Evaluating the Effects of School Curriculum on Students' Critical Thinking Skills

تقييم تأثير المناهج الدراسية على مهارات التفكير النقدي لدى الطلاب

By

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Dedication

I dedicate this modest work to;

The dearest person to my heart, to the person who sacrificed a lot for me and for my siblings, my mother, who never stopped supporting and loving me. Without my mother’s prayers and encouragement, I would never be what I am today.

To my father' soul, may he rest in peace;

To my sisters and brothers

To every person I love;

To that one person who has never stopped supporting me, Mohammed;

To every knowledge seeker;

To everyone who believes that learning is a life-long process

To everyone who never gives up;

To everyone who believes that every cloud has a silver lining;

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Abstract

The development of critical thinking represents a key objective of all school curricula, and any authentic education must include the development of critical thinking. This study examined the critical thinking skills of students in grade 12 (N=100). The participants study in different private schools that offer different school curricula; American Curriculum that is aligned to Connecticut Standards in Site A, British Curriculum aligned to the English National Standards in Site B, US curriculum that is newly aligned to Common Core State Standards and New Generation Science Standards in Site C, International Baccalaureate in Site D, and another US curriculum that is aligned to CCSS and Connecticut Standards in Site E. Critical thinking was assessed using the Cornell Critical Thinking Test Version X. This test measures four critical thinking skills: Induction, Deduction, Credibility, and Identification of Assumptions.

It has been discovered that grade 12 students enrolled in different school curricula score widely different scores on the Connell Critical Thinking Test. That there are a number of differences in critical thinking skills between those students who are enrolled on different school curricula that is sourced from the USA, the UK and on the International Baccalaureate Curricula. And that a number of observational relationships could be evidenced between students' GPA and scores in the Connell Critical Thinking Test when compared to a number of variable factors that included retuned SAT scores. However, the main difference is where a number of demographic variables were present that provided evidence that impacted considerably affecting students' critical thinking skills. The study also found out that skills such as assessing the credibility of observational reports and identifying assumptions were not well developed among grade 12 students.

The findings from the study suggest that school curricula may have an effect on students' critical thinking skills. However, this research did not look at instructions within the curriculum; thus, the reported differences cannot be exclusively attributed to the school curriculum.

ملخص

تطوير التفكير النقدي يمثل هدفا رئيسيا لجميع المناهج الدراسية ، و يجب أن يشمل أي نوع من التعليم الحقيقي تطوير التفكير النقدي. فحصت هذه الدراسة مهارات التفكير النقدي لدى طلاب الصف الثاني عشر و الذين ينتمون الى مدارس خاصة تقدم مناهج دراسية مختلفة: منهاج أمريكي يتماشى مع معايير كونيتيكت في الموقع أ, منهاج بريطاني في موقع ب, منهاج أمريكي متامشي حديثا مع معايير الدولة الأساسية المشتركة في الموقع ث, الباكالوريا الدولية في الموقع ج, و منهاج أمريكي آخر محاذ لي معايير كونيتيكت في الموقع ح. تم تقييم التفكير النقدي باستخدام اختبار كورنيل للتفكير النقدي النسخة اكس و يقيس هذا الاختبار أربع مهارات للتفكير الناقد: الاستقراء، الاستنتاج، المصداقية، وتحديد الافتراضات.

وقد تم اكتشاف أن طلبة الصف 12 و المسجلين في المناهج الدراسية المختلفة حصلوا على نتائج مختلفة على نطاق واسع في اختبار كورنيل للتفكير النقدي و أن هناك عددا من الاختلافات في مهارات التفكير النقدي بين هؤلاء الطلاب الذين ينتمون الى مناهج دراسية مختلفة مصدرها من الولايات المتحدة الأمريكية والمملكة المتحدة و مناهج البكالوريا الدولية .و يمكن أن يتضح عدد من العلاقات بين المعدل التراكمي للطلبة و نتائجهم في اختبار كورنيل لمهارات التفكير النقدي بالمقارنة مع عدد من العوامل المتغيرة و التي شملت نتائج امتحان السات.

ومع ذلك، فإن الفرق الرئيسي هو حيث كان عدد من المتغيرات الديموغرافية الحالية التي قدمت أدلة أثرت بشكل كبير على مهارات التفكير النقدي لدى الطلاب. وجدت الدراسة أيضا إلى أن مهارات مثل تقييم مصداقية تقارير الرصد وتحديد الافتراضات ليست متطورة بشكل جيد بين طلاب الصف الثاني عشر.

وتشير النتائج التي توصلت إليها الدراسة أن المناهج الدراسية قد يكون لها تأثير على مهارات التفكير النقدي لدى الطلاب. ومع ذلك ، فإن هذا البحث لم ينظر إلى التعليم ضمن المناهج الدراسية؛ وبالتالي ، فإن الاختلافات التي ذكرت لا يمكن أن تعزى حصرا إلى المناهج الدراسية.

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List of Acronyms Used in the Research

Acronym	What it stands for
ACER	Australian Council for Educational Research
ANOVA	Analysis of Variance
CCSS	Common Core State Standards
CCTT	Cornell Critical Thinking Test
GCSE	General Certificate of Secondary Education
GPA	Grade Point Average
IB PYP	International Baccalaureate Primary Years Program
IB	International Baccalaureate
IBDP	International Baccalaureate's Diploma Program
IBT	International Benchmark Test
ICT	Information and Communication Technologies
IEP	Internet Encyclopaedia of Philosophy
IGCSE	International General Certificate of Secondary Education
ITBS	Iowa Tests of Basic Skills
ITGS	Information and Technology in a Global Society
KHDA	Knowledge and Human Development Authority
MAP	Measure of Academic Progress
NEASC	New England Association of Schools and Colleges
NGSC	New Generation Science Standards
SAT	Scholastic Aptitude Test
TOEFL	Test of English as a Foreign Language
UAE	United Arab Emirates
UK	United Kingdom
US	United States

Chapter One: Introduction

1.1Background of the Study

The two main objectives of education were to impart knowledge and cultivate wisdom. Provided with great stability, traditional societies have emphasized the first of these objectives. Considered as an accumulation of truths, knowledge was passed from one generation to another. It was conceived as a body of eternal truths sticking perfectly to the skin of a frozen world. (Lipman, 1995)

There comes a time when the stability collapses. It is said that “time changes." Traditional knowledge can then be inadequate or even obsolete. It is during these unstable times that people tend to focus on intellectual flexibility and creativity, and give less importance to knowledge as such. This is probably why the Stoics cultivated wisdom: they were preparing for the possibility of good and bad days.

Contemporary conception of education as a process of research combines these two objectives. It emphasizes on the process and the product of thought as well as knowledge, research and truth. It is agreed that each discipline is made of a set of knowledge slowly changing, constantly accumulating and representing the synthesis of every acquired experience in this discipline. However, it is now no longer expected that students learn only what is already known, it is expected that they think critically.

Critical thinking, therefore, is maintaining this part of the traditional education which stressed the importance of cultivating wisdom and its application in practice and in daily life .

1.2Statement of the Problem

The development of critical thinking represents a key objective of all school curricula. Reboul (1984), argues that all authentic education must include the development of critical thinking, which aims to promote the development of autonomy of thought among students: "[...] an education that takes the liberty as an end is the one that gives the students the power to do without their teachers, to continue by themselves their own education, to acquire by themselves new knowledge and find their own standards "(p.159)

The aim of critical thinking can be explained by a need for the individual to adapt to his environment, by his desire to participate in the democratic life- especially by the need he feels to locate in front of the unreleased or vis-à-vis the controversial issues. Furthermore, Chadwick (2012, p.9) states that "teaching children to become effective thinkers is progressively more recognized as an important and immediate goal of education." Chadwick (2012) also argues that one of the most important concerns in addition to teaching students to be ethically and morally solid is to teach them to be effective thinkers.

Although no one can deny the importance of critical thinking, many studies have shown that schools do no teach children to think critically (Chadwick, 2012)

1.3 Research Questions

This study aimed to answer the following questions:

1) How do grade 12 students enrolled in different school curricula score on the Connell Critical Thinking Test?
2) What differences or similarities in critical thinking skills, if any, exist between students enrolled in different school curricula, namely, US, UK, and IB curricula?
3) What are the observed relationships, if any, exist between students' GPA and scores in the Connell Critical Thinking Test?
4) Are any of the variables (gender, language, and family background) considerably affecting students' critical thinking skills?

1.4 Significance of the Study

Critical thinking is an important approach in education because it allows the increase of satisfaction and the level of students' learning when students have to use and apply ideas contained in the curriculum. Students who receive information in a passive or transmissive way are less likely to understand what they have heard or read than students who reviewed, interpreted, applied or tested this information critically. In presenting the material as a problem or issue, students are more motivated and can understand better. As noted by Paul (1993), "knowledge is acquired only through thinking".

The current research aimed to add to the knowledge of critical thinking through a comparison of the critical thinking skills of students enrolled in diverse school curricula. The aim of the study was to evaluate quantitatively the critical thinking skills of grade 12 students enrolled in American, British, and in the International Baccalaureate (IB) curricula in some private schools in the Emirate of Dubai in the UAE. The study intended also to determine how these different school curricula might affect students' critical thinking development.

1.5 The Organization of the Research

The first chapter presents the definition of the problem, describes the background and the purpose of the research, and states the research questions. This chapter also highlights the significance of this study.

In the second chapter, I will examine today's teenagers in their vulnerability and in the family, school and social contexts. Moreover, we will look at the development of critical thinking in school. This chapter ends with some recent researches on critical thinking.

The third chapter presents different definitions of critical thinking as well as cognitive and moral development of the adolescent, essential to the expression of critical thinking. We will also look at some theoretical models and teaching strategies that promote critical thinking. At the end of chapter three, I will discuss the assessment of critical thinking, and I will present some instruments used to measure students' critical thinking skills.

The fourth chapter presents the research methodology. This chapter is composed of five parts. The first part is a description of the setting and the schools involved in the study. The second part highlights the processes used to get the participants, and the demographics of every group. The third part describes the assessment instrument, whereas the fourth part describes the experimental design and data collection methods. Finally, the fifth part describes the procedures for data analysis.

Chapter five analyses and responds to those results that were gleaned within the testing that was created and produced for this paper. In doing so, this chapter seeks to place these responses and results into a phenomenological context and considers a number of variables, such as the impact of curricular choices of establishments on learners and how these impact upon the wider ethos of

educational processes, such as the ability of the education system to help inform and benefit the development a person who is capable of residing within a society and act as critical thinker. Underpinning this development is the choice of curriculum that the educational establishment chooses.

The sixth chapter discusses the results of the research in relation to the study questions and places these in context to that of a number of variables that can be found within this discourse. This includes the importance of the choice of curriculum within education and where there is real potential that education may not be holistically achieving its outcomes. This chapter also addresses study limitations and implications for practice.

Chapter Two: Literature Review Part One

2.1 Introduction

Adolescence is a period that is perceived as difficult. Therefore, any intervener must educate young people to exercise critical thinking in their actions, because teenagers must lead their lives in a way not to be trapped by the temptations that offer our societies. Using one's own critical thinking is one of the goals that many educational systems are aiming for.

