3.92 to 0.01	
		Distinction ≥70	17	-2.18	-4.42 to 0.07	
		Total	41	-2.02	-3.33 to -0.71	

Table 25: ILS mean scores according to Academic Achievement 2, mean, 95% confidence interval of difference of means (95% CI) and p-value for year cohort 4 (group C)

ILS	Year (Group)	Academic Achievement 1	Number	Mean	95% CI	p-value
Active/ Reflective		Fail ≤44	3	-1.67	-16.84 to 13.51	
		Borderline 45-49	0	0	0	
		Pass 50-59	0	0	0	
		Merit 60-69	7	-0.71	-3.62 to 2.20	0.927
		Distinction ≥70	13	-1.62	-5.08 to 1.85	
		Total	23	-1.35	-3.48 to 0.78	
Sensing/ Intuitive		Fail ≤ 44	3	0.33	-12.17 to 12.84	
		Borderline 45-49	0	0	0	
		Pass 50-59	0	0	0	
		Merit 60-69	7	-4.43	-8.66 to -0.20	0.325
		Distinction ≥70	13	-5.15	-8.83 to -1.84	
	4 (C)	Total	23	-4.22	-6.65 to -1.79	
Visual / Verbal		Fail ≤ 44	3	-5.00	19.90 to 9.90	
		Borderline 45-49	0	0	0	
		Pass 50-59	0	0	0	
		Merit 60-69	7	-4.14	-8.90 to 0.62	0.960
		Distinction ≥70	13	-4.69	-7.52 to -1.86	
		Total	23	-4.57	-6.62 to -2.51	
Sequential / Global		Fail ≤ 44	3	1.00	-16.21 to 18.21	
		Borderline 45-49	0	0	0	
		Pass 50-59	0	0	0	
		Merit 60-69	7	-1.00	-2.51 to 0.51	0.580
		Distinction ≥70	13	-1.62	-4.00 to 0.77	
		Total	23	-1.09	-2.73 to 0.55	

4.2. Comparative Data of The Approach to Learning and Studying (ALSI) with Academic Achievement:

There were no significant differences between ALSI and academic achievement 1 or 2 as seen in Tables 26 and 27.

Table 26: Mean ALSI scores, 95% confidence interval of difference of means (95% CI), and p-value according to Academic Achievement 1 for year cohorts 3 and 4 (groups A and B):

Year Cohort	ALSI (Group)	Academic Achievement 1	Number	Mean	95% CI	p-value
	Total ALSI (A)	Fail ≤ 44	2	71.5	-61.92 to 204.92	
		Borderline 45-49	3	72	61.17 to 82.83	
		Pass 50-59	22	68.59	65.34 to 71.84	0.334
		Merit 60-69	58	65.97	63.71 to 68.22	
		Distinction ≥70	14	64.36	59.74 to 68.97	
		Total	99	66.62	64.96 to 68.27	
	Deep (A)	Fail ≤ 44	2	25.5	-31.68 to 82.68	
		Borderline 45-49	3	23	18.03 to 27.97	
		Pass 50-59	22	21.73	20.17 to 23.29	0.384
		Merit 60-69	58	21.29	20.34 to 22.25	
		Distinction ≥70	14	20.57	18.65 to 22.49	
		Total	99	21.42	20.71 to 22.14	
3	Surface (A)	Fail ≤ 44	2	14.5	-4.56 to 33.56	
		Borderline 45-49	3	13.33	5.74 to 20.92	
		Pass 50-59	22	14.77	13.56 to 15.98	0.401
		Merit 60-69	58	13.14	12.18 to 14.09	
		Distinction ≥70	14	13.71	12.11 to 15.32	
		Total	99	13.62	12.96 to 14.28	
	Monitoring (A)	Fail ≤ 44	2	16.5	10.15 to 22.85	
		Borderline 45-49	3	18.33	14.54 to 22.13	
		Pass 50-59	22	16.59	15.65 to 17.54	0.138
		Merit 60-69	58	15.84	15.11 to 16.58	
		Distinction ≥70	14	14.71	13.19 to 16.24	
		Total	99	15.94	15.41 to 16.47	
	Organised/Effort (A)	Fail ≤ 44	2	15	-35.82 to 65.82	
		Borderline 45-49	3	17.33	7.93 to 26.74	
		Pass 50-59	22	15.5	14.25 to 16.75	0.885
		Merit 60-69	58	15.78	14.93 to 16.62	
		Distinction ≥70	14	15.36	13.39 to 17.33	
		Total	99	15.69	15.06 to 16.32	

Continued from Table 26:

Year Cohort	ALSI (Group)	Academic Achievement 1	Number	Mean	95% CI	p-value
	Total ALSI (B)	Fail ≤ 44	1	82	0	0.263
		Borderline 45-49	3	69.67	31.08 to 108.26	
		Pass 50-59	9	61.56	54.69 to 68.42	
		Merit 60-69	40	64.63	61.45 to 67.80	
		Distinction ≥70	9	67.67	60.85 to 74.49	
		Total	62	65.15	62.60 to 67.69	
	Deep (B)	Fail ≤ 44	1	30	0	0.313
		Borderline 45-49	3	23	9.17 to 36.83	
		Pass 50-59	9	20.67	17.82 to 23.52	
		Merit 60-69	40	22.25	20.92 to 23.58	
		Distinction ≥70	9	22.56	19.18 to 25.93	
		Total	62	22.23	21.16 to 23.29	
3	Surface (B)	Fail ≤ 44	1	14	0	0.155
		Borderline 45-49	3	16	7.39 to 24.61	
		Pass 50-59	9	12.11	10.17 to 14.05	
		Merit 60-69	40	12.25	11.17 to 13.33	
		Distinction ≥70	9	14.56	11.70 to 17.41	
		Total	62	12.77	11.91 to 13.64	
	Monitoring (B)	Fail ≤ 44	1	18	0	0.821
		Borderline 45-49	3	15.33	5.29 to 25.37	
		Pass 50-59	9	14.11	12.42 to 15.81	
		Merit 60-69	40	14.75	13.68 to 15.82	
		Distinction ≥70	9	14.67	12.49 to 16.84	
		Total	62	14.73	13.94 to 15.51	
	Organised/Effort (B)	Fail ≤ 44	1	20	0	0.690
		Borderline 45-49	3	15.33	7.35 to 23.32	
		Pass 50-59	9	14.67	11.32 to 18.02	
		Merit 60-69	40	15.38	14.24 to 16.51	
		Distinction ≥70	9	15.89	13.99 to 17.79	
		Total	62	15.42	14.53 to 16.30	

Continued from Table 26:

Year Cohort	ALSI (Group)	Academic Achievement 1	Number	Mean	95% CI	p-value
		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
	Total ALS (A)	Pass 50-59	2	44.5	-38.09 to 127.09	0.825
		Merit 60-69	21	43.38	40.02 to 46.75	
		Distinction ≥70	17	41.76	36.34 to 47.19	
		Total	40	42.75	39.95 to 45.55	
		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
	Deep (A)	Pass 50-59	2	15.5	-41.68 to 72.68	0.924
		Merit 60-69	21	15.62	13.85 to 17.38	
		Distinction ≥70	17	16.18	13.62 to 18.74	
		Total	40	15.85	14.46 to 17.24	
		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
4	Surface (A)	Pass 50-59	2	7.5	1.15 to 13.85	0.437
		Merit 60-69	21	10.62	8.96 to 12.28	
		Distinction ≥70	17	10.88	9.15 to 12.62	
		Total	40	10.58	9.47 to 11.68	
		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
	Monitoring (A)	Pass 50-59	2	11.5	-7.56 to 30.56	0.157
		Merit 60-69	21	8.14	6.89 to 9.39	
		Distinction ≥70	17	7.65	6.41 to 8.88	
		Total	40	8.1	7.25 to 8.95	
		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
	Organised/Effort (A)	Pass 50-59	2	10	-2.71 to 22.71	0.246
		Merit 60-69	21	9	7.55 to 10.45	
		Distinction ≥70	17	7.06	4.73 to 9.38	
		Total	40	8.23	7.00 to 9.45	

Table 27: Mean ALSI scores, 95% confidence interval of difference of means (95% CI), and p-value according to Academic Achievement 2 year cohort 3 (group C):

Year Cohort	ALSI (Group)	Academic Achievement 2	Number	Mean	95% CI	p-value
		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
	Total ALSI (C)	Pass 50-59	2	65	39.59 to 90.41	0.676
		Merit 60-69	26	59.81	54.29 to 65.32	
		Distinction ≥70	16	62.44	59.02 to 65.86	
		Total	44	61	57.60 to 64.40	
		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
	Deep (C)	Pass 50-59	2	23	-2.41 to 48.41	0.715
		Merit 60-69	25	21.2	19.76 to 22.64	
		Distinction ≥70	16	21.75	20.04 to 23.46	
		Total	43	21.49	20.46 to 22.51	
		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
	Surface (C)	Pass 50-59	2	13.5	-5.56 to 32.56	0.302
3		Merit 60-69	25	11.8	10.69 to 12.91	
		Distinction ≥70	16	13	11.64 to 14.36	
		Total	43	12.33	11.51 to 13.14	
		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
	Monitoring (C)	Pass 50-59	2	15	-10.41 to 40.41	0.218
		Merit 60-69	25	15.08	14.09 to 16.07	
		Distinction ≥70	16	13.81	12.78 to 14.85	
		Total	43	14.6	13.90 to 15.31	
		Fail ≤ 44	0	0	0	
		Borderline 45-49	0	0	0	
	Organised/Effort (C)	Pass 50-59	2	16	-9.41 to 41.41	0.714
		Merit 60-69	25	14.16	12.83 to 15.49	
		Distinction ≥70	16	13.81	11.64 to 15.99	
		Total	43	14.12	13.04 to 15.20	

4.3. Comparative Data of Reflection in Learning and Studying (RLS) with Academic

Achievement:

There are no significant differences for RLS scores and academic achievement for third

and fourth year cohorts groups A, B, and C as seen in Table 28 and Table 29.

Table 28: RLS mean scores according to Academic Achievement 1, 95% Confidence Interval of difference of means (95% CI) and p-value for year cohorts 3 and 4 (group A and B):

Year Cohort	Total RLS (Group)	Academic Achievement 1	Number	Mean	95% CI	p-value
3	Total RLS (A)	Fail ≤ 44	2	71.5	-150.86 to 293.86	0.409
		Borderline 45-49	3	69.33	25.93 to 112.74	
		Pass 50-59	22	58.09	53.43 to 62.75	
		Merit 60-69	55	59.6	55.70 to 63.50	
		Distinction ≥70	14	55.64	45.68 to 65.60	
		Total	96	59.23	56.33 to 62.13	
	Total RLS (B)	Fail ≤ 44	1	85	0	0.337
		Borderline 45-49	3	55	26.35 to 83.65	
		Pass 50-59	9	60.56	51.74 to 69.37	
		Merit 60-69	38	59.92	54.60 to 65.24	
		Distinction ≥70	9	54.11	47.24 to 60.98	
		Total	60	59.32	55.53 to 63.10	
4	Total RLS (A)	Fail ≤ 44	0	0	0	0.861
		Borderline 45-49	0	0	0	
		Pass 50-59	2	67	-60.06 to 194.06	
		Merit 60-69	20	62.3	57.11 to 67.49	
		Distinction ≥70	16	61.94	54.65 to 69.23	
		Total	38	62.39	58.43 to 66.36	

Table 29: Total RLS mean scores according to Academic Achievement 2, 95% Confidence Interval of difference of means (95% CI) and p-value for year cohorts 3 and 4 (group C):

Year Cohort	Total RLS (Group)	Academic Achievement 2	Number	Mean	95% CI		p-value
3	Total RLS (C)	Fail ≤ 44	0	0	0		0.167
		Borderline 45-49	0	0	0		
		Pass 50-59	2	76.5	-18.80 to	171.80	
		Merit 60-69	24	58.75	53.50 to	64.00	
		Distinction ≥70	16	58.94	52.03 to	65.85	
		Total	42	59.67	55.66 to	63.68	
4	Total RLS (C)	Fail ≤ 44	3	48.67	37.47 to	59.87	0.28
		Borderline 45-49	0	0	0		
		Pass 50-59	0	0	0		
		Merit 60-69	6	64	45.58 to	82.42	
		Distinction ≥70	13	69.54	56.13 to	82.95	
		Total	22	65.18	56.23 to	74.14	

4.4. Comparative Data of Dundee Ready Environment Educational Method (DREEM) with Academic Achievement:

There are no significant differences between DREEM and subscales mean scores and academic achievements 1 or 2 for third and fourth year cohorts groups A, B, and C as seen in Tables 30 and 31.

Table 30: DREEM and Subscales mean scores according to Academic Achievement 1, 95% confidence interval of difference of means (95% CI) and p-value for year cohort 3 (groups A and B):

Year Cohort	DREEM and Subscales (Group)	Academic Achievement 1	Number	Mean	95% CI	p-value
3	Total DREEM (A)	Fail ≤ 44	2	131.5	112.44 to 150.56	
		Borderline 45-49	3	122.33	93.54 to 151.13	
		Pass 50-59	22	125.86	118.51 to 133.21	0.983
		Merit 60-69	57	126.96	120.53 to 133.40	
		Distinction ≥70	13	128.77	120.57 to 136.97	
		Total	97	126.91	122.72 to 131.09	
	Perception of Learning (A)	Fail ≤ 44	2	30.5	-1.27 to 62.27	
		Borderline 45-49	3	27.67	15.41 to 39.92	
		Pass 50-59	22	29.41	27.24 to 31.58	0.678
		Merit 60-69	57	30.93	29.32 to 32.54	
		Distinction ≥70	13	29.38	26.81 to 31.95	
		Total	97	30.27	29.16 to 31.38	
	Perception of Teachers(A)	Fail ≤ 44	2	26	26.00 to 26.00	
		Borderline 45-49	3	27	22.70 to 31.30	
		Pass 50-59	22	27.23	25.24 to 29.22	0.892
		Merit 60-69	57	27.96	26.42 to 29.51	
		Distinction ≥70	13	28.85	26.05 to 31.65	
		Total	97	27.85	26.79 to 28.90	
	Academic Self Perception (A)	Fail ≤ 44	2	24.00	24.00 to 24.00	
		Borderline 45-49	3	20.67	12.68 to 28.65	
		Pass 50-59	22	21.27	19.81 to 22.73	0.695
		Merit 60-69	57	20.6	19.30 to 21.89	
		Distinction ≥70	13	21.92	20.24 to 23.60	
		Total	97	21	20.15 to 21.85	
	Perception of Atmosphere (A)	Fail ≤ 44	2	31.00	18.29 to 43.71	
		Borderline 45-49	3	28.67	18.63 to 38.71	
		Pass 50-59	22	30.32	28.37 to 32.26	0.907
		Merit 60-69	57	29.42	27.42 to 31.42	
		Distinction ≥70	13	31.08	28.88 to 33.28	
		Total	97	29.86	28.58 to 31.13	
	Student Social Self Perception (A)	Fail ≤ 44	2	20.00	-5.41 to 45.41	
		Borderline 45-49	3	18.33	12.08 to 24.58	
		Pass 50-59	22	17.64	15.97 to 19.30	0.895
		Merit 60-69	57	18.05	17.06 to 19.04	
		Distinction ≥70	13	17.54	16.09 to 18.99	
		Total	97	17.94	17.23 to 18.64	

Continued from Table 30:

Year Cohort	DREEM and Subscales (Group)	Academic Achievement 1	Number	Mean	95% CI	p-value
3	Total DREEM (B)	Fail ≤ 44	1	143	0	0.518
		Borderline 45-49	3	106.67	68.72 to 144.61	
		Pass 50-59	9	120.89	108.04 to 133.74	
		Merit 60-69	39	118.59	110.91 to 126.27	
		Distinction ≥70	9	111.44	101.89 to 121.00	
		Total	61	117.69	112.28 to 123.10	
	Perception of Learning (B)	Fail ≤ 44	1	34	0	0.555
		Borderline 45-49	3	25.33	7.02 to 43.64	
		Pass 50-59	9	25.67	21.92 to 29.41	
		Merit 60-69	39	26.44	24.08 to 28.79	
		Distinction ≥70	9	23.33	19.27 to 27.40	
		Total	61	25.93	24.23 to 27.64	
	Perception of Teachers (B)	Fail ≤ 44	1	28	0	0.396
		Borderline 45-49	3	24.67	21.80 to 27.54	
		Pass 50-59	9	29	26.66 to 31.34	
		Merit 60-69	39	26.44	24.73 to 28.14	
		Distinction ≥70	9	24.67	20.71 to 28.62	
		Total	61	26.49	25.24 to 27.74	
	Academic Self Perception (B)	Fail ≤ 44	1	23	0	0.975
		Borderline 45-49	3	19.67	6.92 to 32.41	
		Pass 50-59	9	20.22	17.68 to 22.77	
		Merit 60-69	39	20.18	18.65 to 21.71	
		Distinction ≥70	9	20.22	18.35 to 22.10	
		Total	61	20.21	19.15 to 21.28	
	Perception of Atmosphere (B)	Fail ≤ 44	1	34	0	0.460
		Borderline 45-49	3	23.33	12.99 to 33.68	
		Pass 50-59	9	29	24.84 to 33.16	
		Merit 60-69	39	27.56	25.42 to 29.71	
		Distinction ≥70	9	26	23.00 to 29.00	
		Total	61	27.44	25.89 to 28.99	
	Student Social Self Perception (B)	Fail ≤ 44	1	24	0	0.051
		Borderline 45-49	3	13.67	5.68 to 21.65	
		Pass 50-59	9	16.67	14.74 to 18.59	
		Merit 60-69	39	17.72	16.63 to 18.81	
		Distinction ≥70	9	17.22	15.90 to 18.54	
		Total	61	17.39	16.57 to 18.22	