Many authors discuss the reality of adolescence. Some are optimistic (Dolto , 1988 Fize 1994; Natanson , 1998, Roy- Office , 2002 Morin , 1985; Gutton , 2005) , by cons, others (Grand'Maison , 1992, 1999 ; Vitaro and Carbonneau , 2000; Bare1 1984, De Koninck , 2006) showed a rather pessimistic view . For most of these professionals, the present and the future appears bleak for teens. Moreover, the media convey, through the selection of news and television series, often a delinquent image of adolescents.

To what extent this defeatist attitude can it affect the perception of teens about themselves? To get through this period, adolescents must use critical thinking to keep a positive image despite the pressures of their entourage. After many researches on the behaviour of adolescents, did we endow them with a strong critical sense that allows them to make informed choices? Are they provided with instruments such as core values , enlightened consciousness, and diverse knowledge? Encouraging students to use their critical thinking is a goal that the educational authorities in Dubai are trying to promote to all teachers and schools.

In education, adolescents represent a challenge precisely because of the perception that the society maintains about this age group. How many times have we hear people praise the courage and determination of teacher (s) working with teenagers? How is it that teenagers have bad impressions for adults? Are we not likely to make them immediately responsible when there is outbreak of violence or vandalism? In fact, for Gutton (2005), the society needs some guilty people. We blame teenagers for their recklessness, lack of compassion and lack of interest. The question is to know if they are really lacking and if, despite what we may think, the desire to understand and learn remains. Do Today's youth possess the critical thinking that every human being should have to develop his/her consciousness and good judgment? For Paris and Bastarache (1995), this critical thinking is a reflection on the power of independent thought; it is

just the opposite of made-answers, the blind acceptance of the political, religious or other doctrines. Critical thinking is a pause before accepting an idea or engaging in an action in order to judge its value.

Natanson (1998) emphasizes that the adolescents discover an ability of surprise in front of all the new changes that they encounter. The author adds that this is the period of extremes, mainly in the needs and contradictions: need of adventure and safety, risk and protection, meeting and isolation, agitation and calm, etc. Galland (1997) speaks of an inner personality boiling with intense joy followed by incomprehensible depressions. The adolescent enters a period of egocentrism, where he thinks that he is the focus.

Indeed, the adolescent is brought to perceive the world from his point of view only (Bee and Boyd, 2003). He is demanding and requires clear answers to his questions. In doing so, the teenager appeals to the whole society, his family, his parents, the school and his teachers (Gutton , 2005). His whole being is thirsty for confidence that is essential for the acquisition of new knowledge. It is about being the "master of his thinking". There are so many reasons to guide and encourage the adolescents in their need for achievement and self-realization.

In traditional societies the youth was quickly thrown into the world of adults. His new responsibilities placed him under an obligation to use the most effectively his critical thinking in order to achieve a certain level of security and maturity. As reported by the sociologist Fize (1994), traditional values, such as work, family, solidarity, equality have left place to modern values such as money, pleasure, risk, and challenge. A multitude of reasons exist to educate young people to be discerning and use critical thinking in their actions.

2.2 Today's Youths

Today's teenagers were born when major changes are taking place within the two major institutions that surround the adolescents, namely the family and the school. As mentioned by Hurtubise (2005) and Tahon (1995), the changes experienced in the families of the last thirty years have been characterized by a process of "institutionalization" of the family. Nowadays, these transformations take a different form which leaves room for diversity and pluralism. For

some, this may seem dangerous in a society. However, the previous authors consider these transformations very positive. Indeed, democracy came in families allowing everyone to express himself, and this new approach has revolutionized the exercise of authority. (Gruyère Arnaud, 2005).

Another effect of this change: the extension of schooling in some countries has helped develop a dependency which takes young people away from the social responsibility. According to Pasquier (2005), this dependence appears to be harmful to society. Dolto (1988) also believes that the youth suffers from the ease of living and lack of motivation. Teenagers are becoming increasingly aware of the difference of their values and their interests vis-à-vis the world of adults. In addition, the group of friends greatly influences the attitudes and behaviours of adolescents. However, Galland (1997) doesn't worry too much about this situation, and in many areas, young people do not stray much from the rest of society because at this age, it is the friendships that dominate. In fact, a young person needs to love people of his age and learn from those of his own generation. Many testimonies of young people, in groups or interviews, confirmed that friendship occupies a prominent place, for most young people, friendship comes before love. In addition, Natanson (1998) states that the use of peers to locate in face of the adult world seems to be a need for the teenager since he learns about relationships. Indeed, for vulnerable young people, it is friendship only that can make their lives liveable and tolerable.

The authors Bee and Boys (2003) also noted that the youth must lead his life in a way not to be fooled by the many social problems (fights, delinquency , alcohol and drug abuse) that line his road. In this new reality, the teenager must demonstrate sharp critical thinking so not to suffer from his choices.

2.3 Adolescence: A Vulnerable Period

According to Gauthier (1994), adolescence is the age of imagination, action and desire of independence, consumption can become a particularly desirable appeal. When it comes to consumption, it is about the extraordinary market which the adolescents represent. The author gives the example of a survey conducted in 1989 where it is stated that for the 15-24 age group, the pleasure of consuming is so important and buying produces more fun than the utility of the product. Adolescents are an easy and impressionable clientele. According to Natenson (1998),

they are exploited without regard to a dramatic impact that excessive consumption will have on them. Modes, whether it is about food, clothing or sports relentlessly push young people to spend if they do not want to live in marginalization. Advertising is the vehicle par excellence of this consumption. As stated by Houssaye (1992), advertising presents a model of values which it imposes on people. Therefore, the products are no longer produced for the needs of people, but to match their desires. Consequently, young people have henceforth a prolific common culture: of music, television or radio programs, magazines, video games, discussion forums on the Internet, etc. (Pasquier, 2005: 27) . Moreover, the field of information and communication technologies (ICT) offers information which is not always very credible and that require critical thinking.

The young people develop alerted critical thinking so not to give in to this pressure. Most preferred models by young people are created from scratch by superficial and artificial television or radio programming. But for Leroux (2004), our impulses, our desires and pictures imprison us and if, as adults it is difficult to escape, imagine the difficulty for a teenager. We can see that the models proposed by the “star-system” do not encourage young people to take a critical distance in front of them. As mentioned by Grand'Maison (1999: 200) : " we must say that the star-system enhances mediatically some idols who claim to transcend any judgment , whether it is about values to respect , good or evil, or right or wrong. " What can parents do in front of such a mediatic crusade? This vein that represents the search for an idol and / or model seems to be inexhaustible. The teenagers need role models who can assist them in structuring their lives. It is tempting for a young to imitate someone he or she appreciates. However, some behaviours considered undesirable can result. Other realities, such as the appeal to psychoactive substances (drugs and alcohol) , depression , suicide, and the virtual world represent temptations or potential hazards that could be the source of indifference or moral resignation of some young people.

Grand'Maison (1999) sees the adolescents with a confused inner world without culture, without sacred limit to respect. They are, according to the author, controlled by immediate and tyrannical, asocial and amoral impulses. Today, the young person is exposed to an empty argument (Bedard, 2003). Also according to Bédard, an education based on critical thinking could avoid this dangerous escalation.

Gutton (2005) sees in teenagers a new culture that discredits the traditional indicators. Indeed, the media glamorize and reinforce the image of a culture in which risk behaviours seduce young people. In contemporary societies, these risk behaviours are not so far from the rites of passage which mark a desire to live giving meaning to their lives (Breton, 2004). Too many images of violence (fictitious images or real deaths) trivialize the deadly behaviours (Fize 1994). In addition, a pornographic accessible environment, where everything is acceptable, desirable and possible, and even love violence make teenagers bitter and disillusioned (Robert , 2005). For Hintermeyer (2005), violence is practiced as a way to assert and protect themselves. However, the author adds that with the help of adult educators, the teenagers could take a step back from their behaviours and adopt a critical perspective on themselves. The most fragile and impressionable teenager does not always have the chance to be monitored and supervised by professionals. When a difficult family context or a traumatic event is added, as mentioned by Dolto (1988), all the ideal components of a depressive episode or passage to the act are met. It should be added that even if there is a low proportion of youth who come to this extreme action, this situation remains intolerable. Gratton (1996 : 325) concludes: " constantly choosing , taking risks and deciding on the values of interest , while correctly assessing their resources, can , over time , become extremely demanding, exhausting, unsatisfying for the youth.

Barel (1984) denounces the society and makes it responsible for the refusal of transcendence. For the teenager to reach full maturity, he needs to excel and surprise himself. Impotence, educational failure, insecurity often linked to the lack of a framework for life, quite consistent benchmarks conspire to prevent the youth to overcome the obstacles inherent in his age group, what the same author calls the social vacuum. .

In sum, adolescence offers a pitch exposed to various influences. In this slice of life, critical thinking remains essential in order to make informed choices. The society must provide a place for teenagers, and enough room for them to be and to become. However, this place that the youth must occupy, where should it be rooted? In the following paragraphs, I will discuss the place that parents occupy in the family as well as their influences.

2.4 The Family Context of Contemporary Teenagers

According to Bee and Boyd (2003) , nearly two-thirds of parents perceive adolescence as one of the most difficult stages in their parenting role , both for the loss of authority and for the concern about the need for freedom and autonomy claimed by adolescents. They estimate that about 5 to 10% of North American families studied suffer a catastrophic deterioration in the quality of the relationship parents-children in the early teens. Similarly, a family of 5 is affected by serious problems of diverse nature (Peeters , 2005). For Hone and Mercury (1996), the task of raising teenagers is probably more complicated than educating the younger ones. Nevertheless, many theorists believe that the conflicts remain necessary and even healthy for normal adolescents' development. The adolescents learn to discover themselves as individuals while engaging in a process of separation from their parents. However, according to a research conducted around the world, Bee and Boyd (2003) suggest that adolescents who remain closely attached to their parents will remain the same all their lives, and it is also with them that they will find love and safety. Indeed, despite the lack of authority of many parents, they remain still, the first reference. Parents often choose to do nothing or say nothing. The lack of reference for the parent causes a lack of reference for the children. However, young people suffer more from insecurity than from lack of freedom. For Grand'Maison (1999: 109): " the total permissiveness is the most likely practice to deliver a child to differentiation without indicators that will prevent him to structure himself . How many depressions, suicides of teenagers are now lived in an undifferentiated interior world"? A confused, lost, disoriented or insecure teenager becomes an easy prey for unscrupulous system (small underworld, exploiters, dealers...etc.).

A much more emotional security than a physical one remains the cornerstone in building a strong personality. If, in addition, it is reinforced by the love and the presence of caring parents, we will find the best guarantees for balanced growth. Indeed, parents are primarily responsible for the quality or lack of essential elements in the design of critical thinking of adolescents. Some hypotheses were advanced to explain the parental impotence.

Changes in the roles helped transform the family functioning. Indeed, Gauthier (1994) and Gutton (2005) show that the advent of feminism has confused the female and male roles. The authority of the father is found to be erased especially as family size has favoured a more democratic relationship than authoritarian and patriarchal one. Paternal disengagement seems to

appear especially during separation. For their part, Cyr and Carobene (2004), drawing on research of Dandurand (1994), state that more than 20 % of children have no contact with their father. The majority of children living with their mothers see their father less than once per week. Pepin (2005: 274) asks: "Where are the fathers? What has happened in our society that the father does not play his role? ". The presence of the father is no longer absolutely essential for the functioning of the family; he is no longer the only provider of the family. Tahon (1995) supports this hypothesis of fathers' resignation because they are no longer found in the role of provider. However, Merrieu (2002) and Pepin (2005) argue that one can slowly become a father and only if the mother gives up space. Indeed, in the modern couple, the mother takes the father's decision-making authority regarding the child. Even in the absence of their father, the young people easily recognize the responsibilities of their mother. Without help, a mother can still raise his or her children. Studies by Lefebvre and Merrigan (1998) and Neyrand (2000) suggest that mothers lavish more direct care to young children than do fathers . Tahon (1995) is widely abundant in this direction by adding that children are mainly the responsibility of the mother. Not only it is observable in two-parent families, but it's particularly evident in single-parent families and stepfamilies (Pepin , 2005). Yet the father as the mother plays a fundamental role in the construction of identity from birth to adulthood. For Le Camus (2000), the father introduces children to socialization and culture and the mother cares about the protection and well-being of the child. So one stimulates and the other secures. In addition, Widlöcher (1998) and Porot (1976) see the father as the representative of the masculine sex in what he calls the "family constellation." For these authors, this representation provides a balance in the emotional life, thus contributing to the independence and autonomy of the child. In short, any educational course should involve teaching that requires critical thinking. To achieve this, the role of each parent should be well defined. Therefore, the parent is a model, a guide, a leader. Nevertheless, many communication problems reside in the imbalance of these roles. However, as Hurtubise (2005) points out, we should not conclude to a weakening or disappearance of family morality.

Finally, for the authors, the new family and parenting realities require adults a continuous update in their ways to educate. Being a parent requires special skills that are not always intrinsic. Every parent learns to become one. Skills such as logical reasoning, argumentation, and decision making, represent a gap for some parents. Lipman (1991) denounces the weakness of judgment in children, so education should focus on improving their judgment. However, the progression of

judgment will be possible if the school is concerned to develop the necessary reasoning in conducting critical thinking.

2.5 The Role of the School

Up to what extent does the school play a key role in building critical thinking in adolescents? For the most part, it is at the school that the child learns to behave in society, to take a position according to his values and it is always at school that he learns to differentiate himself from others and to assume his choice. The school is his second environment of life.

2.5.1 The School: An Environment of Life

What is school for teenagers? Galland (1997) states that adolescents have a busy schedule and have limited time to devote to other things as school activities , family and extracurricular activities . However, it is logical to think that their social life happens mostly at school. Without school, young people are idle, find time as long and are anxious to return to their regular activities that surround and secure them. For the majority, school is not a place of imprisonment; rather, it is a world of gathering and learning. A study by Bouchard, St- Amand , Bouchard and Tondreau (1997) report that additional guidance followed by the parents results in adolescents having a more positive view of the school, greater investment , better academic performance and optimism about the future career . If the school was not compulsory, they will come anyway. Of course, the school offers a variety of programs estimated or not by the teenager. Some courses are more appreciated than others; usually moral teaching is a favourite because it represents a critical space for reflection and introspection.

2.5.2 The Teacher and the Student

For Lafortune, Doudin , Pons and Hancock (2004) , the relationship between students and teachers constitutes a real link marked by emotions . Researches on the place of emotions in the classroom and in the pedagogical relationship prove its importance on the academic achievement of students and in their rapport with the teacher. Although adolescents prefer a cognitive dimension of the pedagogical relationship, they likewise seek an emotional relationship with the teacher. Also according to Lafortune et al. (2004), all teachers should be convinced that the pleasure in learning is an essential condition in the success of young people. Yet beliefs

conveyed by society ensure that learning is seen as a difficult job that has nothing to do with pleasure. However, Krishnamurti (1982) argues that the pleasure of learning increases in contact with a respectful and affectionate teacher.

A study by Bouchard et al. (1997) states that, like teachers, students make a representation about what is a "good teacher" or a "bad teacher." Their judgments are based on essential elements in their learning: the relevance, effectiveness, and relationship. Humour also plays a large part in the teacher / teenager relationship. Natanson (1998) adds that some young people who have difficulty communicating with their parents see in their teachers, significant adults who are capable of listening. These young people have a great need to meet adults who love their authentic teaching profession, that is to say, a teacher who says what he thinks about the big questions and can hear the thoughts of the adolescents. They are also aware that this job is demanding and requires a lot of patience.

For Bouchard et al. (1997), effective teachers guide young people's interest. Teenagers despise teachers who come only for their pay. They also grasp that every teacher should be an expert in his field. The negative aspects experienced in the pedagogical relationship are related to teachers' attitudes. Houssaye (1992) identified two major qualities in adolescents: their mind of independence and their wisdom. They feel they have the right to dignity and respect and claim the right to speak, and to give their opinion. The author adds that the youth feel more challenged by the values. It is a minority that shows a lack of interest. The role of the teacher is not to provide a system of values exterior to the student, but to allow the student to develop his own system of values.

To conclude, Lafortune et al. (2004: 109) specify that "it is clear that education and classroom instruction should be based on a humanist foundation focused on attention, appreciation, encouragement and comfort."

2.5.3 The Development of Critical Thinking in School

Developing critical thinking remains a prerequisite for every educational action. Forming the mind of someone means to develop his intellectual abilities so that he can defend his views and convince others of their value (Bastarache and Paris , 1992). It is in this light that critical thinking occupies in the formation of the person. A growing body of information in society needs

to be analyzed and controlled to enable the individual to exercise his sense of discernment. Indeed, an information processing is imposed. Critical thinking occupies an important part of adult life and should be rooted in adolescence. Boisvert (1999) argues that the development of critical thinking is essential to protect young people against the abuse of televised images and the propaganda they will face in their lives. The competition in the school is necessary to fill gaps in students in terms of the formation of critical thinking. As denounced by Sasseville (1999), when we observe the societies in which we live, and we witness the disappearance of their entire parts (violence, murder, war, genocide, suicide, bankruptcy, separation, poverty, etc.) , we should not be surprised by the results of our education systems. Young people spend much of their life time at school. The school remains for a large part responsible for the development of critical thinking. One of the principal objectives according to Guilbert et al. (1999) remains not only the development of critical thinking among students, but also the critical thinking of teachers in the face of their practice and in the face of the requirements of the educational institution.

2.6 Recent Researches on Critical Thinking

Knowing the evolution of the students' critical thinking in the cognitive process, here is what the latest researches on critical thinking represent. One approach focuses specifically on the “how” rather than the “why”. Several studies have been conducted over the last decade in Canada (Roy , 2005; Harnadek , 1996; Lafortune , 2000; Schleifer , 1998; Piette, 2003, Daniel , 2005; Pallascio 2004 Guilbert and al , 1999) , in Europe (Ardois , 2006) and in the United States (Lee, 2006 . Delpit , 2006; Cogan, 1998) in the first, second and third cycle of primary education. In addition to that, college and university students (Boisvert, 1996, 2003 , 2005 and Therrien , 2005) collaborated to the studies on the relevance of education focused on critical thinking . However, all the above- mentioned researchers have relied on different attitudes and different approaches that have already proven with studied clienteles. The scientific community seems to favour younger or older clients to conduct researches about critical thinking. Indeed, few studies on critical thinking focused on this age group of teenagers. Finally, the goal of this research is not to highlight the cognitive process specific to the exercise of critical thinking, but rather to observe the willingness and ability of today's teens to exercise critical thinking in their daily lives. It is important to note that this research on critical thinking among teenagers is only a modest contribution to the scientific research in education.

The conceptions that teachers maintain about critical thinking represent an important consideration in the analysis of the development of critical thinking in the curriculum. Court and Francis (1993) interviewed 17 teachers from kindergarten to grade 12 on their beliefs and teaching methods regarding critical thinking. Commonalities emerged from their responses include openness, methods to promote interaction between students and focus on problem solving activities and argumentation. The authors conclude that intuitive conceptions of teachers show several characteristics of critical thinking as Beyer (1985) and others have identified. In addition, they believe that further dialogue between the school and the university could bring an informed praxis of critical thinking.

Judging the importance that the student demonstrates a predisposition and a favourable attitude towards the activities of critical thinking, Shepelak, Curry, Jackson and Moore (1992) investigated the extent to which students believed to benefit from their introductory courses to sociology in terms of critical thinking. For this purpose, a questionnaire was given at the end of each course in sociology in four classes with approaches specifically focused on the development of critical thinking. As mentioned by the authors, very little research has examined the opinions and reactions of students with regard to instructional strategies focused on the development of critical thinking. Overall, 70% of students felt they had valuable opportunities to develop their critical thinking skills and 62% believe they have developed these skills, where 16% in a substantial way; and at about the same proportion affirm greater use of critical thinking skills in the lessons and this use is, in their views, a result of courses taken in sociology with a focus on critical thinking approach. In addition, there would be no significant difference between boys and girls.

Chapter Three: Literature Review Part Two

3.1 Critical Thinking

According to Beyer (1988), the term "critical thinking" is one of the most misleading in the lexicon of thinking skills. Guilbert (1990) indicates that the definitions of critical thinking are very diverse, sometimes contradictory, and that only a few can be practical. When considering models that inspire teaching in American schools and universities, Walters (1994) denounces the design of critical thinking most often limited to logical reasoning and analysis of arguments. Johnson (1992), meanwhile, highlights five key concepts of critical thinking (those of Ennis, Lipman, McPeck, Paul and Siegel) which he considers sufficiently developed and supported by principles and arguments.

3.2 Definitions of Critical Thinking

Legendre (2005: 1024) defines critical thinking as “a thought that is applied to assess the authenticity of a thing, the value of a text, the accuracy of an argument, and the precision of data or knowledge”. In education , critical thinking appears as an " investigation whose purpose is to explore a situation, a phenomenon , a question or a problem to arrive at a hypothesis or a conclusion that integrates all available information and which can therefore be demonstrably justified . " (Legendre, 2005 : 1024). As Guilbert (1990) points out, many authors define critical thinking according to different characteristics sometimes distinct and sometimes contradictory. Since there are different meanings of critical thinking, it is necessary to describe and define this concept. Five authors Ennis, Lipman, McPeck , Paul and Siegel designated under the name of "Group of Five" , have developed rigorous elements on the concepts, principles and arguments in order to support the definition of critical thinking .

The design of Ennis (1987) implies several cognitive operations including critical thinking attitudes and includes indicators for several of the proposed dimensions. In addition, Siegel (1988) estimates that the work of Ennis on critical thinking is crucial ; Guilbert (1990) considers that the model of Ennis is an important contribution in the description of critical thinking.

Ennis (1993) defines critical thinking as “a reflective thinking which helps to choose what it is to do or believe. Ennis (1985 : 45) also defines critical thinking as "reasonable and reflective thinking focused on deciding what to believe or do." In addition, the author differs from the other four because for him the critical thinking is not limited to skills, but also includes attitudes. This is why the author is seen as a pioneer in the field. According to Norris and Ennis (1989), ‘reflective thinking’ is manifested consciousness in the search and the use of valid reasons. "Reasonable thinking “means a thought that is based on acceptable reasons to reach logical conclusions in statements or actions. ‘ Focused’ suggests an activity consciously directed towards a goal, that is to say, an activity which does not happen by accident or without a reason. ‘On deciding what to believe or do’ emphasizes that critical thinking can evaluate statements (what we believe) as well as actions (what we do) .