Table 31: DREEM and Subscales mean scores according to Academic Achievement 2, 95% confidence interval of difference of means (95% CI) and p-value for year cohorts 3 and 4 (group C):

Year Cohort	DREEM and Subscales (Group)	Academic Achievement 2	Number	Mean	95% CI	p-value
3	Total DREEM (C)	Fail ≤ 44	0	0	0	0.770
		Borderline 45-49	0	0	0	
		Pass 50-59	2	125.5	81.03 to 169.97	
		Merit 60-69	25	116.68	109.08 to 124.28	
		Distinction ≥70	16	119.63	108.27 to 130.98	
		Total	43	118.19	112.34 to 124.03	
	Perception of Learning (C)	Fail ≤ 44	0	0	0	0.448
		Borderline 45-49	0	0	0	
		Pass 50-59	2	31	31.00 to 31.00	
		Merit 60-69	25	26.04	23.61 to 28.47	
		Distinction ≥70	16	27.44	24.25 to 30.63	
		Total	43	26.79	25.00 to 28.59	
	Perception of Teachers (C)	Fail ≤ 44	0	0	0	0.506
		Borderline 45-49	0	0	0	
		Pass 50-59	2	23.5	-33.68 to 80.68	
		Merit 60-69	25	26.88	25.30 to 28.46	
		Distinction ≥70	16	26.25	24.03 to 28.47	
		Total	43	26.49	25.25 to 27.72	
	Academic Self Perception (C)	Fail ≤ 44	0	0	0	0.311
		Borderline 45-49	0	0	0	
		Pass 50-59	2	22.5	3.44 to 41.56	
		Merit 60-69	25	19.8	18.24 to 21.36	
		Distinction ≥70	16	18.63	16.71 to 20.54	
		Total	43	19.49	18.35 to 20.62	
	Perception of Atmosphere (C)	Fail ≤ 44	0	0	0	0.686
		Borderline 45-49	0	0	0	
		Pass 50-59	2	30.5	24.15 to 36.85	
		Merit 60-69	25	27.2	25.15 to 29.25	
		Distinction ≥70	16	27.44	24.45 to 30.42	
		Total	43	27.44	25.88 to 29.00	
	Student Social Self Perception (C)	Fail ≤ 44	0	0	0	0.833
		Borderline 45-49	0	0	0	
		Pass 50-59	2	18	5.29 to 30.71	
		Merit 60-69	25	22	10.85 to 33.15	
		Distinction ≥70	16	18.06	16.02 to 20.11	
		Total	43	20.35	13.99 to 26.70	

Continued from Table 31:

Year Cohort	DREEM and Subscales (Group)	Academic Achievement 2	Number	Mean	95% CI	p-value
4	Total DREEM (C)	Fail ≤ 44	3	130.33	18.95 to 241.71	0.668
		Borderline 45-49	0	0	0	
		Pass 50-59	0	0	0	
		Merit 60-69	8	133.88	123.12 to 144.63	
		Distinction ≥70	13	122.46	103.24 to 141.69	
		Total	24	127.25	115.44 to 139.06	
	Perception of Learning (C)	Fail ≤ 44	3	30	8.34 to 51.66	0.911
		Borderline 45-49	0	0	0	
		Pass 50-59	0	0	0	
		Merit 60-69	8	30.75	27.38 to 34.12	
		Distinction ≥70	13	29.69	26.38 to 33.01	
		Total	24	30.08	27.87 to 32.30	
	Perception of Teachers (C)	Fail ≤ 44	3	27	-7.78 to 61.78	0.752
		Borderline 45-49	0	0	0	
		Pass 50-59	0	0	0	
		Merit 60-69	8	29.25	26.43 to 32.07	
		Distinction ≥70	13	27.31	24.22 to 30.39	
		Fail ≤ 44	24	27.92	25.42 to 30.42	
	Academic Self Perception (C)	Fail ≤ 44	3	24	6.61 to 41.39	0.927
		Borderline 45-49	0	0	0	
		Pass 50-59	0	0	0	
		Merit 60-69	8	22.88	20.90 to 24.85	
		Distinction ≥70	13	23.38	20.48 to 26.29	
		Total	24	23.29	21.49 to 25.09	
	Perception of Atmosphere (C)	Fail ≤ 44	3	29	-4.42 to 62.42	0.800
		Borderline 45-49	0	0	0	
		Pass 50-59	0	0	0	
		Merit 60-69	8	31.63	29.22 to 34.03	
		Distinction ≥70	13	31	28.06 to 33.94	
		Total	24	30.96	28.60 to 33.32	
	Student Social Self Perception (C)	Fail ≤ 44	3	20.33	13.16 to 27.50	0.766
		Borderline 45-49	0	0	0	
		Pass 50-59	0	0	0	
		Merit 60-69	8	19.38	16.38 to 22.37	
		Distinction ≥70	13	27.23	7.07 to 47.39	
		Total	24	23.75	13.41 to 34.09	

Appendix D

Results for the KAUFD study for year cohorts 1 through 6

1. Comparative Data of the Assessment Tools Related to Year:

1. 2. Comparative Data of Index of Learning Styles (ILS) with Year:

The Frequency / percentage of ILS (active/reflective, sensitive/intuitive, visual/verbal, and

sequential/global) across year cohorts one through 6 (group A) are shown in Tables 1-4.

Table 1: Distribution of number and percentage of the Active/ Reflective Scale across year cohorts 1 through 6 (group A)

Year Cohort Academic year 2007/08 (group A)		Active/Reflective Scale			
		Active	Balanced	Reflective	Total
1	Number	13	55	14	82
	Percent	15.9%	67.1%	17.1%	100%
2	Number	16	79	8	103
	Percent	15.5%	76.7%	7.8%	100%
3	Number	25	54	5	84
	Percent	29.8%	64.3%	6.0%	100%
4	Number	13	58	12	83
	Percent	15.7%	69.9%	14.5%	100%
5	Number	19	62	5	86
	Percent	22.1%	72.1%	5.8%	100%
6	Number	17	38	4	59
	Percent	28.8%	64.4%	6.8%	100%
Total	Number	103	346	48	497
	Percent	20.7%	69.6%	9.7%	100%

Table 2: Distribution of number and percentage of the Sensing/Intuitive Learning style across year cohorts 1 through 6 (group A)

Year Cohort Academic year 2007/08 (group A)		Sensing/Intuitive Scale			
		Sensing	Balanced	Intuitive	Total
1	Number	29	44	9	82
	Percent	35.4%	53.7%	11.0%	100%
2	Number	41	52	10	103
	Percent	39.8%	50.5%	9.7%	100.0%
3	Number	34	43	7	84
	Percent	40.5%	51.2%	8.3%	100.0%
4	Number	51	28	4	83
	Percent	61.4%	33.7%	4.8%	100.0%
5	Number	48	34	4	86
	Percent	55.8%	39.5%	4.7%	100.0%
6	Number	35	21	3	59
	Percent	59.3%	35.6%	5.1%	100.0%
Total	Number	238	222	37	497
	Percent	47.9%	44.7%	7.4%	100.0%

Table 3: Distribution of number and percentage of the Visual/Learning Learning style across year cohorts 1 through 6 (group A)

Year Cohort Academic year 2007/08 (group A)		Visual/Verbal Scale			
		Visual	Balanced	Verbal	Total
1	Number	61	18	3	82
	Percent	74.4%	22.0%	3.7%	100.0%
2	Number	61	37	5	103
	Percent	59.2%	35.9%	4.9%	100.0%
3	Number	64	17	3	84
	Percent	76.2%	20.2%	3.6%	100.0%
4	Number	51	28	4	83
	Percent	61.4%	33.7%	4.8%	100.0%
5	Number	58	26	2	86
	Percent	67.4%	30.2%	2.3%	100.0%
6	Number	44	14	1	59
	Percent	74.6%	23.7%	1.7%	100.0%
Total	**Number**	**339**	**140**	**18**	**497**
	Percent	**68.2%**	**28.2%**	**3.6%**	**100.0%**

Table 4: Distribution of number and percentage of the Sequential/Global Learning style across year cohorts 1 through 6 (group A)

Year Cohort Academic year 2007/08 (group A)		Sequential/Global Scale			
		Sequential	Balanced	Global	Total
1	Number	12	60	10	82
	Percent	14.6%	73.2%	12.2%	100.0%
2	Number	23	70	10	103
	Percent	22.3%	68.0%	9.7%	100.0%
3	Number	9	67	8	84
	Percent	10.7%	79.8%	9.5%	100.0%
4	Number	15	58	10	83
	Percent	18.1%	69.9%	12.0%	100.0%
5	Number	20	59	7	86
	Percent	23.3%	68.6%	8.1%	100.0%
6	Number	11	40	8	59
	Percent	18.6%	67.8%	13.6%	100.0%
Total	**Number**	**90**	**354**	**53**	**497**
	Percent	**18.1%**	**71.2%**	**10.7%**	**100.0%**

The Frequency and percentage of ILS (active/reflective, sensitive/intuitive, visual/verbal, and sequential/global) across academic years for group B are shown in Tables 5-8.

Table 5: Distribution of number and percentage of the Active/Reflective Learning style across year cohorts 1 through 5 (group B)

Year Cohort		Active/Reflective Scale			
Academic year 08/09 (group B)		Active	Balanced	Reflective	Total
1	Number	26	81	11	118
	Percent	22%	68.6%	9.3%	100.0%
2	Number	26	67	11	104
	Percent	25%	64.4%	10.6%	100.0%
3	Number	34	48	3	85
	Percent	40%	56.5%	3.5%	100.0%
4	Number	22	57	6	85
	Percent	25.9%	67.1%	7.1%	100.0%
5	Number	24	60	6	90
	Percent	26.7%	66.7%	6.7%	100.0%
Total	**Number**	**132**	**313**	**37**	**482**
	Percent	**27.4%**	**64.9%**	**7.7%**	**100.0%**

Table 6: Distribution of number and percentage of the Sensing/Intuitive Learning style across year cohorts 1 through 5 (group B)

Year Cohort		Sensing/Intuitive Scale			
Academic year 08/09 (group B)		Sensing	Balanced	Intuitive	Total
1	Number	53	58	7	118
	Percent	44.9%	49.2%	5.9%	100%
2	Number	60	38	6	104
	Percent	67.7%	36.5%	5.8%	100%
3	Number	40	42	3	85
	Percent	47.1%	41.4%	2.9%	100%
4	Number	46	36	3	85
	Percent	65.3%	49.4%	3.5%	100%
5	Number	59	27	4	90
	Percent	65.6%	30%	4.4%	100%
Total	**Number**	**258**	**201**	**23**	**482**
	Percent	**53.5%**	**41.7%**	**4.8%**	**100%**

Table 7: Distribution of number and percentage of the Visual/Verbal Learning style across year cohorts 1 through 5 (group B)

Year Cohort Academic year 08/09 (group B)		Visual/Verbal Scale			
		Visual	Balanced	Verbal	Total
1	Number	80	35	3	118
	Percent	67.8%	29.7%	2.5%	100.0%
2	Number	58	38	8	104
	Percent	55.8%	36.5%	7.7%	100.0%
3	Number	58	25	2	85
	Percent	68.2%	29.4%	2.4%	100.0%
4	Number	64	17	4	85
	Percent	75.3%	20%	4.7%	100.0%
5	Number	65	24	1	90
	Percent	72.2%	26.7%	1.1%	100.0%
Total	**Number**	**325**	**139**	**18**	**482**
	Percent	**67.4%**	**28.8%**	**3.7%**	**100.0%**

Table 8: Distribution of number and percentage of the Sequential/Global Learning style across year cohorts 1 through 5 (group B)

Year Cohort Academic year 08/09 (group B)		Sequential/Global Scale			
		Sequential	Balanced	Global	Total
1	Number	20	86	12	118
	Percent	16.9%	72.9%	10.2%	100.0%
2	Number	21	68	15	104
	Percent	20.2%	65.4%	14.4%	100.0%
3	Number	12	60	13	85
	Percent	14.1%	70.6%	15.3%	100.0%
4	Number	15	62	8	85
	Percent	17.6%	72.9%	9.4%	100.0%
5	Number	17	64	9	90
	Percent	18.9%	71.1%	10%	100.0%
Total	**Number**	**85**	**340**	**57**	**482**
	Percent	**17.6%**	**70.5%**	**11.8%**	**100.0%**

For the final part of the study, the ILS questionnaire was only given to the fifth year cohort (group C). Frequency and percentage ILS (active/reflective, sensing/intuitive, visual/verbal, and sequential/global) for the fifth year cohort in group C is shown in Table 9.

Table 9: Distribution of ILS (Active/Reflective, Sensitive/Intuitive, Visual/Verbal, and Sequential/Global) for year cohort 5 (group C)

ILS		Year Cohort 5 (group C) Academic year 08/09	
		Number	**Percentage**
Active/Reflective	Active	21	24.7%
	Balanced	59	69.4%
	Reflective	5	5.9%
	Total	**85**	**100%**
Sensing/Intuitive	Sensing	56	65.9%
	Balanced	26	30.6%
	Intuitive	3	3.5%
	Total	**85**	**100%**
Visual/Verbal	Visual	63	74.1%
	Balanced	21	24.7%
	Verbal	1	1.2%
	Total	**85**	**100%**
Sequential/Global	Sequential	19	22.4%
	Balanced	55	64.7%
	Global	11	12.9%
	Total	**85**	**100%**

1.2. Comparative Data of Approach to Learning and Studying (ALSI) with Year:

Table 10 shows the distribution of ALSI scale for groups A, B and C according to year.