According to Ennis (1987), this definition involves both abilities and attitudes (dispositions). The author presents twelve abilities and sets fourteen attitudes. The detailed list of skills and attitudes proves useful in establishing targets for the development of students’ critical thinking. This helps to specify the dimensions of critical thinking that we want to focus on for a particular course addressing a specific topic.

For his part, Lipman (1995) defines critical thinking as a self-correcting thinking, this thinking requires rectifying the methods and procedures to correct the thinking and discover the weaknesses. This thinking is permeable to the context (because it must apply strict rules) and this thinking facilitates the judgment because it is based on the criteria used as a basis for comparison such as, values, models , principles , conventions, rules, objectives, policies , rules or dogmas . These criteria may represent a solid foundation in the development of judgment. This is what allows the student to “do more than just think, it is equally important that he exerts in judging well” (Lipman, 1995 : 154). Therefore, critical thinking helps one to distinguish among a wealth of information, those pieces of information proved to be the most relevant from those which are not. Critical thinking appears as a tool to counteract the opinion and the thoughtless action.

McPeck (1981: 81) defines critical thinking as "the skill and propensity to engage in an activity with reflective scepticism." For the author, critical thinking varies from one area to another. There cannot be a set of skills, abilities or general attitudes of critical thinking that can be applied

in all contexts. This is why critical thinking is not a set of general skills that are transferable. In sum, we can retain from the conception of McPeck that own knowledge of any discipline is essential for critical thinking to exert.

For Paul (1992: 9), critical thinking is "a disciplined, self-directed thinking which represents the perfection of thinking appropriate to a particular mode or domain of thought." The author focuses on three important aspects of critical thinking. First, he refers to the perfection of thinking. This dimension includes clarity, accuracy, relevance, logic, depth and congruence of purpose. In the second dimension of critical thinking, the author includes a set of characteristics such as understanding and the ability to formulate, analyze and evaluate; these are indispensable to the control of thinking. The third dimension touches the domains of thinking and must be applied to a disciplinary field or to a domain of thinking such as the concepts, the theories or schools of thought.

As for Siegel (1988: 38) "a critical thinker is a person who can act, assess claims and make judgments on the basis of reasons, and who understands and complies to the principles guiding the evaluation of the strength of these reasons". So he defines critical thinking as the ability to think in terms of principles coherently applied.

Finally , three major groups emerge throughout the work of the Group of Five (Ennis, Lipman, McPeck , Paul and Siegel) . First, critical thinking involves several thinking skills. Second, it requires information and knowledge to occur. Third, it involves an emotional dimension. The Group of Five agrees on these points, and therefore, special attention is paid on the first two convergences throughout this research.

For this research, the researcher selected two specific concepts that appear useful for the purpose of the research, those of Robert Ennis and Richard Paul. Each of these two approaches is based on principles and arguments that support the definition of critical thinking attached to it , makes reference to both ability and attitudes, and presents a consistent list of abilities and dispositions (attitudes) proper to critical thinking . While the list of Robert Ennis (1987) includes 12 skills and 14 attitudes, the list of Richard Paul and his colleagues (1989) contains 35 strategies: 9 affective strategies (which refer to attitudes) and 26 cognitive strategies (17 Macro-Abilities and

9 Micro-Skills). These two lists are presented below in Tables 1 and 2. It should be noted that they overlap on some dimensions of critical thinking and they complement each other.

3.3 Indicators of Progress of Critical Thinking in the Classroom

Ennis (1985) uses a list of indicators of progress of critical thinking in class. These indicators, consisting of capacities or intellectual skills and attitudes or predispositions allowing to assess the progression of critical thinking. The author provides a short list of interrelated elements that characterize the critical thinker. For its simplicity, this list of attitudes and interdependent abilities may be useful as part of a school program. Finally, it should also be noted that Robert Ennis is the co-author of the Cornell Critical Thinking Test, which is used in this research

Table 1: Critical Thinking Abilities and dispositions according to Ennis (1987)

Critical Thinking Abilities
1. The focus on a question 2. The analysis of arguments 3. The formulation and resolution of clarification or challenge questions 4. The evaluation of the credibility of a source 5. The observation and evaluation of observation reports 6. The development and evaluation of deductions 7. The development and evaluation of inductions 8. The formulation and evaluation of value judgments 9. The definition of terms and the evaluation of definitions 10. Identification of assumptions 11. Respect the steps of the decision process of an action 12. The interaction with others (for example, the presentation of an argument to others, either orally or in writing).
Critical Thinking Dispositions (attitudes)
1. The desire to enunciate clearly the problem or position 2. The tendency to look for reasons for phenomena 3. The propensity to provide a constant effort to be well- informed 4. The use and the mention of credible sources 5. The consideration of the overall situation 6. Maintaining attention on the main subject 7. The concern to keep in mind the initial preoccupation 8. A review of different perspectives 9. The expression of an open mind 10. The tendency to adopt a position (and change it) when the facts warrant it or when we have reasonable grounds to do so. 11. Seeking clarification when the subject permits 12. The adoption of an orderly approach when dealing with parts of a complex whole 13. The tendency to implement critical thinking skills 14. Taking into consideration the feelings of others, their level of knowledge, and their degree of intellectual maturity.

Table 2: A List of 35 Critical Thinking Strategies (Richard Paul & Contributors 1989)

A. Affective Strategies
• S-1 thinking independently
• S-2 developing insight into egocentricity or socio-centricity
• S-3 exercising fair-mindedness
• S-4 exploring thoughts underlying feelings and feelings underlying thoughts
• S-5 developing intellectual humility and suspending judgment
• S-6 developing intellectual courage
• S-7 developing intellectual good faith or integrity
• S-8 developing intellectual perseverance
• S-9 developing confidence in reason
B. Cognitive Strategies - Macro-Abilities
• S-10 refining generalizations and avoiding oversimplifications
• S-11 comparing analogous situations: transferring insights to new contexts
• S-12 developing one's perspective: creating or exploring beliefs, arguments, or theories
• S-13 clarifying issues, conclusions, or beliefs
• S-14 clarifying and analyzing the meanings of words or phrases
• S-15 developing criteria for evaluation: clarifying values and standards
• S-16 evaluating the credibility of sources of information
• S-17 questioning deeply: raising and pursuing root or significant questions
• S-18 analyzing or evaluating arguments, interpretations, beliefs, or theories
• S-19 generating or assessing solutions
• S-20 analyzing or evaluating actions or policies
• S-21 reading critically: clarifying or critiquing texts
• S-22 listening critically: the art of silent dialogue
• S-23 making interdisciplinary connections
• S-24 practicing Socratic discussion: clarifying and questioning beliefs, theories, or perspectives
• S-25 reasoning dialogically: comparing perspectives, interpretations, or theories
• S-26 reasoning dialectically: evaluating perspectives, interpretations, or theories
C. Cognitive Strategies - Micro-Skills
• S-27 comparing and contrasting ideals with actual practice
• S-28 thinking precisely about thinking: using critical vocabulary
• S-29 noting significant similarities and differences
• S-30 examining or evaluating assumptions
• S-31 distinguishing relevant from irrelevant facts
• S-32 making plausible inferences, predictions, or interpretations
• S-33 giving reasons and evaluating evidence and alleged facts
• S-34 recognizing contradictions
• S-35 exploring implications and consequences

3.4 Prerequisites to Critical Thinking: Knowledge and Judgment

The importance of having a knowledge repository for critical thinking is a very important point for some authors. Several authors (McPeck, 1981 Sheehy, 1999; Boisvert, 1999) specify that a thorough knowledge of the taught subject is an important condition of pedagogy of critical thinking. Sheehy puts particular emphasis on the importance of having a repertoire of knowledge and personal experiences to use critical thinking. For his part, Lipman (1995) instead uses the term "productive knowledge" or theories and essential ideas for students to study and organize their school subjects.

Also according to Lipman (1995) , critical thinking is a thought that facilitates the judgment since it is based on criteria used as a basis of comparison. These criteria are compelling reasons. However, the reason according to Lipman is: (1) adequate in a specific case , (2) proven , and (3) is pretty solid. With respect to the criteria on which critical thinking is exercised, the author states that anything can be criteria; but the criteria are superior to reasons and act to draw conclusions or make decisions. A criterion for the author is anything which facilitates decisively the foundation of a conclusion or the decision making. The criteria most commonly used are : (1) values accepted by all , (2) precedents and conventions , (3) common basis for comparison, (4) requirements , (5) views (6) principles , (7) rules (8) standards (9) definitions (10) facts (11) test results and finally (12) goals. This list of criteria is not exhaustive according to the author. However, they may represent a solid foundation in the development of judgment. This is what allows the student to "do more than simply think; it is equally important to exercise good judgment" (Lipman 1995 : 154).

3.5 The Cognitive and Moral Development of the Adolescent

To define the key concepts in the development of critical thinking of adolescents, it is important to question the adolescent's cognitive and moral development which encompasses the exercise of critical thinking.

Piaget (1984) identified six types of reasoning which he called "formal operations." For Piaget (1984), the adolescent is capable of deduction and judgment. It will also be an issue of moral

reasoning according to Kohlberg (1976), who adds an evaluative perspective to the formal operations of Piaget.

3.5.1 Critical Thinking in the Cognitive Development of the Adolescent according to Piaget

Most teenagers are able to perform the types of reasoning which seem previously inaccessible to them. Piaget (1963) was the first to attempt to explain this change in the thinking of adolescents. The period of formal operations emerges in adolescence, between the ages of 12 and 16 years. This period includes six features:

1. **From the concrete to the abstract**. The thinking is not limited to concrete or visible content: it can reach abstract data, hypotheses or proposals.
2. **From real to possible**. All the possibilities of a situation can be considered to mentally combine all possible relationships.
3. **Prediction of long-term consequences**: It is the ability to foresee the consequences of one's actions and start thinking about the future. It is at this point more precisely that critical thinking begins. Indeed, anticipating events requires the use of critical thinking.
4. **Systematic problem-solving**: The development of a method to solve problems. The hypothetical- deductive thinking allows the teenager to generate multiple hypotheses.
5. **Deductive logic**: The deduction allows you to find the relevance of one or more proposals.
6. **Moral Development**: Two stages correspond to the adolescence: the stage of interpersonal concordance (good boy / good girl) in early adolescence and the stage of consciousness of the social system (law and order) at the end of adolescence.

Piaget (1984) states that the first three changes in the thinking of adolescents are at the centre of a broader argument in the reasoning that he called the hypothetical- deductive reasoning ,that is to say the ability to draw conclusions from hypothetical premises . Let's see how moral reasoning develops in adolescence.