Table 10: Distribution of ALS scale (Deep, Surface, Monitoring, and Organised/Effort Approach) for students in group A, B, and C years cohorts 1 through 6

Year Cohort	ALSI Approach		ALSI (group A) Academic year 07/08		ALSI (group B) Academic year 08/09		ALSI (group C) Academic year 08/09	
			Number	Percent	Number	Percent	Number	Percent
1	Deep	Low	0	0%	0	0%	0	0%
		Mid	29	36%	51	43.2%	0	0%
		High	52	64%	67	56.8%	0	0%
		Total	81	100%	118	100%	0	0%
	Surface	Low	6	7%	6	5.1%	0	0%
		Mid	61	75%	83	70.3%	0	0%
		High	14	17%	29	24.6%	0	0%
		Total	81	100%	118	100%	0	0%
	Monitoring	Low	0	0%	1	0.8%	0	0%
		Mid	27	33%	43	36.4%	0	0%
		High	54	67%	74	62.7%	0	0%
		Total	81	100%	118	100%	0	0%
	Organised/ Effort	Low	0	0%	2	1,7%	0	0%
		Mid	36	44%	55	46.6%	0	0%
		High	45	56%	61	51.7%	0	0%
		Total	81	100%	118	100%	0	0%
2	Deep	Low	0	0%	0	0%	0	0%
		Mid	50	50%	0	0%	0	0%
		High	51	50%	0	0%	0	0%
		Total	101	100%	0	0%	0%	0%
	Surface	Low	5	5%	0	0%	0	0%
		Mid	77	76%	0	0%	0	0%
		High	19	19%	0	0%	0	0%
		Total		101	0	0%	0%	0%
	Monitoring	Low	0	0%	0	0%	0	0%
		Mid	57	56%	0	0%	0	0%
		High	44	44%	0	0%	0	0%
		Total		101	0	0%	0%	0%
	Organised/ Effort	Low	5	5%	0	0%	0	0%
		Mid	50	49.5%	0	0%	0	0%
		High	46	45.5%	0	0%	0	0%
		Total		101	0	0%	0%	0%

Continued from Table 10:

Year Cohort	ALSI Approach		ALSI (group A) Academic year 07/08		ALSI (group B) Academic year 08/09		ALSI (group C) Academic year 08/09	
			Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
3	Deep	Low	0	0%	0	0%	0	0%
		Mid	38	46%	31	41.7%	0	0%
		High	45	54%	49	58.3%	0	0%
		Total	83	100%	84	100%	0	0%
	Surface	Low	5	6%	6	7.1%	0	0%
		Mid	61	73%	62	73.8%	0	0%
		High	17	20%	16	19%	0	0%
		Total	83	100%	84	100%	0	0%
	Monitoring	Low	1	1%	0	0%	0	0%
		Mid	42	51%	39	46.4%	0	0%
		High	40	48%	45	53.6%	0	0%
		Total	83	100%	84	100%	0	0%
	Organised/ Effort	Low	3	4%	0	0%	0	0%
		Mid	49	59%	46	54.8%	0	0%
		High	31	37%	38	45.2%	0	0%
		Total	83	100%	84	100%	0	0%
4	Deep	Low	0	0%	0	0%	0	0%
		Mid	35	43%	0	0%	0	0%
		High	46	57%	0	0%	0	0%
		Total	81	100%	0	0%	0%	0%
	Surface	Low	2	2%	0	0%	0	0%
		Mid	52	64%	0	0%	0	0%
		High	27	33%	0	0%	0	0%
		Total	81	100%	0	0%	0%	0%
	Monitoring	Low	0	0%	0	0%	0	0%
		Mid	42	52%	0	0%	0	0%
		High	39	48%	0	0%	0	0%
		Total	81	100%	0	0%	0%	0%
	Organised/ Effort	Low	2	2%	0	0%	0	0%
		Mid	43	53%	0	0%	0	0%
		High	36	44%	0	0%	0	0%
		Total	81	100%	0	0%	0%	0%
5	Deep	Low	1	1%	0	0%	0	0%
		Mid	37	44%	38	42.2%	37	44%
		High	47	55%	52	57.8%	47	56%
		Total	85	100%	90	100%	84	100%
	Surface	Low	4	5%	6	6.7%	4	4.8%
		Mid	62	73%	56	62.2%	52	61.9%
		High	19	22%	28	33.1%	28	33.3%
		Total	85	100%	90	100%	84	100%
	Monitoring	Low	0	0%	1	1.1%	0	0%
		Mid	36	42%	30	33.3%	34	40.5%
		High	49	58%	59	65.6%	50	59.5%
		Total	85	100%	90	100%	84	100%

Continued from Table 10:

Year Cohort	ALS approach		ALS (group A) Academic year 07/08		ALS (group B) Academic year 08/09		ALS (group C) Academic year 08/09	
			Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
5	Organised Effort	Low	4	5%	5	5.6%	2	2.4%
		Mid	41	48%	49	54.4%	50	59.5%
		High	40	47%	36	40%	32	38.1%
		Total	85	100%	90	100%	70	100%
6	Deep	Low	0	0%	0	0%	0	0%
		Mid	32	54%	0	0%	0	0%
		High	27	46%	0	0%	0	0%
		Total	59	100%	0	0%	0	0%
	Surface	Low	3	5%	0	0%	0	0%
		Mid	41	69%	0	0%	0	0%
		High	15	25%	0	0%	0	0%
		Total	59	100%	0	0%	0%	100%
	Monitoring	Low	2	3%	0	0%	0	0%
		Mid	27	46%	0	0%	0	0%
		High	30	51%	0	0%	0	0%
		Total	59	100%	0	0%	0%	0%
	Organised/Effort	Low	3	5%	0	0%	0	0%
		Mid	24	41%	0	0%	0	0%
		High	32	54%	0	0%	0	0%
		Total	59	100%		0%	0%	0%

A one-way between-groups analysis of variance (ANOVA) was conducted to explore the impact of educational year on the approach to learning and studying as measured by (ALSI), there were no significant differences between the year cohorts in group A and B and the deep, surface, monitoring, and organised/effort approach as seen in Table 11 and 12.

Table 11: Distribution of ALSI mean scores, 95% confidence interval of mean difference (95%CI) and p-value for year cohorts 1 through 6 (group A)

Year Cohort	ALSI (group)	Number	Mean	95% CI	P-value
1		81	67.73	66.27 to 69.18	
2		101	66.06	64.65 to 67.47	
3		84	65.37	63.71 to 67.03	
4	Total ALS (A)	83	67.89	66.11 to 69.67	0.224
5		86	66.57	64.85 to 68.29	
6		59	65.93	63.56 to 68.31	
Total		494	66.60	65.91 to 67.28	
1		81	24.11	23.39 to 24.83	
2		101	23.43	22.75 to 24.10	
3	Deep	84	23.13	22.35 to 23.91	
4	(A)	83	23.81	23.03 to 24.59	0.301
5		85	23.45	22.63 to 24.26	
6		59	22.83	21.89 to 23.77	
Total		493	23.48	23.17 to 23.80	
1		81	12.70	12.01 to 13.40	
2		101	12.98	12.37 to 13.59	
3	Surface	84	13.00	12.29 to 13.71	
4	(A)	83	14.01	13.35 to 14.68	0.120
5		85	13.02	12.35 to 13.69	
6		59	12.80	11.89 to 13.71	
Total		493	13.10	12.82 to 13.38	
1		81	16.02	15.45 to 16.60	
2		101	15.15	14.66 to 15.63	
3	Monitoring	84	14.93	14.34 to 15.52	
4	(A)	83	15.43	14.85 to 16.01	0.123
5		85	15.67	15.06 to 16.28	
6		59	15.29	14.49 to 16.09	
Total		493	15.41	15.17 to 15.65	
1		81	14.89	14.15 to 15.63	
2		101	14.55	13.86 to 15.25	
3	Organised/Effort	83	14.35	13.59 to 15.11	
4	(A)	82	14.63	13.87 to 15.40	0.890
5		85	14.31	13.48 to 15.13	
6		59	14.80	13.77 to 15.82	
Total		491	14.57	14.26 to 14.89	

Table 12: Distribution of ALSI mean scores, 95% confidence interval of mean difference (95%CI) and p-value for year cohorts 1, 3, and 5 (group B)

Year Cohort	ALSI (group B)	N	Mean	95% CI	P-value
1		118	68.03	66.73 to 69.32	
3	Total ALSI	84	66.67	65.15 to 68.19	
5	(B)	90	67.57	66.90 to 69.24	0.431
Total		292	67.49	66.65 to 68.34	
1		118	23.96	23.27 to 24.64	
3	Deep	84	23.70	23.01 to 24.39	
5	(B)	90	24.32	23.59 to 25.05	0.336
Total		292	23.73	23.36 to 24.10	
1		118	13.40	12.81 to 13.98	
3	Surface	84	12.42	11.73 to 13.11	
5	(B)	90	12.99	12.27 to 13.71	0.112
Total		292	12.99	12.61 to 13.37	
1		118	16.08	15.58 to 16.59	
3	Monitoring	84	15.56	15.03 to 16.09	
5	(B)	90	16.11	15.52 to 16.70	0.306
Total		292	15.94	15.63 to 16.25	
1		118	14.92	14.31 to 15.52	
3	Organised/Effort	84	15.24	14.67 to 15.81	
5	(B)	90	14.38	13.62 to 15.13	0.206
Total		292	14.84	14.47 to 15.22	

1.3. Comparative Data of the Reflection in Learning Scale (RLS) with Year:

The final scores for the RLS were placed into a scale: restricted, partial, ample and maximal levels of reflection. This allowed for more variation in the distribution of students along the scale and to compare with (item 15) of the RLS inventory. Table 13 show the distribution of the calculated RLS for the students groups A, B, and C.

Table 13: Distribution of RLS scale for students in groups A, B, and C across year cohorts 1 through 6:

Year Cohort	RLS Scale	RLS (group A) Academic year (07/08)		RLS (group B) Academic year (08/09)		RLS (group C) Academic year (08/09)	
		Number	Percentage	Number	Percentage	Number	Percentage
1	Restricted	0	0%	1	0.8%	31	36.5%
	Partial	16	19.8%	34	28.8%	41	48.2%
	Ample	55	67.9%	63	53.4%	13	15.3%
	Maximal	10	12.3%	20	16.9%	4	4.6%
	Total	81	100%	85	100%	85	100%
2	Restricted	2	2%			6	5.7%
	Partial	31	31%			37	35.2%
	Ample	58	58%			57	54.3%
	Maximal	9	9%			5	4.8%
	Total	100	100%			105	100%
3	Restricted	2	2.4%	0	0%	2	2.2%
	Partial	28	33.7%	23	27.7%	24	26.1%
	Ample	48	57.8%	45	54.2%	60	65.2%
	Maximal	5	6%	15	18.1%	6	6.5%
	Total	83	100%	83	100%	92	100%
4	Restricted	2	2.4%			1	1.3%
	Partial	35	42.2%			31	38.8%
	Ample	41	49.4%			43	53.8%
	Maximal	5	6%			5	6.3%
	Total	83	100%			80	100%
5	Restricted	1	1.2%	3	3.4%	2	2.4%
	Partial	27	31.4%	16	18.2%	17	20.2%
	Ample	53	61.6%	55	62.5%	49	58.3%
	Maximal	5	5.8%	14	15.9%	16	19%
	Total	86	100%	88	100%	84	100%
6	Restricted	1	1.7%				
	Partial	19	32.8%				
	Ample	31	53.4%				
	Maximal	7	12.1%				
	Total	58	100%				

For the last item in the RLS inventory (item 15), the subjects rated their personal efficacy to reflective into restricted, partial, ample or maximal. Table 14 shows the distribution of (item 15) in for the students in groups A, B, and C from year one to six.

Table 14: Distribution of item RLS15 for students from year cohort 1 through 6 (groups A, B, and C):

Year Cohort	Scale	RLS 15 (group A) Academic year 07/08		RLS 15 (group B) Academic year 08/09		RLS 15 (group C) Academic year 08/09	
		Number	Percentage	Number	Percentage	Number	Percentage
1	Restricted	10	14.3%	12	10.8%	8	10%
	Partial	27	38.6%	45	40.5%	30	37.5%
	Ample	21	30%	34	30.6%	27	33.8%
	Maximal	12	17.1%	20	18%	15	18.8%
	Total	70	100%	111	100%	79	100%
2	Restricted	20	20.8%			21	21.6%
	Partial	48	50%			38	39.2%
	Ample	24	24%			28	28.9%
	Maximal	5	5.2%			10	10.3%
	Total	96	100%			97	100%
3	Restricted	14	16.9%	6	7.4%	9	9.9%
	Partial	33	39.8%	34	42%	40	44%
	Ample	32	38.6%	29	35.8%	33	36.3%
	Maximal	4	4.8%	12	14.8%	9	9.9%
	Total	83	100%	81	100%	91	100%
4	Restricted	19	26.03%			11	15.7%
	Partial	27	36.99%			26	37.1%
	Ample	24	32.88%			26	37.1%
	Maximal	3	4.11%			7	10%
	Total	73	100.00%			70	100%
5	Restricted	16	18.8%	18	20.7%	9	11%
	Partial	26	30.6%	25	28.7%	26	31.7%
	Ample	39	45.9%	37	42.5%	37	45.1%
	Maximal	4	4.7%	7	8%	10	12.2%
	Total	85	100%	87	100%	82	0%
6	Restricted	4	7.3%				
	Partial	23	41.8%				
	Ample	23	41.8%				
	Maximal	5	9.1%				
	Total	55	100%				

To distinguish the difference between the students actual RLS scale as evaluated by the RLS inventory and the students' perception of their ability to reflect as measured by (item 15) in the RLS inventory, the RLS difference (RLS score-RLS Item 15) was calculated. The distribution for the RLS difference for groups A, B, and C are shown in Table 15.

Table 15: Distribution of RLS Difference for year cohorts 1 through 6 (groups A, B, and C)

Year Cohort	RLS diff score	Group A Number	Group A Percent	Group B Number	Group B Percent	Group C Number	Group C Percent
1	-3	0	0%	0	0%	0	0%
	-2	2	2.9	5	4.5%	4	5.1%
	-1	11	15.7	19	17.1%	13	16.5%
	0	21	30.0	38	34.2%	37	46.8%
	1	28	40.0	37	33.3%	17	21.5%
	2	7	10.0	9	8.1%	8	10.1%
	3	1	1.4	3	2.7%	0	0%
	Total	70	100.0	111	100%	79	100%
2	-3	0	0%			0	0%
	-2	0	0%			5	5.2%
	-1	10	10.3%			13	13.5%
	0	34	35.1%			33	34.4%
	1	39	40.2%			33	34.4%
	2	13	13.4%			12	12.5%
	3	1	1%			0	0&
	Total	97	100%			96	100%
3	-3	0	0%	0	0%	0	0%
	-2	1	1.2%	0	0%	1	1.1%
	-1	9	10.8%	12	14.8%	12	13.2%
	0	41	49.4%	38	46.9%	42	46.2%
	1	23	27.7%	24	29.6%	30	33%
	2	9	10.8%	6	7.4%	5	5.5%
	3	0	0%	1	1.2%	1	1.1%
	Total	83	100%	81	100%	91	100%
4	-3	0	0%			0	0%
	-2	1	1.4%			1	1.4%
	-1	14	19.2%			16	23.2%
	0	23	31.5%			24	34.8%
	1	21	28.8%			21	30.4%
	2	14	19.2%			7	10.1%
	3	0	0%			0	0%
	Total	73	100%			69	100%
5	-3	0	0%	0	0%	1	1.2%
	-2	0	0%	1	1.2%	2	2.4%
	-1	13	15.3%	9	10.5%	8	9.8%
	0	38	44.7%	35	40.7%	36	43.9%
	1	25	29.4%	26	30.2%	28	34.1%
	2	8	9.4%	14	16.3%	6	7.3%
	3	1	1.2%	1	1.2%	1	1.2%
	Total	85	100%	86	100%	82	100%
6	-3	0	0%				
	-2	1	1.8%				
	-1	7	12.7%				
	0	27	49.1%				
	1	18	32.7%				
	2	2	3.6%				
	3	0	0%				
	Total	55	100%				

To investigate the impact of academic year on the RLS difference one – way analysis of variance was used; there were no statistical significant differences as seen in Table 16.

Table 16: RLS Difference (RLS Scale – Item 15 RLS) mean scores, 95% confidence interval of difference of mean difference (95% CI), and p-value for year cohorts 1 through 6 (groups A,B, and C)

Year Cohort	RLS Difference (group)	Number	Mean	95% CI	p-value
1		70	0.43	0.19 to 0.67	
2		97	0.60	0.42 to 0.78	
3		83	0.36	0.17 to 0.55	
4	RLS Diff (A)	73	0.45	0.21 to 0.70	0.261
5		85	.36	0.17 to 0.56	
6		55	0.24	0.02 to 0.45	
Total		463	0.42	0.34 to 0.51	
1		111	0.31	0.11 to 0.52	
2		0			
3		81	0.33	0.14 to 0.52	
4	RLS Diff (B)	0			0.253
5		86	0.53	0.33 to 0.74	
6		0	.	.	
Total		278	0.39	0.27 to 0.51	
1		79	0.15	-0.07 to 0.37	
2		96	.35	0.14 to 0.56	
3		91	0.32	0.14 to 0.50	
4	RLS Diff (C)	69	0.25	0.01 to 0.48	0.648
5		82	0.34	0.13 to 0.55	
6		0	.	.	
Total		417	0.29	0.19 to 0.38	

1.4 Comparative Data of the Dundee Ready Educational Environment Method (DREEM) with Year:

Distribution of DREEM and subscales (perception of learning, perception of teachers, academic self perception, perception of atmosphere, and social-self perception) for the dental undergraduates for groups A and C from first to sixth year cohort shown in Table 17.