3.5.2 Critical Thinking in the Development of Moral Reasoning according to Kohlberg

Piaget provides a description of the development of formal thinking. However, it is the name of Lawrence Kohlberg (1976), who is associated with the theory of stages of moral judgment. Indeed, he was the first to introduce the practice of evaluation of moral reasoning. To do this, he presented the teenager with a series of dilemmas in the form of stories, each of which highlighted a particular moral problem. After listening to these stories, he asked the teenager a series of questions. Based on the proposed solutions, Kohlberg (1976) concluded that there exist three main levels of moral reasoning. The first level is the pre- conventional morality. The moral judgment reacts to the consequences of acts and is guided by the concepts of obedience and punishment. It may also depend on outside authorities. The second level is that of conventional morality. The judgment is based on the values and rules of the group to which the person belongs. Moreover, this self-interest gives way to an early social conscience. Finally, the third level is the post-conventional morality; the moral principles. The judgment is based on justice, individual rights and the needs of society. The action must aim for “the best for the greatest number." Thus, the principles of freedom and equality between human beings must be defended at all costs.

It is important to note that each level of morality works sequentially, that is to say the first level leads to second and the second to the third. The individual cannot regress; he can only evolve from one level to the other, if he has to evolve. In addition, the more a teenager reaches a high level of moral reasoning, the more the link with his behaviour will be narrow.

3.6 Critical Thinking Instruction

3.6.1 Some Theoretical Models

Several authors advocate a model of teaching critical thinking that takes into account many dimensions. Selman, 1989 in Court, 1991 proposed a multidimensional approach to identify exhaustively the skills, attitudes and the necessary dispositions of critical thinking. Whimbey and Sadler (1985) advocated a holistic approach where the teaching of analytical thinking is combined with that of communication. Tishman , Jay and Perkins (1993) focus on the overall

educational environment and recommend teachers to create a culture of thinking in the classroom : we must consider all the interactions in the classroom and the physical space of the room or the expectations expressed by the students.

A brief survey of the literature reveals four major theoretical models that could constitute professional practice of the teaching of critical thinking.

3.6.1.1 Metacognition

Pithers and Soden (2000) review various researches on the teaching of critical thinking they retain strategies that involve metacognition, because they seem to make students aware of their higher thinking processes, such as critical thinking. They emphasize that the teaching techniques that encourage passivity (the teacher who explains everything, who denigrates the response of the student, and who does not value new ideas or uses only questions that recall information) harm the development of critical thinking. By cons, authors suggest some teaching techniques that stimulate critical thinking. These are the techniques that encourage students:

- To think from multiple perspectives to become active in seeking information, ask relevant questions, etc. ;
- To consider knowledge as dependent from context and desire more independence in their learning;
- To systematically analyze their basic beliefs, formulate multiple hypotheses, suggest different interpretations, and make predictions, etc

They conclude, as Kuhn (1999, 2004) and Lafortune and Robertson (2005), that the strategies that encourage critical thinking have common metacognitive characteristics: students have better self-reflexive control when they can; a) make explicit their thinking and learning strategies b) make systematic reflection on their core beliefs.

3.6.1.2 Teaching by Infusion

The infusion approach appears also appropriate for every education which focuses on the development of critical thinking. Ennis (1989) presents the infusion approach as a comprehensive teaching of a subject of study in which students are encouraged to think critically

about the subject, and in which we explicit the general principles of attitudes and abilities of critical thinking. This explanation of the principles, especially by the identification and the description of the operations involved in critical thinking, encourages students to take distance in front of the subject context in which they apply these operations. This approach promotes the transfer of operations.

Smith (2003) offers a teaching approach inspired by the infusion approach of Ennis (1992). The teaching of critical thinking by infusion is intended to provide an in-depth content at the same time as making explicit the exercise of certain critical thinking skills.

3.6.1.3 Immersion

Tishman, Jay and Perkins (1993) want to show that the acquisition of critical thinking skills is insufficient if they are not accompanied by attitudes that give the flavour to practice them. The classroom should be an environment that encultures (sic) students with an exciting thought. This means that the teacher should focus on creating an environment that encourages students to ask questions, investigate, assess allegations and substantiate the claims. The immersion should take care of students' dispositions toward critical thinking and provide examples and models of critical thinkers. The Interventions of teachers can have one of the following formats: provide examples of intellectual dispositions that we wish to solicit, encourage peer interactions that involve any disposition, and teach specifically and model the chosen disposition. Students should also acquire large intellectual dispositions that promote critical thinking behaviours more broadly than strict critical skills. They generally correspond to the attitudes that promote critical thinking, such as those presented here:

- Openness and generosity of spirit,
- Curiosity and sense of observation,
- Desire to understand,
- Tendency to plan,
- Intellectual rigor,
- Tendency to evaluate the pros and cons,
- Desire to control one's own thought processes: metacognition.

3.6.1. 4 Developmental epistemology

The work of Kuhn (1999, 2004) showed the relationship between metacognition and critical thinking. However, in this work, I retain mostly of his work a developmental view of critical thinking. It distinguishes four stages of epistemological development:

1. naive realism,
2. dogmatic realism,
3. relativism,
4. the sceptical realism.

The stages reflect the student's beliefs about the reality, beliefs based on epistemic assumptions. Students feel comfortable in the first stage: the reality is accessible by the senses, and the speech is a copy. At the Second stage, they do not try the personal reflection, because the knowledge of the teacher, experts (and those who claim to be) is "facts" considered absolute and stable. In the third stage, the students rebel against the comfortable simplicity of previous levels and develop intellectual autonomy, without necessarily noticing that it might seem pretentious "everything is a matter of opinion." The final stage is much more demanding, because it furthers the quest of conscious autonomy of doubt and responsibility. The author wants to show that critical thinking is an evolutionary process, even if all students do not reach the final stages, they can advance their conceptions of reality. Teachers who adequately capture the level of students' feedback can better help them move to the next stage.

3.6.2 Teaching Strategies

Several authors are interested in the teaching strategies of critical thinking. I will present six of these strategies that might be applicable in schools.

3.6.2.1 Short Writing Tasks

It seems recognized (Tsui, 1999, 2002) that writing has a positive effect on the development of critical thinking , especially when analysis and rewriting tasks are demanded after feedback from the teacher. Meyers (1986) believes that a series of short essays shows more the quality of thought than a long essay at the end of the lesson. He privileges summaries, short series of concepts analysis tests, problem solving using the current news, simulations and case studies.

Adler (1987) focuses on the importance of the writing task on the formulation of opinions and plausible adverse positions. This put the focus only on the arguments that are worth to be defended and not holding the most indefensible or those already admitted. Moreover, Walker (2003) believes it is important that students have an emotional relationship with the writing tasks so that they feel the relevance of the cognitive data to use.

A team from Simon Fraser University (Bailin , 2002; Bailin , Case, Coombs and Daniels , 1999; Case and Daniels , 1999) has developed a set of learning resources called " critical challenges " to teach critical thinking by infusion using the subject content transmission . These authors conceive critical thinking as a normatively correct thinking which requires a constellation of resources to be used depending on the context: criteria, concepts, thinking strategies, attitudes and knowledge. The critical challenges are built from problems or controversial positions in the subject.

Bean (2001) provides a directory of 25 writing practices. For him, it is important to vary the layout and the design of problems requiring the exercise of critical thinking in the course. It is also essential to see teachers as coaches who need to consider writing as a process and not as a product. The teacher must clarify the task and provide the audience, the format, the steps and the criteria.

So it seems that the writing activities are not only expected tasks to succeed, but also to learn. Teachers must plan tasks to ensure that they exercise critical thinking dimensions previously identified. Teachers must ensure to provide short tasks, varied, meaningful to the students, using the controversies, emotionally engaging, and requiring the use of judgment.

3.6.2.2 The Design and Formulation of Complex Questions

The authors referred to in this section are concerned with the quality of the questions which the students ask and suggest activities so that students can ask in depth questions. King (1995) argues that we can teach students how to formulate challenging questions for critical thinking. These are questions that need to go beyond the facts and beyond what was presented in class. The author guides her students by providing first a list of 25 sample questions with which they generate content questions previously presented and for which they ignore the answer. The simple formulation of such questions is a metacognitive experience that encourages students to

think, because the questions used as triggers for high-level of cognitive processes. Finally, she believes that teachers should model their questions in class on these exemplary questions rather than stick to factual questions involving memory.

Browne and Freeman (2000) believe that the central feature of critical thinking is the ability and willingness to apply rational criteria to perform a systematic evaluation of reasoning. They suggest a list of questions to raise awareness of the complexity of views and to engage students in a discussion.

These are questions that encourage students to seek better conclusions than those to which they are emotionally attached. As these are questions that nobody wants to ask oneself, one should expect that students resist the controversy and do not tolerate ambiguity and doubt. It is the task of the teacher, they conclude, to ensure that the search for a judgment which is based rationally takes place in a non-threatening environment. Here's what these questions might look like:

- What are the ambiguous words and sentences?
- What are the descriptive statements and value judgments?
- What are the facts that support the proposals?
- What is the quality of the evidence?
- Are the analogies persuasive?
- What important information is not mentioned in the reasoning?
- Is there another cause that may explain the conclusion?
- Can we admit the data and conclude logically anything else ?

Yanchar and Slife (2004) present a strategy to develop critical thinking by examining core beliefs. These are beliefs that we take for granted to justify opinions and actions. According to their experience, what most interest students are the basic beliefs about the nature of reality (simple metaphysics), the limits of knowledge (elementary epistemology), the nature-nurture debate and matters of morality. Using examples and sample questions, students ask a question about the basic beliefs in relation to the major theories presented in class. At the next meeting, students should ask about the possible implications of beliefs in real life.

Savage (1998) points out that asking questions is always the best teaching strategy to encourage the exercise of critical thinking by students. However, a search by the U.S. Department of Education (USDOE, 1986 in Savage, 1998) shows that between 70% and 80 % of the questions focused on recalling facts. The author has developed training workshops to teach teachers how to ask questions requiring higher order thinking skills.

Teachers naturally ask questions in class; they must also teach students how to ask questions that appeal to the requirements of critical thinking. Teachers must realize that the questions are not all at higher level, they can start by modelling the students' questions and then ask questions that lead to evaluate judgments, they can also teach techniques of Socratic questions and question students on their core beliefs.

3.6.2.3 Debate and Discussion

Debates and discussion are often considered the usual methods to advance thinking and reflection. They are spontaneous and regular educational interventions for teachers. A study by Tsui (2002) shows that the class discussions are essential to develop critical thinking. Walker (2003), reports that the tension from the confrontation between two arguments in a debate stimulates critical thinking, and after a certain time, students are more comfortable to find arguments for and against a controversial topic.

3.6.2.4 Argumentation Schemas

For Twardy (2004) and van Gelder (2001 2005) , critical thinking manifests itself mainly in the analysis of arguments that support truth or falsity . Van Gelder has developed software named Reason/Able in order to help to visually represent an argument as a structured organization around the arguments, objections and conclusions. The software presents the explicit structure of reasoning in a graphical environment, rather than in a usual linear sequence. The software is designed for practicing general reasoning skills, generate the missing arguments and highlight the criteria for evaluating the arguments and objections. However, Twardy (2004) concludes with a caveat: providing frequent feedback to students' schemas adds a constraint to the burden of corrections. So one might think that students would use this tool to evaluate themselves more, we observe that they do not do as they do not have to submit a marked work.