Table 17: Distribution of the DREEM and subscales for students in group A across years 1 through 6 and group C across years 2 through 6:

Year Cohort	DREEM Scale		DREEM (group A) Academic year 07/08		DREEM (group C) Academic year 08/09	
			Number	Percent	Number	Percent
	DREEM	Very Poor	0	0%	0	0%
		Plenty of Problems	9	11%	12	14.1%
		More Positive than Negative	71	88%	70	82.4%
		Excellent	1	1%	3	3.5%
		Total	81	100%	85	100%
	Perception of Learning	Very Poor	0	0%	0	0%
		Teaching viewed negatively	15	19%	23	27.1%
		More Positive Perception	63	78%	59	69.4%
		Teaching is highly thought of	3	4%	3	3.5%
		Total	81	100%	85	100%
	Perception of Teachers	Abysmal	1	1%	0	0%
		In need of some retraining	26	32%	26	30.6%
		Moving in the right direction	53	65%	56	65.9%
		Model Teachers	1	1%	3	3.5%
		Total	81	100%	85	100%
1	**Student Academic Perception**	Feeling of Total Failure	0	0%	0	0%
		Many Negative Aspects	9	11%	13	15.3%
		Feeling More on the Positive	60	74%	61	71.8%
		Confident	12	15%	11	12.9%
		Total	81	100%	85	100%
	Student Perception of Atmosphere	Terrible Environment	1	1%	0	0%
		Many Issues which need change	13	16%	17	20%
		More positive Atmosphere	60	74%	63	74.1%
		Good Feeling Overall	7	9%	5	5.9%
		Total	81	100%	85	100%
	Social Self-Perception	Miserable	3	4%	0	0%
		Not a nice place	19	23%	18	21.2%
		Not too bad	51	63%	62	72.9%
		Very good socially	8	10%	5	5.9%
		Total	81	100%	85	100%

Continued from Table 17:

Year Cohort	DREEM Scale		DREEM (group A) Academic year 07/08		DREEM (group C) Academic year 08/09	
			Number	**Percent**	**Number**	**Percent**
	DREEM	Very Poor	0	0%	1	1%
		Plenty of Problems	28	27%	48	46.2%
		More Positive than Negative	74	73%	55	52.9%
		Excellent	0	0%	0	0%
		Total	102	100%	104	100%
	Perception of Learning	Very Poor	2	2%	3	2.9%
		Teaching viewed negatively	36	35%	60	57.7%
		More Positive Perception	63	62%	41	39.4%
		Teaching is highly thought of	1	1%	0	0%
		Total	102	100%	104	100%
	Perception of Teachers	Abysmal	1	1%	5	4.8%
		In need of some retraining	31	30%	43	41.3%
		Moving in the right direction	70	69%	55	52.9%
		Model Teachers	0	0%	1	1%
		Total	102	100%	104	100%
2	**Student Academic Perception**	Feeling of Total Failure	3	3%	3	2.9%
		Many Negative Aspects	32	31%	52	50%
		Feeling More on the Positive	60	59%	43	41.3%
		Confident	7	7%	6	5.8%
		Total	102	100%	104	100%
	Student Perception of Atmosphere	Terrible Environment	0	0%	7	6.7%
		Many Issues which need change	32	31%	44	42.3%
		More positive Atmosphere	67	66%	52	50%
		Good Feeling Overall	3	3%	1	1%
		Total	102	100%	104	100%
	Social Self Perception	Miserable	0	0%	1	1%
		Not a nice place	31	30%	46	44.2%
		Not too bad	68	67%	57	54.8%
		Very good socially	3	3%	0	0%
		Total	102	100%	104	100%
	DREEM	Very Poor	0	0%	0	0%
		Plenty of Problems	15	18%	18	19.8%
		More Positive than Negative	66	80%	70	76.9%
		Excellent	1	1%	3	3.3%
		Total	82	100%	91	100%
3	**Perception of Learning**	Very Poor	0	0%	0	0%
		Teaching viewed negatively	27	32.9%	33	36.3%
		More Positive Perception	55	67.1%	55	60.4%
		Teaching is highly thought of	0	0%	3	3.3%
		Total	82	100%	91	100%
	Perception of Teachers	Abysmal	0	0%	0	0%
		In need of some retraining	20	24%	26	28.6%
		Moving in the right direction	57	70%	60	65.9%
		Model Teachers	5	6%	5	5.5%
		Total	82	100%	91	100%

Continued from Table 17:

Year Cohort	DREEM Scale		DREEM (group A) Academic Year 07/08		DREEM (group B) Academic Year 08/09	
			Number	Percent	Number	Percent
3	**Student Academic Perception**	Feeling of Total Failure	1	1%	0	0%
		Many Negative Aspects	22	27%	23	25.3%
		Feeling More on the Positive	54	66%	60	65.9%
		Confident	5	6%	8	8.8%
		Total	82	100%	91	100%
	Student Perception of Atmosphere	Terrible Environment	1	1%	0	0%
		Many Issues which need change	21	26%	23	25.3%
		More positive Atmosphere	55	67%	64	70.3%
		Good Feeling Overall	5	6%	4	4.4%
		Total	82	100%	91	100%
	Social Self-Perception	Miserable	0	0%	1	1.1%
		Not a nice place	26	32%	39	42.9%
		Not too bad	52	63%	46	50.5%
		Very good socially	4	5%	5	5.5%
		Total	82	100%	91	100%
4	**DREEM**	Very Poor	1	1%	0	0%
		Plenty of Problems	24	30%	35	43.8%
		More Positive than Negative	55	68%	45	56.3%
		Excellent	1	1%	0	0%
		Total	81	100%	98	100%
	Perception of Learning	Very Poor	2	2%	4	5%
		Teaching viewed negatively	30	37%	38	47.5%
		More Positive Perception	47	58%	38	47.5%
		Teaching is highly thought of	2	2%	0	0%
		Total	81	100%	80	100%
	Perception of Teachers	Abysmal	0	0%	2	2.5%
		In need of some retraining	28	35%	38	47.5%
		Moving in the right direction	50	62%	39	48.8%
		Model Teachers	3	4%	1	1.3%
		Total	81	100%	80	100%
	Student Academic Perception	Feeling of Total Failure	1	1%	1	1.3%
		Many Negative Aspects	31	38%	23	28.8%
		Feeling More on the Positive	43	53%	49	61.3%
		Confident	6	7%	7	8.8%
		Total	81	100%	80	100%
	Student Perception of Atmosphere	Terrible Environment	1	1%	2	2.5%
		Many Issues which need change	32	40%	37	46.3%
		More positive Atmosphere	45	56%	40	50%
		Good Feeling Overall	3	4%	1	1.3%
		Total	81	100%	80	100%
	Social Self-Perception	Miserable	1	1%	2	2.5%
		Not a nice place	25	31%	35	43.8%
		Not too bad	52	64%	43	53.8%
		Very good socially	3	4%	0	0%
		Total	81	100%	80	100%

Continued from Table 17:

Year Cohort	DREEM Scale		DREEM (group A) Academic year 07/08		DREEM (group C) Academic year 08/09	
			Number	**Percent**	**Number**	**Percent**
		Very Poor	0	0%	0	0%
		Plenty of Problems	27	32%	35	42.2%
	DREEM	More Positive than Negative	57	67%	48	57.8%
		Excellent	1	1%	0	0%
		Total	85	100%	83	100%
		Very Poor	2	2%	2	2.4%
	Perception of Learning	Teaching viewed negatively	34	40%	39	47%
		More Positive Perception	46	54%	41	49.4%
		Teaching is highly thought of	3	4%	1	1.2%
		Total	85	100%	83	100%
		Abysmal	3	4%	4	4.8%
	Perception of Teachers	In need of some retraining	33	39%	41	49.4%
		Moving in the right direction	48	56%	38	45.8%
		Model Teachers	1	1%	0	0%
5		Total	85	100%	83	100%
		Feeling of Total Failure	0	0%	0	0%
	Student Academic Perception	Many Negative Aspects	20	24%	20	24.1%
		Feeling More on the Positive	60	71%	52	62.7%
		Confident	5	6%	11	13.3%
		Total	85	100%	83	100%
		Terrible Environment	3	4%	7	8.4%
	Student Perception of Atmosphere	Many Issues which need change	30	35%	38	45.8%
		More positive Atmosphere	47	55%	38	45.8%
		Good Feeling Overall	5	6%	0	0%
		Total	85	100%	83	100%
		Miserable	2	2%	4	4.8%
	Social Self-Perception	Not a nice place	34	40%	34	41%
		Not too bad	47	55%	44	53%
		Very good socially	2	2%	1	1.2%
		Total	85	100%	83	100%
		Very Poor	0	0%		
		Plenty of Problems	18	31%		
	DREEM	More Positive than Negative	38	64%		
		Excellent	3	5%		
		Total	59	100%		
		Very Poor	3	5%		
6	**Perception of Learning**	Teaching viewed negatively	19	32%		
		More Positive Perception	34	58%		
		Teaching is highly thought of	3	5%		
		Total	59	100%		
		Abysmal	1	1.7%		
	Perception of Teachers	In need of some retraining	15	25.4%		
		Moving in the right direction	37	62.7%		
		Model Teachers	6	10.2%		
		Total	59	100%		

Continued from Table 17:

Year Cohort	DREEM Scale		DREEM (Group A) Academic year 07/08		DREEM (Group C) Academic year 08/09	
			Number	**Percent**	**Number**	**Percent**
	Student Academic Perception	Feeling of Total Failure	1	1.7%		
		Many Negative Aspects	18	30.5%		
		Feeling More on the Positive	35	59.3%		
		Confident	5	8.5%		
		Total	59	100%		
6	**Student Perception of Atmosphere**	Terrible Environment	4	6.8%		
		Many Issues which need change	30	35.3%		
		More positive Atmosphere	47	55.3%		
		Good Feeling Overall	5	5.9%		
		Total	59	100%		
	Social Self-Perception	Miserable	2	3.4%		
		Not a nice place	23	39%		
		Not too bad	32	54.2%		
		Very good socially	2	3.4%		
		Total	59	100%		

Table 18 shows the scores for individual DREEM items mean scores (1-50) and subscales distribution for undergraduate students for students in group A from first through sixth year cohorts and C across first through fifth year cohorts. Items labelled in red represent negative items that score two or lower, while green items represent positive aspects of the environment that score three or more.

Table 18: Scores for DREEM items 1-50 and Subscales (perception of learning, perception of teachers, academic self perception, perception of atmosphere, and social self-perception) for year cohorts 1 through 6 (group A) and year cohorts 1 through 5 (group C), weak items (≤ 2) are labelled in red, positive items (≥ 3) are labelled in green:

Item No.	DREEM items	Year Cohort1				Year Cohort 2				Year Cohort 3				Year Cohort 4				Year Cohort5				Year Cohort 6	
		Group A		Group C		Group A		Group C		Group A		Group C		Group A		Group C		Group A		Group C		Group A	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	Perception of Learning																						
1	I am encouraged to participate in class	**3.09**	0.81	2.54	0.92	2.49	1.18	2.14	1.09	2.41	1.09	2.49	0.98	2.39	1.25	2.63	1.03	2.60	1.16	2.40	1.15	2.59	1.19
7	The teaching is often stimulating	2.04	1.03	2.11	0.85	2.12	1.03	**1.58**	0.93	2.10	0.99	2.14	0.87	**1.84**	1.05	**1.79**	0.99	2.08	1.13	**1.73**	1.04	2.14	1.05
13	The teaching is student centred	2.66	0.89	2.02	1.04	2.37	1.03	**1.62**	0.97	2.28	1.14	2.09	1.01	2.35	1.13	**1.67**	1.03	**1.99**	1.07	**1.66**	1.10	2.35	1.03
16	The teaching helps to develop my competence	2.83	0.85	2.88	0.91	2.72	0.97	2.60	1.01	2.76	0.90	2.73	0.86	2.49	1.16	2.43	1.02	2.76	0.98	2.78	0.97	2.47	1.12
20	The teaching is well focused	2.75	0.89	2.45	0.86	2.43	0.96	2.20	1.02	2.38	0.97	2.42	0.88	2.29	1.02	2.14	0.94	2.19	0.96	**1.85**	0.97	2.19	1.02
22	The teaching helps to develop my confidence	2.68	1.02	2.56	0.84	2.34	1.02	2.03	1.06	2.51	0.94	2.45	0.93	2.22	1.14	2.04	1.03	2.59	0.99	2.35	1.14	2.34	1.18
24	The teaching time is put to good use	2.60	0.95	2.42	1.05	2.39	1.00	**1.69**	1.19	2.27	1.07	2.32	0.94	2.11	1.11	**1.88**	1.11	**1.86**	1.07	**1.66**	1.13	2.12	1.11
25	The teaching over-emphasizes factual learning	**1.40**	0.85	2.68	1.10	**1.56**	0.95	**1.96**	1.25	**1.43**	0.74	2.62	0.93	**1.81**	0.97	2.37	1.08	**1.64**	0.91	2.56	1.09	**1.50**	0.80
38	I am clear about the learning objectives of the course	2.36	1.02	2.36	1.02	2.22	0.91	**1.81**	1.10	2.30	0.96	2.45	0.86	2.62	0.85	2.31	0.90	2.31	0.95	2.08	1.11	2.33	1.01
44	The teaching encourages me to be an active learner	2.38	1.11	2.60	0.83	2.22	0.98	**1.94**	1.09	2.09	1.08	2.04	1.03	2.05	1.12	**1.81**	1.14	**1.90**	1.11	**1.87**	1.18	2.16	1.08
47	Long-term learning is emphasized over short term learning	2.55	0.98	2.51	0.89	2.28	1.04	2.32	0.97	2.45	0.98	2.38	0.97	2.41	0.96	2.39	0.93	2.66	0.89	2.66	0.75	2.55	1.02
48	The teaching is too teacher-centred	**1.76**	1.08	**1.52**	1.14	**1.52**	0.98	**1.26**	0.98	**1.63**	0.92	**1.64**	0.86	**1.73**	1.00	**1.27**	0.87	**1.50**	0.94	**1.59**	1.01	**1.67**	1.05
	Total	28.17	5.09	27.47	5.12	26.13	5.16	23.05	5.49	26.33	5.24	26.48	5.74	26.01	5.49	23.91	5.44	25.35	5.40	24.29	5.92	25.90	6.98

Item No.	DREEM items	Year Cohort 1 Group A Mean	SD	Group C Mean	SD	Year Cohort 2 Group A Mean	SD	Group C Mean	SD	Year Cohort 3 Group A Mean	SD	Group B Mean	SD	Year Cohort 4 Group A Mean	SD	Group C Mean	SD	Year Cohort 5 Group A Mean	SD	Group C Mean	SD	Year Cohort6 Group A Mean	SD
	Students' Perception of Teachers																						
2	The Teachers are knowledgeable	2.83	0.97	2.45	1.02	2.84	0.93	2.65	0.91	**3.17**	0.75	**3.04**	0.82	2.79	0.94	2.85	0.74	2.88	0.85	2.63	0.98	**3.15**	0.69
6	The teachers are patient with patients	2.47	0.99	2.35	0.68	2.28	0.83	2.10	0.90	2.63	0.94	2.25	0.97	2.27	1.21	2.02	1.03	2.08	1.12	**1.93**	1.08	2.36	1.01
8	The teachers ridicule the students	2.21	1.18	2.36	0.98	2.01	1.01	2.02	1.01	2.43	1.55	2.20	0.99	**1.71**	1.05	**1.63**	1.02	**1.61**	1.06	**1.39**	0.93	**1.88**	1.09
9	The teachers are authoritarian	2.11	1.05	2.28	0.94	2.01	1.01	2.08	1.09	2.04	1.91	**1.76**	0.93	**1.53**	1.08	**1.35**	0.95	**1.50**	1.10	**1.25**	0.89	**1.59**	1.1
18	The teachers have good communications skills with patients	2.15	0.88	2.29	0.80	2.23	0.87	**1.94**	0.97	2.48	0.69	2.30	0.83	2.28	1.1	2.08	1.02	2.31	0.93	**1.99**	1.06	2.58	0.93
29	The teachers are good at providing feedback to students	2.36	1.02	2.41	0.91	2.37	0.93	**1.94**	1.08	2.56	0.98	2.36	0.79	2.52	0.98	**1.94**	1.09	2.11	0.98	**1.63**	1.12	2.21	1.10
32	The teachers provide constructive criticism here	2.17	0.96	2.38	0.80	2.15	0.97	2.01	1.02	2.48	0.89	2.30	0.86	2.11	1.00	2.16	1.18	**1.95**	1.03	**1.90**	1.07	2.10	1.00
37	The teachers give clear examples	2.51	0.99	2.37	1.08	2.51	0.91	2.41	0.91	2.83	0.65	2.62	0.74	2.62	0.90	2.50	0.84	2.35	1.01	2.12	1.08	2.58	0.89
39	The teachers get angry in class	**1.92**	1.13	**1.79**	1.01	**1.81**	1.10	**1.88**	1.12	**1.91**	1.00	2.23	0.97	**1.67**	1.09	**1.75**	0.94	2.25	1.25	**1.99**	1.07	2.03	0.93
40	The teachers are well prepared for their class	2.56	0.96	2.56	0.93	2.66	0.96	2.43	1.15	2.71	0.84	2.62	0.80	2.67	0.97	2.38	0.88	2.49	0.98	2.43	1.01	2.80	0.86
50	The students irritate the teachers	2.08	1.23	**1.87**	1.17	**1.44**	1.16	**1.29**	1.11	**1.95**	1.13	2.36	1.14	**1.69**	1.16	**1.78**	1.18	2.31	1.15	2.20	1.12	2.28	1.07
	Total	24.18	5.03	24.69	5.12	23.93	4.37	22.24	6.15	26.76	5.32	25.89	5.14	23.60	5.19	22.11	4.69	23.66	5.39	21.33	5.38	25.39	6.37
	Students' Academic Self-Perception																						
5	Learning strategies which worked for me before continue to work for me now	2.64	0.99	2.56	0.99	2.41	1.12	2.33	0.94	2.36	1.03	2.25	1.00	2.40	1.06	2.38	1.00	2.35	1.09	2.39	1.10	2.52	1.05
10	I am confident about passing this year	2.78	1.26	2.91	0.95	2.48	1.02	2.22	1.13	2.52	1.09	2.59	0.98	2.53	1.09	2.59	0.89	2.87	0.99	2.96	0.92	2.25	1.23
21	I feel I am being well prepared for my profession	2.54	1.02	2.56	0.83	2.32	1.09	2.21	0.97	2.46	0.90	2.41	0.92	2.16	1.02	**1.98**	1.01	2.24	1.03	2.40	1.02	2.38	1.07