3.6.2.5 Case Studies

Herreid (2004) believes that critical thinking is reflected in the ability to argue and challenge yourself. We should therefore enhance the sceptic reactions, that is to say a 'standby' continuously in the mode of inquiry and research of facts, data and evidence. These are the elements of critical thinking that can be developed using case studies. The author has developed a method of fragmented case study that resembles an authentic scientific activity, on the model of what the scientists do in the field: working with incomplete data, formulating hypotheses, collecting other information, reviewing hypotheses, and raising more data, etc.

3.6.2.6 An Exercise in Personal Growth

Hole (1991) experienced a pedagogical strategy that uses critical thinking as a tool to support a desired change in his personal life. He maintains that critical thinking should stimulate genuine philosophical reflection on his own life, and not just in school context. He demonstrates that we inevitably come to big philosophical questions when we want to deepen the issues of self-knowledge. And finally, he uses this experience about himself as a pretext to reflect on the limits of critical thinking (resistance to questioning, confrontation with the basic beliefs, anxiety generated by the opposition with authority or tradition, awareness of his ignorance, discomfort of doubts... etc). This experience makes students aware of the risk of two common reactions facing these challenges: the relativism and the nihilism.

3.7 The Assessment of Critical Thinking

The instruments of measure and data collection on critical thinking vary on a quantitative / qualitative continuum. A writer such as Facione (1986) believes it is possible to test the critical thinking skills among very big groups using auto-correction instruments. Others, such as Marzano and Costa (1988), believe that this is not possible, and advocate the use of qualitative assessment techniques. Ennis (1993) considers that the multiple choice tests do not directly and efficiently evaluate several important aspects of thinking, such as the openness of mind and the ability to draw based conclusions cautiously. The author recommends the use of techniques that give the opportunity for individuals to provide elaborate and personal answers.

3.7.1 Tests of Critical Thinking

The critical thinking test that the researcher selected for the purpose of this research is one of the most recognized tests in the field because it covers as whole core abilities that can be linked to critical thinking. Below is a description of this test with its two versions.

3.7.1.1 Cornell Critical Thinking Test

The multiple choice Cornell Critical Thinking Test (Ennis, Millman and Tomko, 1985) is based on the conception of critical thinking according to Ennis. This test covers most of the abilities put forward in this design which, however, does not address any attitude of critical thinking. There are two versions.

3.7.1.1.1 Cornell Critical Thinking Test (Version X)

The version X of the test is designed for students aged 9 to 18 years. It includes 71 items divided into four sections : induction (judging whether a fact supports a hypothesis) , credibility of a source (judging the credibility of observation reports) , deduction (deciding what follows) and identification of assumptions (judging what is assumed in an argument) . Ennis, Millman and Tomko (1985) reported a reliability coefficient between 67 and 90 for the test, a rate which indicates that an individual should achieve substantially the same results if he passed the test several times. These authors discuss the subject of the validity of the test in the manual: the relevance of test content is discussed and empirical research on the test is reported, including correlations with other variables, factor analyzes of the tests results, and the results of experimental studies on critical thinking. Norris (1986) finds the first part of the test problematic because the judgment on the evidence may legitimately vary according to the different assumptions: therefore he urges caution in the interpretation of this section and also suggests, to ask students to think aloud when choosing their answers in this section, in order to distinguish their assumptions.

3.7.1.1.2 Cornell Critical Thinking Test (Version Z)

The version Z of the test is for gifted students aged 12 to 18 years, as well as students over 18 years and other adults. It includes 52 items and is divided into seven sections. Section 1 (deduction) refers to the ability to judge whether a given conclusion necessarily follows from the

premises, contradicts or does not match any of the two possibilities. Section 2 (semantics) refers to the ability to explain a faulty reasoning and in relation to more verbal and linguistic aspects of the argument. Section 3 (credibility) involves the ability to judge the credibility of statements. Section 4 (induction) includes items related to the ability to judge whether the information contained in items supports the conclusion, invalidates or does not match any of the two possibilities . Section 5 (prediction in planning experiments) refers to the ability to assess the best prediction of the three presented to each of the items. Section 6 (recognition of definitions) involves, for each of the items, the ability to assess the best definition of a word among the three proposed. Section 7 (identification of assumptions) is to assess the ability to identify what is implicit in the reasoning (Ennis, Millman and Tomko, 1985). The time allotted to take the test is 50 minutes.

Ennis, Millman and Tomko (1985) reported a reliability coefficient between 50 and 77 for the version Z of the test , a test whose results are relatively constant for an individual who passes it several times . Similarly to the version X, the authors address the issue of the validity of the test in the manual considering the same aspects. They point out that, even if the dimensions of critical thinking are presented in seven separate sections, there are many overlaps and a marked interdependence between these dimensions in the real process of critical thinking. They also recommend caution in the interpretation of test results. Norris (1986), meanwhile, has reservations about several sections of the test, which seems too short for him to properly assess the targeted ability , mainly sections 3 (the credibility of a source), 5 (prediction in planning experiments) and 6 (recognition of definitions) which includes only four items each.

3.7.1.2 Ennis-Weir Critical Thinking Essay Test

Ennis and Weir (1985) developed a test in the form of an essay to produce: the Ennis-Weir Critical Thinking Essay Test. This test is for students from about 12 to 18 years. It gives the students a fictional letter addressed to the editor of a newspaper, where the author tries to convince the reader, in eight numbered paragraphs that overnight parking should be prohibited in all city streets. Students have 10 minutes to read this letter and then have 30 minutes to answer in nine paragraphs. The text they write should make a judgment on the arguments and the quality of thought as reflected in each of the eight sections of the initial letter, to which they have to add a ninth overall evaluation paragraph.

This test seeks to measure the students' attitudes and abilities of critical thinking, such as: identifying the issue, revealing the reasons and assumptions, stating one's point of view, giving good reasons, considering other possibilities and responding appropriately to the excessive generalization, excessive scepticism and the use of emotive language in order to persuade. Two features distinguish the Ennis- Weir test from other tests which assess critical thinking in a holistic way: unlike the multiple-choice tests, Ennis- Weir test takes the form of an essay to write and takes into account both attitudes and abilities. In terms of content validity, Ennis and Weir (1985) argue that the test is a typical situation in which the ability to grasp and formulate arguments occurs.

Chapter Four: Methodology

4.1 Setting

This research study took place at five schools in the Emirate of Dubai in the United Arab Emirates. The schools selected for this study were all private schools which offer different international curricula. These curricula are: (IB), US, and UK. All the students who participated in the study were in grade 12. The critical thinking test was administered during the middle of term two of the academic year. The academic year of all schools that participated in the study start from early September and runs to mid of June.

4.1.1 Site A

Site A was a private school that offers US Curriculum that is aligned to the Connecticut Standards. The school has a vision of producing a generation of students who are heritage guardians and global thinkers. The school was accredited by the New England Association of Schools and Colleges (NEASC). At the time of my visit, more than 1900 students from kindergarten to grade 12 were enrolled in the school, with 94 students in grade 12 (52 boys and 42 girls). All these students are required to take English, Math, Chemistry, Physics, Biology, Accounting, Business, Economics, ICT, Arabic, Islamic Studies, in addition to Art and Physical Education. There were no optional courses at this site. A number of students across all phases took external examinations such as the Measures of Academic Progress (MAP), SAT, ACER (IBT), and IOWA. The fees to attend this school is 33701.00 AED per year in Grade 12 (KHDA 2013).

4.1.2 Site B

Site B was a private school offering the English National Curriculum to students from foundation stage to post 16. The school has a vision of helping students become the best versions of themselves. The school offers a number of courses leading to GCSE in year 11 and A-level in the sixth form. More than 1000 students, aged three to 18 years were enrolled in the school, with 54 in year 13 which is the last year in secondary education. The students in year 13 sit either for 3 or 4 A levels which are selected from a menu of 21 options. The choice is almost free depending on it fitting with the school option blocks and then having had sufficient success at year 11 to pass

their GCSE examinations. Most subjects require a minimum of a B at GCSE but some require an A (Mathematics and the Sciences). Subjects of high demand (previously mentioned plus Business and Economics) are very competitive for entry as places are limited to 15 per group reported the depute principal. The full list of subjects offered by the school include the following: Arabic, Art, Biology, Business Studies, Chemistry, Computing, Drama, Economics, English Language, English Literature, French, Geography, History, Mathematics, Media Studies, Music, Physical Education, Physics, Psychology, Sociology and Travel & Tourism. Students also take a number of different examinations at the end of key stages. Students in grade 12 pay 53107.00 AED as an annual fee (KHDA 2013).

4.1.3 Site C

Site C was a private school which offers US curriculum that is newly aligned to the Common Core State Standards in Mathematics and English and has recently adopted the Next Generation Science Standards for the Sciences. The school has a vision of ensuring students are global, accountable, thriving, and creative nationals, who are skilful to accomplish autonomously. More than 700 students from kindergarten to grade 12 were enrolled in the school, with 36 students in grade 12 (13 girls and 20 boys). All students in grade 12 are required to take the following subjects: Arabic Language, English, Mathematics, Sciences (Biology, Chemistry, and Physics), Islamic Studies, Business and Economics, ICT, Art, and Physical Education. A number of students take SAT and TOEFL courses in preparation for admission in universities. The students in grade 12 pay 18751.00 AED as an annual fee (KHDA 2013).

4.1.4 Site D

Site D was a multicultural private school that has students from more than 80 different countries. The school offers the IB PYP program in primary and the IB diploma program in all other phases in the school. The school has a vision of providing students with opportunities to reach their full potential as lifelong learners and to develop globally minded people. The school offers the IBDP (The International Baccalaureate's Diploma Program) to students in grade 11 and 12. The IBDP, which is considered a pre-university course, is approved around the world as a qualification for university admission. The school offers students two different options: the IB Diploma and the IB Courses. Students must make their choice when they are in grade 10. IB Diploma students

must choose six subjects-three must be at higher level whereas IB Courses students must choose six subjects, each at either level. The list of options include: English Language and Literature, Arabic, French, Spanish, Business and Management, Geography, History, Information and Technology in a Global Society (ITGS), Biology, Chemistry, Physics, and Visual Arts. Students sit for the International General Certificate of Secondary Education (IGCSE) and the IB Diploma. More than 1600 students from kindergarten to grade 12 are enrolled in the school. Students at grade 12 pay 731500.00 AED as an annual fee (KHDA 2013).

4.1.5 Site E

Site E was a private school that offers a US curriculum that is aligned to the Common Core State Standards for Mathematics and English and to Connecticut Standards for Science. The school has a vision of establishing high standards of students' learning that would create global learners and thinkers. At the time of my visit there were 1770 students aged between 3 to 18 years. There were 85 students in grade 12 (45 boys and 40 girls). Students in grade 12 take a number subjects including Arabic, English, Math, Biology, Physics, Chemistry, Islamic Studies, Business, Economics, ICT, Art, and Physical Education. There was an optional language course for these students in addition to some Advanced Placement courses. Since the school is aligned to US Standards, students take US assessments such as Iowa. Students also sit for some external examinations such as SAT and TOEFL. Students at grade 12 pay 34042.00 AED as an annual fee (KHDA 2013).

4.2 Participants

The participants were 5 groups of 20 students from different private schools in Dubai. All students were in grade 12, and in the UK curriculum school, students were in year 13 which is their last year in secondary education and in school. The participants studied in different schools that offer different school curricula; US curriculum that is aligned to Connecticut Standards in site A, UK curriculum aligned to the English National Standards in site B, US curriculum that is aligned to CCSS and NGSS in site C, IB curriculum in site D, and another US curriculum that is aligned to CCSS and Connecticut Standards in site E.

The researcher contacted the sites via emails first then physically visited the schools to meet either the principal, vice-principal, or the head of secondary. In every visit, the researcher

presented the permission letter from the university in addition to a letter detailing the study and its purpose (see Appendix A and Appendix B). Furthermore, the researcher presented each school with assent forms and consent forms to be distributed to students who would like to participate in the research (see Appendix C and Appendix D). After agreeing on a specific date for the test, the researcher had to visit each site one day or two days prior to the date of the test in order to install the test software in the schools' lab and to generate user names and passwords for every participant.

4.3 Demographic Data Collection

The researcher adopted a demographic questionnaire used by Walter (2009) to be completed by the participants (See Appendix E). This voluntary questionnaire asked students for information about their GPA, gender, native language, parents' educational background, family income, and scores of some benchmarked tests such as SAT and TOEFL. All participants completed the questionnaire after they had finished the CCTT. Data collected from the questionnaires is discussed below.

4.3.1 Demographic Considerations

Table (3) shows gender, native language, parents' education, and family income. The calculations within Table 3, *Breakdown of Categorical Variables across Groups*, provide indication that the variables contained within the collated data are indicative of a substantial difference in demographical data analysis that serves to inform this research. Within this, it is evident that a wide variance in the participant demographic has been utilised in order to inform the findings of this research. This is particularly the case in relation to family income where although the broad consensus consists of those families whose incomes lie within the 101k to 200k brackets, that this group can potentially utilised as a control for this research emphasizing changes within the other income brackets. Similarly, where drilling down takes place, a number of other assessments can take place, most noticeably in relation to the traditional male and female ratios where the ration between the two correlates is low. However the largest differential is in relation to family income where it can be evidenced that significant variable exists, although this outcome alters slightly when the 'don't knows' are removed from the equation. However in terms of critical thinking and the utility of generational knowledge end educational status is

considered it is apparent that parental educational levels will play a significant role in the findings of this research, particularly in relation to adolescent developmental attitudes. However it is to be noted that the hypothesis that this research is based upon largely relies upon levels of subjectivity, as discussed earlier in this paper. Yet the utility of using five different demographic samples for the basis of this research allows for a narrowing of the focus of this research to those learners who reside within a particular demographic trait. Essentially these are students who predominately speak Arabic as a native language, whose parents had received university education and who earn between 100k and 200k per annum. It is this cohort that forms the basis for this research and where other differences invariables can be assessed where alternate theories and hypotheses are tested. These demographics, therefore, are utilised within this research and where it is conceivable that subsequent tested and findings of critical thinking levels of those learners who reside outside of this mainstay framework can be utilised as comparisons for an overall assessment for this research. That said, however, there are several notes of caution.

Firstly, due to the small sampling group used for this research that findings cannot be applied universally and secondly, that scores gained in the area of language are not complete since there were singular aspects of learners whose mother tongue was not utilised for this research. As such, this particular score is not completely representative of the participant sampling used for this research. So, less weight can be placed upon scores that utilise language as a basis for any hypothesis. Indeed, it is for this reason that two different scores were utilised for assessments relating to income, since there was an element of no scoring.

Table (3) Breakdown of Categorical Variables across Groups

		Site A	Site B	Site C	Site D	Site E	P
Gender	Males	**9**	**14**	**7**	**10**	**9**	**Chi Sq: 4.611**
	Females	**10**	**6**	**12**	**10**	**10**	**P value: 0.32958788**
							Df: 4
Native Language	English	**1**	**15**	**0**	**7**	**0**	**Chi Sq: 72. 36**
	Arabic	**18**	**1**	**16**	**8**	**19**	**P value: 0**
	Urdu	**0**	**4**	**0**	**1**	**0**	**Df: 16**
	Farsi	**0**	**0**	**3**	**1**	**0**	
	German				**3**		
Parental Education	High School	**0**	**4**	**6**	**0**	**3**	**Chi Sq: 25.616**
	BA, BS, etc.	**11**	**8**	**7**	**7**	**12**	**P value: 0.01215896**
	MA, MBA, etc.	**7**	**8**	**4**	**11**	**1**	**Df: 12**
	PhD, MD, etc.	**1**	**0**	**2**	**2**	**3**	
Family Income	Less than50K	**0**	**0**	**6**	**0**	**0**	**Chi Sq**: **84.24**
	50K - 100K	**0**	**2**	**9**	**0**	**0**	**P value: 0**
							Df: 16
	101K- 200K	**14**	**13**	**2**	**7**	**12**	**With I/D/K taken out:**
	Above 200K	**4**	**2**	**2**	**13**	**5**	**Chi sq: 74.938**
	I don't know	**1**	**3**	**0**	**0**	**2**	**P value: 0 Df : 12**

Chi square calculations seek to identify the correlations and distributions between a number of calculable items and compare them against probability. Within the above calculation, the demographics were compared with the school systems (the sites) and calculations were based upon the responses given. The terminology is thus:

Df (Degrees of freedom): is the numbers of possible scores (in this case, responses). Within the test field of male and female rations there were 97 responses but there can only be two outcomes (male and female) but spread across 5 locations (less 1 for the calculation).

P (probability): The closer to 0, the lower the probability of differentials however the highest score can only be 1. The differential in the male/female ration (based upon 50/50 but spread

across 5 sites) results in a probability that a student will be either male of female of less than half.

Chi Square Value: This score falls between 0 and infinity and the score represents the probability that the final value will fall between 0 and infinity. In the case of male/female rations, the value is indicative of the possibility of male female ratio but across the five sites.

Table 4 below shows the means of SAT scores, years at current school, and GPA, with standard deviation between parentheses. Furthermore, and to verify the comparability of the sites, a series of one-way ANOVA was conducted.

Table (4) Breakdown of Continuous Variables across Groups

	Site A	**Site B**	**Site C**	**Site D**	**Site E**
Mean SAT	1695 (151.85)	/	1440 (215.91)	1684 (245.39)	1664(230.71)
Years at current School	10.20 (4.34)	5.95 (2.70)	6.57 (3.93)	4.65 (1.75)	10.15 (4.37)
Mean GPA	3.82 (0.414)	/	2.59 (0.461)	3.6 (0.343)	3.55 (0.645)

While Site B SAT scores were not available, Site A, B, and E were close to equivalent in term of SAT scores. Site C scored significantly lower than the previous ones, $F(3, 73) = 6.097$, $p = 0.001$. With the exception of Site A and E, years of attendance at current school differ significantly between schools. Years of enrolment is close to equivalent between Site A and E and is higher than the other sites, $F(4, 92) = 9.910$, and $p = 0.000$. GPA scores did not differ much between Site A, D, and E, and here again Site C scored the lowest GPA mean, $F(3, 73) = 44.96$, with p-level= 0.000. Table (5) shows a complete one-way analysis of variance. This includes the sum of squares (SS), degrees of freedom (df), mean squares (MS), F ratio, and p-values.

Table (5) One way ANOVA summary of continuous variables

Mean SAT					
	SS	**df**	**MS**	**F**	**p**
Between	840,988.857	3	280,329.619	6.097	0.001
Within	3,356,356.574	73	45,977.487		
Total	4,197,345.432	76			
Years at Current School					
	SS	**df**	**MS**	**F**	**p**
Between	498.704	4	124.676	9.910	0.000
Within	1,157.491	92	12.581		
Total	1,656.195	96			
Mean GPA					
	SS	**df**	**MS**	**F**	**p**
Between	17.041	4	5.680	44.965	0.000
Within	9.222	73	0.126		
Total	26.263	76			

4.4 Instrument

The version X of the Cornell Critical Thinking test was the instrument used in the study in order to measure students' critical thinking skills. To get the instrument, the researcher contacted The Critical Thinking Company via email (See Appendix F) and then a series of phones calls were made with the Vice President of the company to ask about the software that the researcher would like to purchase. And in order to receive the software which is on a CD in no time and to avoid any delay, the researcher used the mail address of her supervisor to ensure the test will reach safely and quickly. (See Appendix G for the invoice and Appendix H for Network License Agreement.)

The Cornell Critical Thinking Test, level X was created by Ennis, Millman, and Tomko (1985) and includes 71 multiple choice questions divided into four sections : induction (judging whether a fact supports a hypothesis) , credibility of a source (judging the credibility of

observation reports) , deduction (deciding what follows) and identification of assumptions (judging what is assumed in an argument). Five sample questions are provided to students. Fawkes (2005 cited in Manes 2013), argues that this test was independently owned and marketed and not only did it test critical thinking skills, it determined what critical thinking skills were and defined them. Ennis, Millman and Tomko (1985) reported a reliability coefficient between 67 and 90 for the test , a rate which indicates that an individual should achieve substantially the same results if he passed the test several times. An electronic-based format of the test was used as opposed to paper-based format.

4.5 Design and Procedures

This quantitative study consisted of four groups of students in unlike school curricula. The study used one test of critical thinking, which is the Cornell Critical Thinking Test, version X. The outcomes of the test are used as variables in statistical analyses. The independent variable was the curriculum in which the students are enrolled: US, UK, and IB, whereas the dependent variable was the 71 questions of the Cornell Critical Thinking Test, which represent four sub-skills: induction, deduction, credibility, and identification of assumption.

Features of critical thinking ability intentionally integrated in the CCTT are described below, along with the numbers of questions intended to add to the testing of each aspect of the test. Despite the fact that aspects of critical thinking are listed separately, they overlap and there is interdependence among these aspects in the practice of critical thinking. (Ennis et al. 2005)

4.5.1 Deduction

Ennis (2005) describes deduction as the ability to extract information in order to form a sound conclusion. The American Heritage Dictionary defines deduction as "the process of reasoning in which a conclusion follows necessarily from the stated premises; inference by reasoning from the general to the specific". Furthermore, the Internet Encyclopaedia of Philosophy (IEP) states that "a deductive argument is an argument that is intended by the arguer to be (deductively) valid, that is, to provide a guarantee of the truth of the conclusion provided that the argument's premises (assumptions) are true." Deduction is tested through items 52 to 65 and 67

to 76 from the CCTT. These are items are to a large extent unemotionally loaded, but they can be interpreted in everyday language. (Ennis et al. 2005)

4.5.2 Induction

The American Heritage Dictionary states that induction is "the process of deriving general principles from particular facts or instances". Moreover, the Internet Encyclopaedia of Philosophy (IEP) states that "an inductive argument is an argument that is intended by the arguer merely to establish or increase the probability of its conclusion. In an inductive argument, the premises are intended only to be so strong that, if they were true, then it would be unlikely that the conclusion is false". Items from 3 to 25, in addition to items 48, and 50 are intended to test the skill of induction. Ennis et al. (2005) states that "support for a hypothesis comes from its ability to explain facts, from facts that are inconsistent with the competitors of the hypothesis, from things that support the general plausibility of the hypothesis, and from information that is in conflict with things that might weaken the support for a hypothesis".