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Item No.	DREEM items	Year Cohort1 Group A Mean	SD	Group C Mean	SD	Year Cohort 2 Group A Mean	SD	Group C Mean	SD	Year Cohort 3 Group A Mean	SD	Group C Mean	SD	Year Cohort 4 Group A Mean	SD	Group C Mean	SD	Year Cohort 5 Group A Mean	SD	Group C Mean	SD	Year Cohort 6 Group A Mean	SD
26	Last year's work has been a good preparation for this year's work	2.53	1.08	2.68	1.10	2.27	1.11	**1.96**	1.25	2.04	1.07	2.62	0.93	2.06	1.26	2.37	1.08	2.48	1.11	2.56	1.09	2.60	1.02
27	I am able to memorize all I need	2.42	1.08	2.08	0.96	**1.95**	1.16	**1.46**	1.07	2.02	1.01	**1.91**	0.99	**1.83**	1.12	**1.80**	0.99	**1.79**	1.00	**1.59**	0.92	**1.86**	1.13
31	I have learned a lot about empathy in my profession	2.52	0.86	2.61	0.77	2.16	0.95	2.37	0.95	2.57	0.87	2.78	0.88	2.45	0.98	2.63	1.04	2.84	0.87	2.64	1.12	2.78	0.96
41	My problem-solving skills are being well developed here	2.55	1.12	2.18	1.09	2.20	.94	**1.89**	1.00	2.30	1.04	2.19	0.89	2.16	0.93	**1.92**	1.23	2.16	1.11	2.18	1.01	2.14	1.25
45	Much of what I have to learn seems relevant to a career in healthcare	2.65	1.09	2.80	0.79	2.51	0.97	2.67	0.91	2.89	0.73	2.79	0.76	2.56	1.00	2.58	0.92	2.77	0.67	2.73	0.85	2.82	0.74
	Total	20.44	3.99	20.16	4.03	17.96	4.58	16.88	4.79	18.87	4.06	19.51	4.06	18.09	4.41	18.23	4.16	19.40	3.68	19.31	4.59	18.93	5.01
	Students' Perception of Atmosphere																						
11	The atmosphere is relaxed during the ward (clinical) teaching	2.37	0.92	2.40	0.88	2.28	0.91	**1.83**	1.01	2.34	0.87	2.23	0.92	2.37	1.00	**1.78**	1.00	**1.83**	1.09	**1.57**	1.13	**1.59**	1.20
12	The school is well timetabled	2.38	1.08	2.30	1.08	2.11	1.16	**1.45**	1.17	2.23	1.21	**1.85**	1.12	2.16	1.27	**1.73**	1.09	**1.69**	1.23	**1.61**	1.17	**1.91**	1.24
17	Cheating is a problem in this school	2.06	1.44	2.17	1.41	**1.80**	1.31	**1.75**	1.25	**1.94**	1.34	2.10	1.27	**1.99**	1.32	**1.95**	1.22	**1.99**	1.49	**1.83**	1.36	**1.98**	1.32
23	The atmosphere is relaxed during lectures	2.39	1.05	2.64	0.79	2.27	1.06	**1.75**	1.11	2.45	1.06	2.60	0.83	2.37	0.97	2.06	0.97	2.45	1.02	2.02	1.14	2.34	1.10
30	There are opportunities for me to develop interpersonal skills	**3.06**	0.81	**3.02**	0.69	2.43	0.97	2.34	1.03	2.81	0.65	2.67	0.81	2.51	1.07	2.27	1.04	2.59	0.93	2.54	1.07	2.64	0.99
33	I feel comfortable in class socially	2.71	1.23	2.71	0.79	2.53	1.02	2.30	1.03	**3.09**	0.70	2.80	0.87	2.80	0.86	2.38	0.96	2.82	1.05	2.46	1.12	2.98	0.91

| Item No. | DREEM items | Year Cohort 1 | | | | Year Cohort 2 | | | | Year Cohort 3 | | | | Year Cohort 4 | | | | Year Cohort 5 | | | | Year Cohort 6 | |
| | | Group A | | Group C | | Group A | | Group C | | Group A | | Group B | | Group A | | Group C | | Group A | | Group B | | Group A | |
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
34	The atmosphere is relaxed during seminars/tutorials	2.44	1.00	2.31	0.97	2.19	0.97	2.06	1.07	2.37	1.04	2.55	0.82	2.16	1.03	2.17	0.95	2.56	1.02	2.29	1.06	2.45	1.05
35	I find the experience disappointing	2.47	1.15	2.53	1.19	2.25	1.06	2.33	1.07	1.37	1.11	2.52	1.03	2.05	1.21	2.23	1.06	2.35	1.18	2.11	1.25	2.27	1.04
36	I am able to concentrate well	2.73	1.07	2.42	0.97	2.50	1.01	2.18	0.95	2.67	0.93	2.37	0.93	2.28	1.08	2.33	0.84	2.35	0.98	2.29	1.09	2.22	0.97
42	The enjoyment outweighs the stress of studying dentistry	2.31	1.16	1.92	1.12	1.96	1.13	1.46	1.21	1.73	1.08	1.62	1.11	1.82	1.25	1.33	1.34	1.52	1.26	1.30	1.20	1.65	1.23
43	The atmosphere motivates me as a learner	2.41	1.03	2.41	0.84	2.06	1.04	1.65	1.17	2.12	1.06	1.99	0.94	2.07	1.12	1.73	1.10	1.65	1.08	1.56	1.11	1.86	1.11
49	I feel able to ask the questions I want	2.33	1.08	2.24	1.07	2.45	1.16	2.26	1.14	2.54	1.14	2.59	0.98	2.10	1.23	2.28	1.04	2.41	1.14	2.19	1.19	2.48	1.15
	Total	28.94	5.70	28.92	5.36	26.74	5.81	23.13	6.73	28.26	6.18	27.84	5.48	26.47	6.44	23.98	5.58	25.73	6.48	23.64	7.21	25.59	7.55
	Students' Social Self Perception																						
3	There is a good support system for students who get stressed	2.12	1.16	1.66	1.04	1.57	1.17	0.97	1.03	1.28	1.09	1.22	1.08	1.18	1.25	1.10	1.20	1.08	1.33	0.84	1.16	1.07	1.12
4	I am too tired to enjoy the course	1.64	1.16	1.57	1.14	1.79	1.09	1.02	1.06	1.60	1.11	1.17	1.07	1.54	1.16	1.13	1.16	1.44	1.08	1.13	1.22	1.03	1.12
14	I am rarely bored on this course	1.85	1.21	1.47	1.25	1.82	1.23	1.32	1.10	1.59	1.20	1.30	1.06	1.77	1.16	1.32	1.03	1.46	1.12	1.43	1.29	1.64	1.21
15	I have good friends in this school	3.33	0.90	3.33	0.80	3.27	0.88	3.39	0.73	3.58	0.60	3.43	0.74	3.33	0.93	3.27	0.77	3.38	0.82	3.49	0.77	3.25	0.97
19	My social life is good	3.11	0.98	3.13	0.95	2.97	0.94	2.84	1.14	3.20	0.89	3.05	0.94	3.09	0.90	2.64	1.05	2.86	1.13	2.72	1.22	2.90	1.06
28	I seldom feel lonely	2.26	1.25	2.47	1.14	2.22	1.23	2.27	1.14	2.18	1.17	2.14	1.24	2.10	1.27	2.20	1.07	1.95	1.31	1.98	1.22	2.14	1.43
46	My accommodation is pleasant	2.86	1.20	3.18	0.95	2.90	0.85	3.13	0.80	3.06	0.85	2.91	0.89	2.89	0.92	2.90	0.94	2.94	0.90	2.94	0.96	2.93	0.74
	Total	16.88	4.07	16.59	2.91	16.29	3.06	14.84	3.22	16.34	3.03	15.13	3.59	15.69	3.48	14.44	2.87	14.92	3.20	14.49	3.53	14.86	3.82
	Total DREEM	**119.23**	**17.84**	**117.53**	**16.3**	**111.09**	**17.3**	**99.9**	**20.28**	**116.62**	**18.76**	**114.71**	**19.37**	**109.91**	**19.86**	**102.75**	**17.49**	**109.02**	**18.52**	**102.95**	**20.14**	**110.76**	**24.9**

2. Comparative Data of the Assessment Tools Related to Gender:

2.1. Comparative Data of Index of Learning Styles (ILS) with Gender:

An independent t-test was conducted to explore the association of the learning styles of students as measured by ILS and gender for students in groups A, B, and C across year cohorts one through six is shown in Tables 19

Table 19: The Gender Distribution of ILS Mean scores, SD, 95% confidence interval of mean difference (95% CI), and P-value for year cohorts 1 through 6 (group A)

Year Cohort	ILS (group)	Gender	Number	Mean	SD	95% CI	P-value
1	Active/ Reflective	male	40	-0.45	4.34	-2.53 to 1.05	0.400
		female	42	0.31	3.78		
	Sensitive /Intuitive	male	40	-2.20	4.05	-2.28 to1.59	0.725
		female	42	-1.86	4.72		
	Visual /Verbal	male	40	-5.70	4.31	-1.88 to 1.63	0.855
		female	42	-5.57	3.68		
	Sequential /Global	male	40	-0.15	3.23	-1.18 to 1.84	0.668
		female	42	-0.48	3.62		
2	Active/ Reflective	male	53	-0.09	3.13	-0.64 to 1.97	0.313
		female	50	-0.76	3.54		
	Sensitive/ Intuitive	male	53	-2.28	4.77	-0.70 to 2.61	0.255
		female	50	-3.24	3.58		
	Visual/ Verbal	male	53	-4.77	3.86	-2.49 to 1.18	0.481
		female	50	-4.12	5.44		
	Sequential/ Global	male	53	-0.40	3.77	-0.60 to 2.28	0.248
		female	50	-1.24	3.58		
3	Active /Reflective	male	34	-1.12	4.46	-0.37 to 3.09	0.121
		female	50	-2.48	3.50		
	Sensitive/ Intuitive	male	34	-2.88	3.84	-1.84 to 1.99	0.936
		female	50	-2.96	4.65		
	Visual /Verbal	male	34	-5.53	3.98	-0.98 to 2.25	0.441
		female	50	-6.16	3.41		
	Sequential /Global	male	34	0.82	3.28	0.16 to 3.17	**0.031**
		female	50	-0.84	3.50		
4	Active /Reflective	male	41	0.02	4.05	-1.50 to 1.94	0.804
		female	42	-0.19	3.83		
	Sensitive /Intuitive	male	41	-4.17	4.84	-1.08 to 2.74	0.389
		female	42	-5.00	3.85		
	Visual /Verbal I	male	41	-4.51	3.89	-2.22 to 1.68	0.780
		female	42	-4.24	4.96		
	Sequential /Global	male	41	-1.20	3.97	-2.56 to 0.74	0.276
		female	42	-0.29	3.58		

Year Cohort	ILS (group)	Gender	Number	Mean	SD	95% CI	P-value
5	Active /Reflective (A)	male	36	-0.72	2.88	-0.15 to 2.55	0.081
		female	50	-1.92	3.26		
	Sensitive /Intuitive (A)	male	36	-3.44	3.98	-1.04 to 2.23	0.471
		female	50	-4.04	3.60		
	Visual /Verbal (A)	male	36	-5.94	3.93	-3.52 to 0.03	0.054
		female	50	-4.20	4.18		
	Sequential /Global (A)	male	36	-0.50	3.62	-1.62 to 1.66	0.981
		female	50	-0.52	3.87		
6	Active /Reflective (A)	male	20	-1.40	3.60	-1.65 to 2.39	0.716
		female	39	-1.77	3.72		
	Sensitive Intuitive (A)	male	20	-2.60	4.19	-0.09 to 4.07	0.061
		female	39	-4.59	3.56		
	Visual Verbal (A)	male	20	-6.60	4.08	-2.85 to 1.29	0.453
		female	39	-5.82	3.58		
	Sequential Global (A)	male	20	0.20	4.12	-1.27 to 3.16	0.398
		female	39	-0.74	3.98		

Table 20: The Gender Distribution of ILS Mean scores, SD, 95% confidence interval of mean difference (95% CI), and P-value for year cohorts 1 through 5 (group B)

Year Cohort	ILS (group)	Gender	Number	Mean	SD	95% CI	P-value
1	Active Reflective	male	56	-1.54	4.08	-2.37 to.59	0.236
		female	62	-0.65	4.02		
	Sensing Intuitive	male	56	-3.79	5.18	-2.19 to 1.26	0.595
		female	62	-3.32	4.26		
	Visual Verbal	male	56	-5.57	3.79	-1.12 to 1.65	0.703
		female	62	-5.84	3.81		
	Sequential Global	male	56	-0.64	3.52	-1.15 to 1.55	0.774
		female	62	-0.84	3.85		
2	Active /Reflective	male	40	-0.55	3.43	-0.38 to 2.72	0.138
		female	64	-1.72	4.17		
	Sensing/Intuitive	male	40	-4.40	3.74	-1.47 to 1.73	0.871
		female	64	-4.53	4.15		
	Visual/ Verbal	male	40	-4.60	3.93	-2.35 to 1.58	0.701
		female	64	-4.22	5.43		
	Sequential Global	male	40	-0.50	3.44	-1.45 to 1.83	0.821
		female	64	-0.69	4.47		
3	Active Reflective	male	33	-2.45	3.33	-1.15 to 2.08	0.566
		female	52	-2.92	3.84		
	Sensitive Intuitive	male	33	-3.30	3.88	-0.92 to 2.62	0.343
		female	52	-4.15	4.08		
	Visual Verbal	male	33	-5.73	4.21	-1.63 to 1.71	0.960
		female	52	-5.77	3.48		
	Sequential Global	male	33	0.64	4.65	-0.40 to 2.90	0.136
		female	52	-0.62	3.02		
4	Active Reflective	male	38	-1.00	4.26	-0.56 to 2.86	0.186
		female	47	-2.15	3. 68		
	Sensitive Intuitive	male	38	-4.63	3.88	-2.14 to 1.26	0.607
		female	47	-4.19	3.93		
	Visual Verbal	male	38	-5.63	3.98	-1.59 to 1.95	0.843
		female	47	-5.81	4.16		
	Sequential Global	male	38	-1.42	3.70	-2.76 to 0.47	0.162
		female	47	-0.28	3.74		

Continued from Table 20:

Year Cohort	ILS (group)	Gender	Number	Mean	SD	95% CI	P-value
5	Active Reflective (B)	male	39	-1.51	3.65	-0.47 to 2.51	0.176
		female	51	-2.18	3.42		
	Sensitive Intuitive (B)	male	39	-4.85	4.71	-2.13 to 1,42	0.691
		female	51	-4.49	3.75		
	Visual Verbal (B)	male	39	-6.95	3.63	-3.39 to 0.04	0.055
		female	51	-5.27	4.34		
	Sequential Global (B)	male	39	-0.33	4.50	-1.46 to 1.85	0.814
		female	51	-0.53	3.38		

Table 21: The Gender Distribution of ILS mean scores, SD, 95% confidence interval of mean difference (95% CI), and P-value for year cohort (group C)

Year Cohort	ILS (group)	Gender	Number	Mean	SD	95% CI	P-value
5	Active Reflective (C)	male	37	-1.11	2.94	0.16 to 2.79	**0.028**
		female	48	-2.58	3.09		
	Sensing Intuitive (C)	male	37	-3.97	4.82	-0.37 to 3.17	0.120
		female	48	-5.38	3.39		
	Visual Verbal (C)	male	37	-7.38	3.88	-3.33 to 0.24	0.089
		female	48	-5.83	4.26		
	Sequential Global (C)	male	37	0.03	3.48	-0.51 to 3.06	0.159
		female	48	-1.25	4.53		

2.2. Comparative Data of the Approach to Learning and Studying (ALSI) with

Gender:

There were no significant gender differences for fifth year students in group C as seen

in Table 22.

Table 22: Paired t-test results of ALSI mean differences, 95% confidence interval of the difference of the means (95% CI) and P-value for genders in year cohort 5 (group B and C)

Year Cohort	Gender	ALSI (group)	Number	Mean	95% CI	p-value
5	male	Total ALSI (B – C)	33	1.00	-1.98 to 3.98	0.499
		Deep (B- C)	33	0.58	-.69 to 1.84	0.361
		Surface (B – C)	33	-0.30	-1.72 to 1.11	0.665
		Monitoring (B – C)	33	-0.36	-1.38 to 0.65	0.472
		Organised/effort (B – C)	33	1.09	-0.04 to 2.22	0.057
	female	Total ALSI (B – C)	43	-0.12	-2.44 to 2.21	0.920
		Deep (B – C)	43	0.37	-1.02 to 1.76	0.591
		Surface (B – C)	43	-0.54	-1.71 to 0.64	0.364
		Monitoring (B – C)	43	0.44	-0.47 to 1.35	0.334
		Organised/effort (B –C)	43	-0.44	-1.29 to 0.41	0.299

To investigate the difference between genders and academic years an independent t-test was conducted. The results are shown in Tables 23 - 25.

Table 23: Distribution of mean scores for ALSI (Deep, Surface, Monitoring, and Organised/Effort), 95% confidence interval of mean difference (95%CI), and P-value for year cohorts 1 to 6 (group A)

Year Cohort	ALS (group)	Gender	Number	Mean	95%CI	P-value
	Total ALSI (A)	male	39	66.79	-4.71 to 1.10	0.221
		female	42	68.60		
	Deep total (A)	male	39	23.59	-2.44 to 0.43	0.167
		female	42	24.60		
1	Surface total (A)	male	39	12.31	-2.15 to 0.63	0.277
		female	42	13.07		
	Monitoring total (A)	male	39	16.21	-0.80 to 1.50	0.550
		female	42	15.86		
	Organised /Effort total (A)	male	39	14.69	-1.86 to 1.11	0.613
		female	42	15.07		
	Total ALSI (A)	male	53	66.45	-2.01 to 3.66	0.564
		female	48	65.63		
	Deep total (A)	male	53	23.87	-0.42 to 2.28	0.174
		female	48	22.94		
2	Surface total (A)	male	53	13.08	-1.02 to 1.42	0.746
		female	48	12.88		
	Monitoring total (A)	male	53	15.15	-0.97 to 0.97	0.992
		female	48	15.15		
	Organised /Effort total (A)	male	53	14.45	-1.61 to 1.18	0.761
		female	48	14.67		
	Total ALSI (A)	male	34	66.12	-2.13 to 4.65	0.463
		female	50	64.86		
	Deep total (A)	male	34	23.29	-1.33 to 1.87	0.734
		female	50	23.02		
3	Surface total (A)	male	34	13.41	-0.76 to 2.14	0.345
		female	50	12.72		
	Monitoring total (A)	male	34	15.26	-0.64 to 1.77	0.353
		female	50	14.70		
	Organised /Effort total (A)	male	33	14.24	-1.74 to 1.39	0.822
		female	50	14.42		
	Total ALSI (A)	male	41	66.54	-6.21 to 0.85	0.135
		female	42	69.21		
	Deep total (A)	male	41	23.68	-1.81 to 1.32	0.756
		female	42	23.93		
4	Surface total (A)	male	41	13.66	-2.03 to 0.64	0.300
		female	42	14.36		
	Monitoring total (A)	male	41	14.85	-2.29 to -0.01	**0.049**
		female	42	16.00		
	Organised /Effort total (A)	male	41	14.34	-2.12 to 0.95	0.451
		female	41	14.93		

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Continued from Table 23:

Year Cohort	ALS (group)	Gender	Number	Mean	95%CI	P-value
5	Total ALSI (A)	male	36	66.28	-4.02 to 3.01	0.777
		female	50	66.78		
	Deep total (A)	male	36	22.67	-2.98 to 0.28	0.102
		female	49	24.02		
	Surface total (A)	male	36	13.64	-0.28 to 2.41	0.118
		female	49	12.57		
	Monitoring total (A)	male	36	15.58	-1.40 to 1.10	0.810
		female	49	15.73		
	Organised /Effort total (A)	male	36	14.42	-1.49 to 1.87	0.821
		female	49	14.22		
6	Total ALSI (A)	male	20	66.35	-4.42 to 5.69	0.803
		female	39	65.72		
	Deep total (A)	male	20	22.80	-2.06 to 1.97	0.964
		female	39	22.85		
	Surface total (A)	male	20	12.20	-2.83 to 1.02	0.352
		female	39	13.10		
	Monitoring total (A)	male	20	15.85	-0.84 to 2.54	0.318
		female	39	15.00		
	Organised /Effort total (A)	male	20	14.80	-2.18 to 2.19	0.996
		female	39	14.79		

Table 24: Distribution of mean scores for ALSI, 95% confidence interval of mean difference (95%CI), and P-value for year cohorts 1, 3, and 5 (group B)

Year Cohort	ALSI (group)	Gender	Number	Mean	95% CI	P-value
1	Total ALSI (B)	male	56	66.05	-6.27 to -1.24	**0.004**
		female	62	69.81		
	Deep total (B)	male	56	22.71	-2.89 to -0.58	**0.004**
		female	62	24.45		
	Surface total (B)	male	56	12.98	-1.96 to 0.38	0.182
		female	62	13.77		
	Monitoring total (B)	male	56	15.82	-1.51 to 0.51	0.328
		female	62	16.32		
	Organised /Effort total (B)	male	56	14.54	-1.94 to 0.94	0.241
		female	62	15.26		
3	Total ALS (B)	male	33	66.70	-3.08 to 3.18	0.975
		female	51	66.65		
	Deep total (B)	male	33	23.39	-1.44 to 1.24	0.887
		female	51	23.49		
	Surface total (B)	male	33	12.58	-1.16 to 1.68	0.715
		female	51	12.31		
	Monitoring total (B)	male	33	15.33	-1.47 to 0.73	0.501
		female	51	15.71		
	Organised /Effort total (B)	male	33	15.39	-0.92 to 1.43	0.665
		female	51	15.14		

Continued from Table 24:

Year Cohort	ALSI (group)	Gender	Number	Mean	95% CI	P-value
5	Total ALSI (B)	male	39	69.10	-0.63 to 6.05	0.110
		female	51	66.39		
	Deep total (B)	male	39	24.67	-0.44 to 2.32	0.179
		female	51	23.73		
	Surface total (B)	male	39	13.74	-0.10 to 2.76	0.068
		female	51	12.41		
	Monitoring total (B)	male	39	15.74	-1.83 to 0.54	0.280
		female	51	16.39		
	Organised /Effort total (B)	male	39	14.95	-0.51 to 2.52	0.190
		female	51	13.94		

Table 25: Distribution of Mean scores for ALSI, 95% confidence interval of mean difference (95%CI), and P-value for year cohort 5 (group C)

Year Cohort	ALSI (group)	Gender	Number	Mean	95% CI	P-value
5	Total ALSI (C)	male	36	68.53	-1.31 to 5.74	0.215
		female	48	66.31		
	Deep total (C)	male	36	24.08	-0.58 to 2.38	0.232
		female	48	23.19		
	Surface total (C)	male	36	14.08	-0.52 to 2.40	0.206
		female	48	13.15		
	Monitoring total (C)	male	36	16.39	-0.50 to 1.61	0.296
		female	48	15.83		
	Organised /Effort total (C)	male	36	13.97	-1.75 to 1.16	0.684
		female	48	14.27		

Third year female students in group A, scored higher monitoring score (M=16.00, SD=2.47) than the males (M=14.85, SD=2.74) (p=0.048).

First year female students in group B, scored significantly higher for the overall ALS score (M=69.81, SD=6.79) than the males (M=66.05, SD=6.99) (p=0.004). The females (M=24.45, SD=3.00) also scored significantly higher for the deep score (p=0.004) than males (M=22.71, SD=3.35).

There were no significant gender differences in group C sixth year students.

2.3. Comparative Data of the Dundee Ready Educational Environment Measure (DREEM) with Gender:

Table 26: Distribution of mean scores for DREEM and Subscales according to gender, 95% confidence interval of mean difference (95% CI), and p-value for year cohorts 1 through 5 (group C)

Year Cohort Number (M/F)	DREEM (group)	Gender	Mean	95% CI	p-value
1 (45/40)	DREEM (C)	male	115.42	-11.50 to 2.54	0.208
		female	119.90		
	Perception of Learning (C)	male	26.47	-4.31 to 0.05	0.055
		female	28.60		
	Perception of Teachers (C)	male	24.13	-3.40 to 1.02	0.287
		female	25.33		
	Student Academic Perception (C)	male	20.11	-1.87 to 1.64	0.897
		female	20.23		
	Student Perception of Atmosphere (C)	male	28.04	-4.15 to 0.44	0.112
		female	29.90		
	Student Social Self-Perception (C)	male	16.56	-1.34 to 1.20	0.914
		female	16.63		
2 (48/56)	DREEM (C)	male	97.46	-12.44 to 3.36	0.257
		female	102.00		
	Perception of Learning (C)	male	23.38	-1.54 to 2.76	0.577
		female	22.77		
	Perception of Teachers (C)	male	20.96	-4.75 to -0.01	**0.049**
		female	23.34		
	Student Academic Perception (C)	male	16.52	-2.55 to 1.20	0.477
		female	17.20		
	Student Perception of Atmosphere (C)	male	22.35	-4.06 to 1.19	0.282
		female	23.79		
	Student Social Self-Perception (C)	male	14.67	-1.58 to 0.95	0.622
		female	14.98		
3 (35/56)	DREEM (C)	male	112.49	-11.93 to 4.69	0.389
		female	116.11		
	Perception of Learning (C)	male	27.00	-1.63 to 3.30	0.501
		female	26.16		
	Perception of Teachers (C)	male	24.60	-4.27 to 0.07	0.058
		female	26.70		
	Student Academic Perception (C)	male	19.40	-1.92 to 1.58	0.846
		female	19.57		
	Student Perception of Atmosphere (C)	male	27.20	-3.38 to 1.32	0.385
		female	28.23		
	Student Social Self-Perception (C)	male	14.37	-2.76 to 0.29	0.111
		female	15.61		
4 (42/38)	DREEM (C)	male	107.33	2.11 to 17.18	**0.013**
		female	97.68		
	Perception of Learning (C)	male	25.52	1.07 to 5.71	**0.005**
		female	22.13		
	Perception of Teachers (C)	male	22.26	-1.79 to 2.42	0.767
		female	21.95		
	Student Academic Perception (C)	male	19.19	0.22 to 3.84	**0.028**
		female	17.16		
	Student Perception of Atmosphere (C)	male	25.26	0.28 to 5.14	**0.029**
		female	22.55		
	Student Social Self-Perception (C)	male	15.05	0.03 to 2.54	**0.045**
		female	13.76		

Continued from Table 26:

Year Cohort Number (M/F)	DREEM (group)	Gender	Mean	95% CI	p-value
	DREEM (C)	male	99.86	-14.31 to 3.39	0.223
		female	105.32		
	Perception of Learning (C)	male	23.03	-4.81 to 0.35	0.090
		female	25.26		
	Perception of Teachers (C)	male	21.42	-2.23 to 2.55	0.893
5		female	21.26		
(36/47)	Student Academic Perception (C)	male	18.53	-3.40 to 0.62	0.174
		female	19.91		
	Student Perception of Atmosphere (C)	male	22.83	-4.60 to 1.76	0.377
		female	24.26		
	Student Social Self-Perception (C)	male	14.17	-2.14 to 0.98	0.464
		female	14.74		

3. Comparative Data of Assessment Tools with Academic Achievement:

3.1. Comparative Data of the Index of Learning Style (ILS) with Academic

Achievement:

The effect of the students' academic achievement 2 (2008/09) on the active/reflective,

sensing/intuitive, visual/verbal and sequential/global as measured by the ILS for group

B, was explored using ANOVA as illustrated in Table 27.

Table 27: ILS distribution mean scores, Academic Achievements 2 (2008/09), 95% confidence interval of mean difference (95% CI) and p-value for year cohorts 1 through 5 (group B)

Year Cohort (group)	ILS	Academic Achievement 1 (2008/09)	Number	Mean	95% CI	p-value
1 (B)	Active / Reflective	Excellent	27	-1.00	-2.52 to 0.52	0.397
		Very Good	51	-1.35	-2.50 to -0.20	
		Good	28	-1.71	-3.28 to -0.15	
		Satisfactory	5	1.00	-2.93 to 4.93	
		Pass	0	0	0	
		Fail	5	1.40	-5.26 to 8.06	
		Total	116	-1.14	-1.88 to -0.39	
	Sensing/ Intuitive	Excellent	27	-3.52	-5.27 to -1.77	0.691
		Very Good	51	-4.10	-5.49 to -2.71	
		Good	28	-3.21	-5.09 to -1.33	
		Satisfactory	5	-2.20	-7.92 to 3.52	
		Pass	0	0	0	
		Fail	5	-1.40	-6.18 to 3.38	
		Total	116	-3.55	-4.42 to -2.68	
	Visual / Verbal	Excellent	27	-6.33	-7.81 to -4.86	0.848
		Very Good	51	-5.59	-6.65 to -4.53	
		Good	28	-5.57	-7.23 to -3.91	
		Satisfactory	5	-5.00	-8.51 to -1.49	
		Pass	0	0	0	
		Fail	5	-4.60	-9.38 to 0.18	
		Total	116	-5.69	-6.39 to -4.99	
	Sequential / Global	Excellent	27	-1.00	-2.30 to 0.30	0.862
		Very Good	51	-0.73	-1.74 to 0.29	
		Good	28	-0.79	-2.37 to 0.80	
		Satisfactory	5	-0.60	-5.38 to 4.18	
		Pass	0	0	0	
		Fail	5	1.00	-2.04 to 4.04	
		Total	116	-0.72	-1.39 to -0.06	

Continued from Table 27:

Year Cohort (group)	ILS	Academic Achievement 1 (2008/09)	Number	Mean	95% CI	p-value
2 (B)	Active / Reflective	Excellent	12	-1.00	-3.10 to 1.10	0.537
		Very Good	30	-0.87	-2.49 to 0.76	
		Good	35	-1.97	-3.24 to -0.70	
		Satisfactory	9	-2.56	-4.83 to -0.28	
		Pass	16	0.00	-2.37 to 2.37	
		Fail	1	-1.00	0	
		Total	103	-1.27	-2.04 to -0.51	
	Sensing / Intuitive	Excellent	12	-3.33	-6.29 to -0.37	0.540
		Very Good	30	-4.60	-5.98 to -3.22	
		Good	35	-5.17	-6.60 to -3.74	
		Satisfactory	9	-4.78	-7.26 to -2.29	
		Pass	16	-3.38	-5.51 to -1.24	
		Fail	1	-1.00	0	
		Total	103	-4.44	-5.21 to -3.66	
	Visual / Verbal	Excellent	12	-5.67	-9.11 to -2.23	0.850
		Very Good	30	-4.40	-6.46 to -2.34	
		Good	35	-4.03	-5.74 to -2.32	
		Satisfactory	9	-3.00	-5.77 to -0.23	
		Pass	16	-5.00	-7.24 to -2.76	
		Fail	1	-3.00	0	
		Total	103	-4.38	-5.34 to -3.42	
	Sequential /Global	Excellent	12	-.17	-3.21 to 2.87	0.553
		Very Good	30	-.33	-2.15 to 1.48	
		Good	35	-.94	-2.03 to 0.14	
		Satisfactory	9	-2.56	-6.22 to 1.11	
		Pass	16	.50	-1.43 to 2.43	
		Fail	1	-3.00	0	
3 (B)	Active /Reflective	Excellent	2	-7.00	-7.00 to -7.00	0.424
		Very Good	31	-2.81	-4.18 to -1.44	
		Good	37	-2.95	-4.08 to -1.81	
		Satisfactory	1	-3.00	0	
		Pass	0	0	0	
		Fail	12	-1.67	-4.28 to 0.95	
		Total	83	-2.81	-3.60 to -2.02	
	Sensing /Intuitive	Excellent	2	-2.00	-90.94 to 86.94	**0.018**
		Very Good	31	-5.39	-6.64 to -4.14	
		Good	37	-2.24	-3.47 to -1.01	
		Satisfactory	1	-3.00	0	
		Pass	0	0	0	
		Fail	12	-4.67	-7.37 to -1.97	
		Total	83	-3.77	-4.65 to -2.90	
	Visual/Verbal	Excellent	2	-5.00	-81.24 to 71.24	0.652
		Very Good	31	-5.45	-6.88 to -4.03	
		Good	37	-6.19	-7.20 to -5.18	
		Satisfactory	1	-1.00	0	
		Pass	0	0	0	
		Fail	12	-5.33	-8.44 to -2.23	
		Total	83	-5.70	-6.52 to -4.88	

Continued from Table 27:

Year Cohort (group)	ILS	Academic Achievement 2 (2008/09)	Number	Mean	95% CI		p-value
3 (B)	Sequential / Global	Excellent	2	0.00	-12.71	to 12.71	
		Very Good	31	-0.61	-1.80	to 0.58	
		Good	37	-0.03	-1.43	to 1.38	
		Satisfactory	1	-3.00	0		0.808
		Pass	0	0	0		
		Fail	12	0.67	-1.92	to 3.26	
		Total	83	-0.18	-1.00	to 0.64	
4 (B)	Active / Reflective	Excellent	0	0	0		
		Very Good	43	-0.86	-2.08	to 0.36	
		Good	35	-2.66	-3.92	to -1.39	
		Satisfactory	1	-3.00	0		0.195
		Pass	0	0	0		
		Fail	5	-0.20	-6.91	to 6.51	
		Total	84	-1.60	-2.46	to -0.73	
	Sensing / Intuitive	Excellent	0	0	0		
		Very Good	43	-4.91	-6.20	to -3.61	
		Good	35	-3.63	-4.82	to -2.44	
		Satisfactory	1	-7.00	0		0.457
		Pass	0	0	0		
		fail	5	-5.00	-10.55	to 0.55	
		Total	84	-4.40	-5.25	to -3.56	
	Visual / Verbal	Excellent	0	0	0		
		Very Good	43	-5.37	-6.68	to -4.06	
		Good	35	-6.31	-7.57	to -5.06	
		Satisfactory	1	-9.00	0		0.428
		Pass	o	o	o		
		Fail	5	-3.80	-10.51	to 2.91	
		Total	84	-5.71	-6.60	to -4.83	
	Sequential / Global	Excellent	0	0	0		
		Very Good	43	-1.28	-2.50	to -0.06	
		Good	35	-0.09	-1.27	to 1.10	
		Satisfactory	1	1.00	0		0.476
		Pass	0	0	0		
		Fail	5	-1.80	-7.24	to 3.64	
		Total	84	-0.79	-1.60	to 0.03	
5 (B)	Active / Reflective	Excellent	2	0.00	-38.12	to 38.12	
		Very Good	45	-2.07	-2.97	to -1.16	
		Good	41	-1.49	-2.79	to -0.19	
		Satisfactory	0	0	0		0.595
		Pass	0	0	0		
		Fail	0	0	0		
		Total	88	-1.75	-2.51	to -0.99	
	Sensing / Intuitive	Excellent	2	-6.00	-18.71	to 6.71	
		Very Good	45	-4.96	-6.06	to -3.85	
		Good	41	-4.32	-5.83	to -2.80	
		Satisfactory	0	0	0		0.710
		Pass	0	0	0		
		Fail	0	0	0		
		Total	88	-4.68	-5.57	to -3.79	

Continued from Table 27:

Year Cohort (group)	ILS	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	p-value
		Excellent	2	-9.00	-34.41 to 16.41	
		Very Good	45	-5.98	-7.33 to -4.63	
		Good	41	-5.93	-7.11 to -4.74	
	Visual / Verbal	Satisfactory	0	0	0	0.589
		Pass	0	0	0	
		Fail	0	0	0	
5		Total	88	-6.02	-6.89 to -5.15	
(B)		Excellent	2	-2.00	-40.12 to 36.12	
		Very Good	45	-1.44	-2.40 to -0.49	
		Good	41	0.71	-0.67 to 2.08	
	Sequential / Global	Satisfactory	0	0	0	**0.031**
		Pass	0	0	0	
		Fail	0	0	0	
		Total	88	-0.45	-1.28 to 0.37	

ANOVA was also used to explore the association of academic achievements for academic year 2008/09 with active/reflective, sensing/intuitive, visual/verbal, and sequential/global learning styles for the fifth year cohort (group C). There were no significant differences as demonstrated in Table 28.

Table 28: ILS mean distribution, Academic Achievements (2008/09), 95% confidence interval of difference of means (95% CI) and p-value for year cohort 5 (group C)

Year Cohort (group)	ILS	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	p-value
		Excellent	2	-2.00	-14.71 to 10.71	
		Very Good	44	-2.68	-3.45 to -1.92	
		Good	37	-1.16	-2.37 to 0.05	
	Active / Reflective	Satisfactory	0	0	0	0.090
		Pass	0	0	0	
		Fail	0	0	0	
5		Total	83	-1.99	-2.67 to -1.31	
(C)		Excellent	2	-10.00	-22.71 to 2.71	
		Very Good	44	-4.82	-6.09 to -3.55	
		Good	37	-4.51	-5.88 to -3.15	
	Sensing / Intuitive	Satisfactory	0	0	0	0.192
		Pass	0	0	0	
		Fail	0	0	0	
		Total	83	-4.81	-5.71 to -3.90	

Continued from Table 28:

Year Cohort (group)	ILS	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	p-value
5 (C)	Visual / Verbal	Excellent	2	-10.00	-22.71 to 2.71	
		Very Good	44	-6.64	-7.94 to -5.33	
		Good	37	-6.41	-7.69 to -5.12	
		Satisfactory	0	0	0	0.481
		Pass	0	0	0	
		Fail	0	0	0	
		Total	83	-6.61	-7.50 to -5.73	
	Sequential / Global	Excellent	2	-3.00	-104.65 to 98.65	
		Very Good	44	-0.86	-1.97 to 0.24	
		Good	37	-0.24	-1.71 to 1.23	
		Satisfactory	0	0	0	0.580
		Pass	0	0	0	
		Fail	0	0	0	
		Total	83	-0.64	-1.55 to 0.27	

3.2. Comparative Data of the Approach to Learning and Studying (ALSI) with Academic Achievement:

A one –way between groups analysis of variance was conducted to explore the impact of students' academic achievement 2 on the deep, surface, monitoring and organised/effort approach as measured by ALSI on students in group B in the first, third, and fifth year cohorts.

Table 28: ALSI mean distribution, Academic Achievements 2 (2008/09), 95% confidence interval of difference of means (95% CI) and p-value for year cohorts 1, 3, and 5 (group B)

Year Cohort (group)	ALSI	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	P-value
1 (B)	Total ALSI	Excellent	28	68.71	66.24 to 71.19	
		Very Good	51	68.57	66.39 to 70.75	
		Good	27	66.44	63.95 to 68.94	
		Satisfactory	5	70.80	61.96 to 79.64	0.444
		Pass	0	0	0	
		Fail	5	64.60	52.80 to 76.40	
		Total	116	68.03	66.72 to 69.35	
	Deep	Excellent	28	24.39	23.24 to 25.55	
		Very Good	51	23.84	22.82 to 24.86	
		Good	27	22.78	21.71 to 23.85	
		Satisfactory	5	24.40	22.32 to 26.48	0.192
		Pass	0	0	0	
		Fail	5	21.40	15.74 to 27.06	
		Total	116	23.65	23.04 to 24.25	
	Surface	Excellent	28	12.68	11.68 to 13.68	
		Very Good	51	12.90	11.95 to 13.86	
		Good	27	14.78	13.53 to 16.02	
		Satisfactory	5	14.40	10.51 to 18.29	**0.044**
		Pass	0	0	0	
		Fail	5	15.20	11.33 to 19.07	
		Total	116	13.45	12.86 to 14.04	
	Monitoring	Excellent	28	16.43	15.34 to 17.52	
		Very Good	51	16.41	15.74 to 17.08	
		Good	27	15.37	14.29 to 16.45	
		Satisfactory	5	16.00	9.98 to 22.02	0.461
		Pass	0	0	0	
		Fail	5	15.00	9.38 to 20.62	
		Total	116	16.09	15.58 to 16.61	
	Organised/ Effort	Excellent	28	15.21	14.12 to 16.31	
		Very Good	51	15.41	14.50 to 16.32	
		Good	27	13.52	11.99 to 15.05	
		Satisfactory	5	16.00	13.85 to 18.15	0.077
		Pass	0	0	0	
		Fail	5	13.00	9.83 to 16.17	
		Total	116	14.84	14.24 to 15.45	
3 (B)	Total ALS	Excellent	2	74.00	-2.24 to 150.24	
		Very Good	31	67.35	64.52 to 70.19	
		Good	36	66.83	64.98 to 68.69	
		Satisfactory	1	59.00	0	0.158
		Pass	0	0	0	
		Fail	12	63.25	58.09 to 68.41	
		Total	82	66.59	65.05 to 68.12	
	Deep	Excellent	2	26.00	13.29 to 38.71	
		Very Good	31	23.97	22.81 to 25.13	
		Good	36	23.78	23.00 to 24.56	
		Satisfactory	1	20.00	0	**0.014**
		Pass	0	0	0	
		Fail	12	21.00	18.77 to 23.23	
		Total	82	23.45	22.79 to 24.11	

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Continued from Table 29:

Year Cohort (group)	ALSI	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	P-value
3 (B)	Surface	Excellent	2	12.50	-6.56 to 31.56	
		Very Good	31	12.55	11.39 to 13.71	
		Good	36	12.31	11.20 to 13.41	
		Satisfactory	1	11.00	0	0.984
		Pass	0	0	0	
		Fail	12	12.08	9.86 to 14.31	
		Total	82	12.35	11.66 to 13.05	
	Monitoring	Excellent	2	17.50	-1.56 to 36.56	
		Very Good	31	15.55	14.46 to 16.64	
		Good	36	15.86	15.26 to 16.47	
		Satisfactory	1	14.00	0	0.328
		Pass	0	0	0	
		Fail	12	14.42	12.59 to 16.24	
		Total	82	15.55	15.00 to 16.10	
	Organised/ Effort	Excellent	2	18.00	-7.41 to 43.41	
		Very Good	31	15.29	14.19 to 16.39	
		Good	36	14.89	14.14 to 15.64	
		Satisfactory	1	14.00	0	0.484
		Pass	0	0		
		Fail	12	15.75	13.97 to 17.53	
		Total	82	15.23	14.65 to 15.81	
5 (B)	Total ALSI	Excellent	2	73.50	-21.80 to168.80	
		Very Good	45	65.96	63.46 to 68.45	
		Good	41	69.05	66.75 to 71.35	
		Satisfactory	0	0	0	0.113
		Pass	0	0	0	
		Fail	0	0	0	
		Total	88	67.57	65.88 to 69.26	
	Deep	Excellent	2	23.50	-20.97 to 67.97	
		Very Good	45	23.47	22.46 to 24.47	
		Good	41	24.93	24.05 to 25.80	
		Satisfactory	0	0	0	0.097
		Pass	0	0	0	
		Fail	0	0	0	
		Total	88	24.15	23.48 to 24.82	
	Surface	Excellent	2	11.00	-39.82 to 61.82	
		Very Good	45	12.31	11.27 to 13.35	
		Good	41	13.88	12.89 to 14.87	
		Satisfactory	0	0	0	0.072
		Pass	0	0	0	
		Fail	0	0	0	
		Total	88	13.01	12.29 to 13.74	
	Monitoring	Excellent	2	19.50	13.15 to 25.85	
		Very Good	45	16.02	15.15 to 16.89	
		Good	41	15.98	15.13 to 16.82	
		Satisfactory	0	0	0	0.220
		Pass	0	0	0	
		Fail	0	0	0	
		Total	88	16.08	15.49 to 16.67	

Continued from Table 29:

Year Cohort (group)	ALSI	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	P-value
5 (B)	Organised/ Effort	Excellent	2	19.50	13.15 to 25.85	
		Very Good	45	14.24	13.17 to 15.32	
		Good	41	14.27	13.13 to 15.41	
		Satisfactory	0	0	0	0.128
		Pass	0	0	0	
		Fail	0	0	0	
		Total	88	14.38	13.61 to 15.14	

A one –way between groups analysis of variance was conducted to explore the impact of students' academic achievement academic year 2008/09 on the approach to learning and studying as measured by ALSI for students in group C as shown in Table 30. There were no differences between the academic achievement scores academic year 2008/09 and the ALSI.

Table 30: ALSI mean distribution, Academic Achievements 2 (2008/09), 95% confidence interval of mean difference (95% CI) and p-value for year cohort 5 (group C)

Year Cohort (group)	ALSI	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	p-value
5 (C)	Total ALSI	Excellent	2	78.50	46.73 to 110.27	
		Very Good	44	66.66	64.45 to 68.87	
		Good	36	67.67	64.69 to 70.64	
		Satisfactory	0	0	0	0.122
		Pass	0	0	0	
		Fail	0	0	0	
		Total	82	67.39	65.62 to 69.16	
	Deep	Excellent	2	27.50	21.15 to 33.85	
		Very Good	44	23.73	22.75 to 24.71	
		Good	36	23.50	22.42 to 24.58	
		Satisfactory	0	0	0	0.232
		Pass	0	0	0	
		Fail	0	0	0	
		Total	82	23.72	23.01 to 24.42	
	Surface	Excellent	2	14.50	-42.68 to 71.68	
		Very Good	44	12.89	11.87 to 13.90	
		Good	36	14.11	13.04 to 15.19	
		Satisfactory	0	0	0	0.241
		Pass	0	0	0	
		Fail	0	0	0	
		Total	82	13.46	12.73 to 14.20	

Continued from Table 30:

Year Cohort (group)	ALSI	Academic Achievement 2 (2008/09)	Number	Mean	95% CI			p-value
5 (C)	Monitoring	Excellent	2	18.00	5.29	to	30.71	
		Very Good	44	16.05	15.32	to	16.77	
		Good	36	16.14	15.31	to	16.96	
		Satisfactory	0	0	0			0.531
		Pass	0	0	0			
		Fail	0	0	0			
		Total	82	16.13	15.61	to	16.66	
	Organised/ Effort	Excellent	2	18.50	12.15	to	24.85	
		Very Good	44	14.14	13.13	to	15.14	
		Good	36	13.92	12.79	to	15.05	
		Satisfactory	0	0	0			0.168
		Pass	0	0	0			
		Fail	0	0	0			
		Total	82	14.15	13.41	to	14.88	

3.3. Comparative Data of the Reflection in Learning Scale (RLS) with Academic Achievement:

A one –way between groups analysis of variance was conducted to assess the impact of students' academic achievement for academic year 2008/09 on the reflective process for students in group B. There were no differences between the academic achievement scores and the reflective process RLS as illustrated in Table 31.

Table 31: RLS mean distribution, Academic Achievements 2 (2008/09), 95% Confidence Interval of mean difference (95% CI) and p-value for year cohorts 1, 3, and 5 (group B)

Year (group)	RLS	Academic Achievement 2 (2008/09)	Number	Mean	95% CI		p-value
1 (B)	Total RLS	Excellent	28	65.57	61.36	69.78	
		Very Good	51	64.75	60.67	68.82	
		Good	28	56.29	52.14	60.44	
		Satisfactory	4	70.25	49.21	91.29	**0.008**
		Pass					
		Fail	5	52.60	37.95	67.25	
		Total	116	62.57	60.13	65.01	

Continued from Table 31:

Year (group)	RLS	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	p-value
1 (B)	RLS Difference	Excellent	28	0.61	0.27 to 0.95	0.085
		Very Good	46	0.41	0.07 to 0.76	
		Good	26	-0.08	-0.50 to 0.35	
		Satisfactory	4	0.25	-1.27 to 1.77	
		Pass	0	0	0	
		Fail	5	-0.40	-1.51 to 0.71	
		Total	109	0.30	0.10 to 0.51	
3 (B)	Total RLS	Excellent	2	71.50	-11.09 to 154.09	0546
		Very Good	31	63.32	59.29 to 67.35	
		Good	36	65.97	61.57 to 70.38	
		Satisfactory	1	68.00	0	
		Pass	0	0	0	
		Fail	11	59.82	50.60 to 69.04	
		Total	81	64.28	61.58 to 66.99	
	RLS Difference	Excellent	2	0.00	0.00 to 0.00	0.917
		Very Good	31	0.32	0.00 to 0.64	
		Good	35	0.37	0.06 to 0.68	
		Satisfactory	1	1.00	0	
		Pass	0	0	0	
		Fail	10	0.30	-0.29 to 0.89	
		Total	79	0.34	0.15 to 0.53	
5 (B)	Total RLS	Excellent	2	87.00	61.59 to 112.41	**0.041**
		Very Good	44	63.43	59.03 to 67.84	
		Good	40	62.55	58.86 to 66.24	
		Satisfactory	0	0	0	
		Pass	0	0	0	
		Fail	0	0	0	
		Total	86	63.57	60.69 to 66.45	
	RLS Difference	Excellent	2	0.50	-5.85 to 6.85	0.280
		Very Good	43	0.67	0.34 to 1.01	
		Good	39	0.33	0.07 to 0.59	
		Satisfactory	0	0	0	
		Pass	0	0	0	
		Fail	0	0	0	
		Total	84	0.51	0.30 to 0.72	

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ANOVA was also used to assess the impact of students' academic achievement for academic year 2008/09 on the reflective process for students in group C as shown in Table 32.

Table 32: RLS mean distribution, Academic Achievement 2 (2008/09), 95% confidence interval of difference of means (95% CI) and p-value for year cohorts 1 through 5 (group C)

Year Cohort (group)	RLS	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	p-value
1 (C)	Total RLS	Excellent	19	66.79	61.40 to 72.17	
		Very Good	38	65.32	60.67 to 69.96	
		Good	21	55.14	52.38 to 57.91	
		Satisfactory	3	58.33	37.65 to 79.02	**0.011**
		Pass	0	0	0	
		Fail	2	56.50	-51.50 to 164.50	
		Total	83	62.61	59.91 to 65.32	
	RLS Difference	Excellent	19	0.16	-.024 to 0.56	
		Very Good	34	0.32	-0.04 to 0.69	
		Good	20	0.10	-0.38 to 0.58	
		Satisfactory	2	0.00	0.00 to 0.00	0.752
		Pass	0	0	0	
		Fail	2	-0.50	-6.85 to 5.85	
		Total	77	.019	-0.02 to 0.41	
2 (C)	Total RLS	Excellent	12	66.08	61.76 to 70.41	
		Very Good	28	55.79	50.75 to 60.82	
		Good	35	52.17	47.80 to 56.54	
		Satisfactory	11	59.64	47.30 to 71.97	**0.026**
		Pass	18	54.28	48.79 to 59.76	
		Fail	1	71.00	0	
		Total	105	56.05	53.49 to 58.61	

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Continued from Table 32:

Year Cohort (group)	RLS	Academic Achievement 2 (2008/09)	Number	Mean	SD	95% CI	p-value
2 (C)	RLS Difference	Excellent	12	.33	0.99	-0.29 to 0.96	
		Very Good	28	.39	0.96	0.02 to 0.76	
		Good	28	.25	1.01	-0.14 to 0.64	
		Satisfactory	10	.10	1.45	-0.94 to 1.14	0.831
		Pass	17	.59	1.06	0.04 to 1.14	
		Fail	1	1.00	0	0	
		Total	96	.35	1.04	0.14 to 0.56	
3 (C)	Total RLS	Excellent	2	70.50	4.95	26.03 to 114.97	
		Very Good	34	62.24	11.22	58.32 to 66.15	
		Good	39	60.95	10.40	57.58 to 64.32	
		Satisfactory	1	50.00	0	0	0.334
		Pass	4	57.75	13.53	36.23 to 79.27	
		Fail	11	55.45	13.33	46.50 to 64.41	
		Total	91	60.71	11.23	58.38 to 63.05	
	RLS Difference	Excellent	2	1.00	0.00	1.00 to 1.00	
		Very Good	34	0.35	1.01	0.00 to 0.71	
		Good	39	0.31	0.80	0.05 to 0.57	
		Satisfactory	1	-1.00	0	0	0.486
		Pass	4	0.50	0.58	-0.42 to 1.42	
		Fail	10	0.10	0.57	-0.31 to 0.51	
		Total	90	0.31	0.86	0.13 to 0.49	
4 (C)	Total RLS	Excellent	0	0	0	0	
		Very Good	41	59.27	12.21	55.41 to 63.12	
		Good	30	59.17	12.34	54.56 to 63.77	
		Satisfactory	2	62.00	9.90	-26.94 to 150.94	0.775
		Pass	0	0	0	0	
		Fail	5	53.60	12.95	37.52 to 69.68	
		Total	78	58.94	12.12	56.20 to 61.67	
	RLS Difference	Excellent	0	0	0	0	
		Very Good	35	.34	0.948	0.02 to 0.66	
		Good	27	.19	0.92	-0.18 to 0.55	
		Satisfactory	2	-.50	0.71	-6.85 to 5.85	0.606
		Pass	0	0	0	0	
		Fail	3	.00	1.73	-4.30 to 4.30	
		Total	67	.24	0.96	0.01 to 0.47	
5 (C)	Total RLS	Excellent	2	90.00	1.41	77.29 to 102.71	
		Very Good	44	66.39	13.20	62.37 to 70.40	
		Good	36	61.83	13.80	57.17 to 66.50	
		Satisfactory	0	0	0	0	**0.011**
		Pass	0	0	0	0	
		Fail	0	0	0	0	
		Total	82	64.96	13.99	61.89 to 68.04	
	RLS Difference	Excellent	2	0.50	0.71	-5.85 to 6.85	
		Very Good	42	0.40	0.91	0.12 to 0.69	
		Good	36	0.25	1.08	-0.12 to 0.62	
		Satisfactory	0	0	0	0	0.768
		Pass	0	0	0	0	
		Fail	0	0	0	0	
		Total	80	0.34	0.98	0.12 to 0.56	

3.4. Comparative Data of the Dundee Ready Educational Environment Measure (DREEM) with Academic Achievement:

An ANOVA was also conducted between groups to explore the impact of students' academic achievement for academic year 2008/09 on the total DREEM scores and the subscales for students in group C as illustrated in Table 33.

Table 33: DREEM mean distribution, Academic Achievements 2 (2008/09), 95% confidence interval of mean difference (95% CI) and p-value for year cohorts 1 through 5 (group C)

Year Cohort (group)	DREEM and Subscales	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	p-value
1 (C)	DREEM	Excellent	19	124.89	118.74 to 131.05	
		Very Good	38	119.26	114.14 to 124.39	
		Good	21	108.95	102.18 to 115.72	
		Satisfactory	3	107.00	32.93 to 181.07	**0.014**
		Pass	0	0	0	
		Fail	2	109.50	14.20 to 204.80	
		Total	83	117.27	113.74 to 120.79	
	Perception of Learning	Excellent	19	29.05	26.37 to 31.74	
		Very Good	38	27.95	26.33 to 29.56	
		Good	21	24.90	22.84 to 26.97	
		Satisfactory	3	28.33	13.78 to 42.89	0.075
		Pass	0	0	0	
		Fail	2	24.00	24.00 to 24.00	
		Total	83	27.35	26.23 to 28.47	
	Perception of Teachers	Excellent	19	26.21	24.11 to 28.32	
		Very Good	38	24.63	22.92 to 26.34	
		Good	21	24.19	21.90 to 26.48	
		Satisfactory	3	19.33	5.2 to 33.46	0.178
		Pass	0	0	0	
		Fail	2	21.00	-29.82 to 71.82	
		Total	83	24.60	23.49 to 25.71	
	Student Academic Perception	Excellent	19	21.53	19.93 to 23.12	
		Very Good	38	20.58	19.34 to 21.82	
		Good	21	18.10	16.29 to 19.90	
		Satisfactory	3	19.33	-0.75 to 39.41	0.069
		Pass	0	0	0	
		Fail	2	19.00	6.29 to 31.71	
		Total	83	20.08	19.21 to 20.95	
	Student Perception of Atmosphere	Excellent	19	31.32	29.14 to 33.50	
		Very Good	38	29.74	28.22 to 31.25	
		Good	21	25.95	23.34 to 28.57	
		Satisfactory	3	26.00	6.2 to 45.72	**0.012**
		Pass	0	0	0	
		Fail	2	27.50	-29.68 to 84.68	
		Total	83	28.95	27.79 to 30.12	

Continued from Table 33:

Year Cohort (group)	DREEM and Subscales	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	p-value
1 (C)	Student Social Self-Perception	Excellent	19	16.79	15.07 to 18.51	0.255
		Very Good	38	17.16	16.31 to 18.00	
		Good	21	15.81	14.49 to 17.13	
		Satisfactory	3	14.00	5.04 to 22.96	
		Pass	0	0	0	
		Fail	2	16.00	16.00 to 16.00	
		Total	83	16.59	15.95 to 17.23	
2 (C)	DREEM	Excellent	12	105.83	93.66 to 118.01	0.137
		Very Good	28	100.57	92.58 to 108.57	
		Good	35	98.57	92.01 to 105.13	
		Satisfactory	10	112.10	100.66 to 123.54	
		Pass	18	91.17	79.90 to 102.43	
		Fail	1	92.00	0	
		Total	104	99.90	95.96 to 103.85	
	Perception of Learning	Excellent	12	23.08	18.77 to 27.40	**0.024**
		Very Good	28	23.32	21.27 to 25.37	
		Good	35	22.83	21.28 to 24.38	
		Satisfactory	10	27.90	24.59 to 31.21	
		Pass	18	20.28	17.37 to 23.19	
		Fail	1	24.00	0	
		Total	104	23.05	21.98 to 24.12	
	Perception of Teachers	Excellent	12	23.67	20.86 to 26.47	0.813
		Very Good	28	22.18	19.65 to 24.71	
		Good	35	22.00	19.80 to 24.20	
		Satisfactory	10	23.90	20.59 to 27.21	
		Pass	18	20.89	17.34 to 24.44	
		Fail	1	23.00	0	
		Total	104	22.24	21.04 to 23.44	
	Student Academic Perception	Excellent	12	18.92	15.50 to 22.34	**0.010**
		Very Good	28	17.39	15.86 to 18.92	
		Good	35	16.57	15.10 to 18.04	
		Satisfactory	10	19.50	15.93 to 23.07	
		Pass	18	13.67	11.11 to 16.22	
		Fail	1	21.00	0	
		Total	104	16.88	15.95 to 17.82	
	Student Perception of Atmosphere	Excellent	12	24.33	20.99 to 27.68	0.251
		Very Good	28	22.86	20.01 to 25.70	
		Good	35	23.09	20.84 to 25.33	
		Satisfactory	10	27.10	23.23 to 30.97	
		Pass	18	20.94	17.32 to 24.56	
		Fail	1	17.00	0	
		Total	104	23.13	21.82 to 24.43	
	Student Social Self-Perception	Excellent	12	16.00	14.12 to 17.88	0.656
		Very Good	28	14.39	13.24 to 15.55	
		Good	35	14.43	13.18 to 15.68	
		Satisfactory	10	15.30	12.52 to 18.08	
		Pass	18	15.33	14.03 to 16.63	
		Fail	1	14.00	0	
		Total	104	14.84	14.21 to 15.46	

Continued from Table 33:

Year Cohort (group)	DREEM and Subscales	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	p-value
	DREEM	Excellent	2	118.50	35.91 to 201.09	
		Very Good	33	118.61	110.81 to 126.40	
		Good	39	114.05	109.13 to 118.97	
		Satisfactory	1	115.00	0	0.176
		Pass	4	91.50	68.90 to 114.10	
		Fail	11	111.00	95.28 to 126.72	
		Total	90	114.46	110.41 to 118.50	
	Perception of Learning	Excellent	2	30.00	4.59 to 55.41	
		Very Good	33	26.42	23.96 to 28.89	
		Good	39	26.46	25.00 to 27.92	
		Satisfactory	1	27.00	0	0.747
		Pass	4	22.50	16.6 to 28.38	
		Fail	11	27.00	22.35 to 31.65	
		Total	90	26.42	25.22 to 27.63	
	Perception of Teachers	Excellent	2	23.50	17.15 to 29.85	
		Very Good	33	27.45	25.52 to 29.39	
		Good	39	24.95	23.66 to 26.24	
		Satisfactory	1	29.00	0	**0.016**
		Pass	4	18.75	12.21 to 25.29	
		Fail	11	26.27	22.54 to 30.00	
3 (C)		Total	90	25.77	24.71 to 26.82	
	Student Academic Perception	Excellent	2	19.00	-69.94 to 107.94	
		Very Good	33	19.88	18.44 to 21.32	
		Good	39	20.08	18.93 to 21.23	
		Satisfactory	1	17.00	0	0.222
		Pass	4	15.50	7.13 to 23.87	
		Fail	11	17.91	15.07 to 20.75	
		Total	90	19.48	18.62 to 20.33	
	Student Perception of Atmosphere	Excellent	2	28.00	-10.12 to 66.12	
		Very Good	33	29.00	26.85 to 31.15	
		Good	39	27.87	26.38 to 29.36	
		Satisfactory	1	26.00	0	0.359
		Pass	4	23.50	17.34 to 29.66	
		Fail	11	25.82	21.12 to 30.52	
		Total	90	27.82	26.67 to 28.98	
	Student Social Self-Perception	Excellent	2	18.00	-45.53 to 81.53	
		Very good	33	15.97	14.49 to 17.45	
		Good	39	15.00	14.09 to 15.91	
		Satisfactory	1	16.00	0	0.079
		Pass	4	11.25	8.24 to 14.26	
		Fail	11	13.64	11.44 to 15.83	
		Total	90	15.10	14.35 to 15.85	

Continued from Table 33:

Year Cohort (group)	DREEM and Subscales	Academic Achievement 2 (2008/09)	Number	Mean	95% CI	p-value
4 (C)	DREEM	Excellent	0	0	0	0.939
		Very Good	41	103.76	98.01 to 109.50	
		Good	30	101.43	95.56 to 107.31	
		Satisfactory	2	103.00	39.47 to 166.53	
		Pass	0	0	0	
		Fail	5	100.40	77.19 to 123.61	
		Total	78	102.63	98.82 to 106.44	
	Perception of Learning	Excellent	0	0	0	0.948
		Very good	41	24.05	22.15 to 25.95	
		Good	30	23.40	21.62 to 25.18	
		Satisfactory	2	23.50	4.44 to 42.56	
		Pass	0	0	0	
		Fail	5	24.60	19.01 to 30.19	
		Total	78	23.82	22.61 to 25.03	
	Perception of Teachers	Excellent	0	0	0	0.904
		Very Good	41	22.54	20.90 to 24.18	
		Good	30	21.80	20.24 to 23.36	
		Satisfactory	2	23.00	23.00 to 23.00	
		Pass	0	0	0	
		Fail	5	21.60	17.07 to 26.13	
		Total	78	22.21	21.16 to 23.25	
	Student Academic Perception	Excellent	0	0	0	0.744
		Very Good	41	18.61	17.21 to 20.01	
		Good	30	17.80	16.43 to 19.17	
		Satisfactory	2	18.50	-13.27 to 50.27	
		Pass	0	0	0	
		Fail	5	16.80	10.63 to 22.97	
		Total	78	18.18	17.25 to 19.11	
	Student Perception of Atmosphere	Excellent	0	0	0	0.993
		Very Good	41	23.85	22.11 to 25.60	
		Good	30	23.93	21.85 to 26.02	
		Satisfactory	2	25.00	12.29 to 37.71	
		Pass	0	0	0	
		Fail	5	23.80	19.38 to 28.22	
		Total	78	23.91	22.71 to 25.11	
	Student Social Self-Perception	Excellent	0	0	0	0.799
		Very Good	41	14.59	13.76 to 15.41	
		Good	30	14.43	13.25 to 15.62	
		Satisfactory	2	13.00	-25.12 to 51.12	
		Pass	0	0	0	
		Fail	5	13.60	9.62 to 17.58	
		Total	78	14.42	13.78 to 15.07	

Continued from Table 33:

Year Cohort (group)	DREEM and Subscales	Academic Achievement 2 (2008/09)	Number	Mean	95% CI		p-value
5 (C)	DREEM	excellent	2	114.50	-44.33	to 273.33	
		very good	43	106.21	99.51	to 112.91	
		good	36	100.00	94.27	to 105.73	
		Satisfactory	0	0	0		0.283
		Pass	0	0	0		
		Fail	0	0	0		
		Total	81	103.65	99.28	to 108.03	
	Perception of Learning	excellent	2	29.00	-21.82	to 79.82	
		very good	43	25.37	23.32	to 27.42	
		good	36	23.00	21.49	to 24.51	
		Satisfactory	0	0	0		0.106
		Pass	0	0	0		
		Fail	0	0	0		
		Total	81	24.41	23.11	25.70	
	Perception of Teachers	Excellent	2	20.50	-11.27	to 52.27	
		Very Good	43	21.02	19.35	to 22.70	
		Good	36	22.14	20.35	to 23.93	
		Satisfactory	0	0	0		0.632
		Pass	0	0	0		
		Fail	0	0	0		
		Total	81	21.51	20.33	to 22.68	
	Student Academic Perception	Excellent	2	26.00	13.29	to 38.71	
		Very Good	43	20.63	19.30	to 21.96	
		Good	36	17.56	16.16	to 18.95	
		Satisfactory	0	0	0		**0.001**
		Pass	0	0	0		
		Fail	0	0	0		
		Total	81	19.40	18.39	to 20.40	
	Student Perception of Atmosphere	Excellent	2	23.50	-122.62	to 169.62	
		Very Good	43	24.28	21.89	to 26.66	
		Good	36	23.67	21.83	to 25.51	
		Satisfactory	0	0	0		0.923
		Pass	0	0	0		
		Fail	0	0	0		
		Total	81	23.99	22.46	to 25.52	
	Student Social Self-Perception	Excellent	2	15.50	-3.56	to 34.56	
		Very Good	43	15.02	13.88	to 16.17	
		Good	36	13.75	12.60	to 14.90	
		Satisfactory	0	0	0		0.268
		Pass	0	0	0		
		Fail	0	0	0		
		Total	81	14.47	13.68	to 15.26	