4.5.3 Credibility

Ennis et al (2005) states that "judgments about credibility are judgments about whether, and to what extent, to believe someone else's assertion, usually in a situation in which the judger has no direct access to the basis for the assertion." Credibility is assessed through items 27 to 50.

4.5.4 Identification of Assumptions

Ennis (2005) assumes that identification of assumptions is related to the ability to identify when a conclusion has been made without sufficient information. Furthermore, Ennis (2005) states that "one basic criterion for an assumption is that it fills a gap in the reasoning". In every element of this part of the test, one statement fills the gap more entirely than the other two (Ennis et al. 2005). Items from 67 to 76 are intended to test the skill of identification of assumptions. As we noticed, the same items that test assumption identification are also listed in under deduction for deduction is helpful in identifying probable candidates for an assumption in a specified line of reasoning. (Ennis et al, 2005)

4.6 Test Administration

To answer the research questions, all participants took the same test once. The Cornell Critical Thinking Test was administered in a 50 minutes class period during a school day in the second term of the academic year.

In every site, the researcher was present in the computer lab where students took the test. Before starting the test, the researcher introduced herself to the students, clarified briefly the purpose of her study, and gave some details about the CCTT, including the duration of the test, the number of the sections, the number of the questions, and any relevant information that would ensure the smoothness of the test. During this time, students' questions were answered. Participants were urged to be cautious while interpreting any section of the test, and to think aloud when choosing their answers. After setting the stage, each participant was given a link, a username, and a password created earlier by the researcher in order to access the test.

In Site B and D, both boys and girls took the test together at the same time at the same computer lab, whereas in Site A, C, and E girls took the test separately without boys, and once girls finished the test and left the computer lab, boys came to the same computer lab and answered the test. This procedure is part of the schools policy where students are segregated by gender starting from grade 4 in Site C and grade 5 in Site A and E.

The CCTT level X is a timed test with maximum time of 50 minutes. Participants at each site finished the test at varying periods of time. Table (4) shows the minimum, maximum, and mean time of test completion at each site.

Table 5: Test Completion Time

Site	Minimum Time	Maximum Time	Mean Time
Site A	31 min	49 min	38 min
Site B	19 min	44 min	34 min
Site C	28 min	49 min	38 min
Site D	10 min	47 min	28 min
Site E	28 min	49 min	40 min

Upon completion of the test, participants could see their final score on the same computer they were solving in. In addition to a general score, scores by sections were also accessible to each participant. At the end of the test, the researcher thanked the participants and generated the test reports for the data analysis.

4.7 Ethical Considerations

At the very basis of any research is the moral imperative of respect for human dignity. This fundamental value follows a series of ethical principles which are respect for vulnerable persons, respect for privacy and personal information, respect for justice and the principle of integration. At the professional practice of research, these principles are subject to very specific rules of conduct, including the free and informed consent, the balance of advantages and disadvantages, minimizing harm and maximizing benefits. As such , ethics should not be seen as a constraint, but rather as dynamic lighting aiming to guide and support the accountable exercise of professional judgment and thus to promote the quality of research.

Ethics can be defined as a rigorous reflection on human action, aiming to raise questions about the purpose of the actions, on the reasons and values that motivate the choices and their likely consequences, in a way to guide decisions that are respectful of human dignity. In other words, ethics allows evaluating decisions in relation to values underlying any research project. Thus, in daily practice, every researcher should be able to engage in such reflection.

While doing this research, the researcher adhered to the ethic of respect which implied many duties. The researcher used a parent consent form and student assent form to address the participants and their parents (see Appendix C & D). Both forms contain information about the researcher including her contact details, and the purpose of the study. Parent consent form also included information about the procedures of the test, risks & discomforts, benefits, costs, and consent. The researcher gave both forms to every school principal, in some sites, to the vice-principal. The latter distributed the forms to students who are willing to participate in the research. Forms were later collected by school administration.

Furthermore, the researcher has made it clear in the consent form to participants and their parents that withdrawing from the research at any time either for a reason or no reason is completely acceptable. Also, before starting the test, participants were informed that they can stop answering

the test, or leave a question unanswered if they wish to. Results from the test have shown that some participants have left some questions unanswered but no participant withdrew from the research.

Moreover, in order to encourage participants to participate in the study, the researcher used the incentive of providing every participant with detailed report of his or her results in the CCTT. The report includes the general score in the test, score by skill, score by section, the number of right, wrong and unanswered questions.

The researched assured that all participants' data will be treated with confidentiality and anonymity and guaranteed that no names will appear in the research. Every student was presented by a number and each school was presented by a letter.

4.8 Data analysis

When assessing student scores against the Connell Critical Thinking Test, students at site A achieved scores that were lower than expected considering that their demographic indicated that these are students who predominately speak Arabic as a native language, whose parents had received university education and who earn between $100k and 200k per annum. However the site that achieved the greatest scores in term of average completion time was site D which is utilised by international students as a preparatory tool for progression towards university. Within this site there is a clear emphasis on the development of critical thinking as part of the development of the person in order to achieve one's full potential. The responses, therefore, that suggests that these students were able to achieve an increased cognitive ability through increased neurological speed processing in indicative of an approach that serves to advance the mental wellbeing of this cohort. It is also evident that as a result of this focus to cognitive speed and agility that actual intellect has not been developed sufficiently for those learners to further advance their critical thinking skills. This is a clear failing on their part, particularly when compared against those of Site A, whose overall scores were higher. Site A, however, has a different educational ethos. It seeks to develop the whole person and utilises a global perspective on both educational and human development. Indeed, within this particular establishment it is noted that the average time spent at this educational institute is far greater than those others that have been utilised for this study and the researcher believes that this factor has played a part in the outcomes achieves for this study. This is particularly the case when it is realised that the time

spent at any educational establishment has a positive impact upon those scholars who attend, particularly if it is based upon a progressive ethos, as is the case with the globalised perspective that is evidenced here. However it is difficult to assess the correlations between the different and divergent aspects of these tests results, based upon scores alone. A further aspect to consider is the utility of different thinking skills as evidenced by a comparison of GPA and Cornell Critical Thinking Test scores.

4.9 Method of Data Analysis

An analysis of variance (ANOVA) was performed to observe differences between mean group scores in total points on the CCTT. The means and the standard deviations in brackets are shown below in table 6. As table 6 shows, Site A which follows and American curriculum aligned to Connecticut Standards scored the highest, followed by site B which is a school that follows the English National Curriculum. The IB group represented by site D came fourth and did not differ highly from site E which came third and is an American curriculum school aligned to Connecticut Standards. All the sites mentioned previously scored significantly higher than site C, which is an American Curriculum school that is newly aligned to CCSS.

By looking at the standard deviation, we can see that the scores have similar variance. This implies that the set of data assumes homogeneity of variance which is necessary condition to run ANOVA Test.

Table 7: Total point scored on CCTT by site

	Site A	**Site B**	**Site C**	**Site D**	**Site E**
Total Score	65 (10.55451)	63 (14.08583)	45 (10.40412)	57 (13.73)	59 (10.68)

One-Way ANOVA Summary Data

The one-way analysis of variance (ANOVA) below shows sums of squares (SS), degrees of freedom (df), mean squares (MS), and F and p-values among Sites in term of total point scored on CCTT. Table 8 below shows that the SS and MS for between group variation is 4,678.68 and 1,169.67 respectively with F (4, 92) = 8.06 and p-value= 0.000. Furthermore, the SS and MS for within group variation appear to be 13,358.22 and 145.20 respectively. Therefore it could be concluded that these results are highly significant ($p< 0.01$). Such an F ratio with a size (8.6) would not occur in reality if the adopted curriculum has no effect. However, it is to be noted that cut-off point of 0.05 is considered to be "the criterion for statistical significance" (Field, 2009. p 383) in this study.

Table 8: One-Way ANOVA Summary Data

	SS	df	MS	F	P
Between	4,678.680	4	1,169.670	8.056	0.000
Within	13,358.224	92	145.198		
Total	18,036.904	96			

Table 9: Score by Skill on CCTT

	Site A	Site B	Site C	Site D	Site E
Induction	65 (13.4558)	67 (14.53707)	54 (12.6639)	61 (16.73446)	66 (15.28214)
Deduction	70 (13.77132)	66 (17.0885)	41 (13.53747)	59 (17.90883)	60 (13.8336)
Credibility	62 (13.83635)	56 (14.29092)	50 (14.28797)	53 (14.16222)	55 (11.21142)
Assumptions	56 (20.60486)	53 (22.02869)	27 (13.26738)	49 (21.74009)	45 (14.66986)

As table 9 shows and in a comparison of accumulative scores per educational institution, it is evident that the scores attained by School A are in line with expectations. Here, the average scores attained across all four skills were the highest across aside from one are, induction, which in all fairness the result would have easily resided within a margin of error. The scores attained here are consistent with the academic aspirations of student and parent as well as the school itself

(these are discussed in more detail later in this paper). However at the other end of this spectrum is school C whose scores were consistently the lowest. Here, for example the average score for assumption was recorded at lower than half of the highest, School A. This aside, it is noted that all schools recorded their lowest scores within the assumption test however the aspirations of school C and that of its cohort are indicative of a school that is largely failing to develop its learners in line with accepted philosophical ideals of education and are not preparing the learners for benefitting the wider world on adulthood. Underpinning this particular perspective, as well as that of each of the other schools, in terms of recording scores and averages for comparisons are the assessment and curricular criteria and their aims. This next chapter provides for a greater analysis of the underlying reasons as to why the Cornell scores returned such different results.

A second series of ANOVAs were conducted to examine differences in skills on the CCTT.

Induction

	SS	df	MS	F	P
Between	2,172.639	4	543.160	2.538	0.045
Within	19,685.485	92	213.973		
Total	21,858.124	96			

Scores on induction differ across Sites. SS and MS for between groups are 2,172.64 and 543.16 respectively and SS and MS within group are 19, 685.49 and 213.97 respectively. The F (4, 92) = 2.54 with p-value = 0.045 is significant and implies that scores on induction differ across Sites suggesting significant effects of curriculum on students' scores on induction.

Deduction

	SS	df	MS	F	P
Between	9,447.031	4	2,361.758	9.967	0.000
Within	21,799.108	92	236.947		
Total	31,246.139	96			

Scores on deduction differ highly across Sites. SS and MS for between groups are 9,447.03 and 2,361.76 respectively and SS and MS within group are 21,799.11 and 236.95 respectively. The F (4, 92) = 9.967 with p-value = 0.000 is highly significant and implies that scores on deduction differ significantly across Sites.

Credibility

	SS	df	MS	F	P
Between	1,502.660	4	375.665	2.025	0.097
Within:	17,068.818	92	185.531		
Total:	18,571.478	96			

Scores on credibility did not differ much between groups. SS and MS for between groups are 1,502.66 and 375.66 respectively and SS and MS within group are 17,068.82 and 185.53 respectively. The F (4, 92) = 9.967 with p-value = 0.097 is not significant because p> 0.05 implying that variation of scores on credibility is insignificant where it could be included that there is 90% likelihood that the results were obtained by chance.

Assumptions

	SS	df	MS	F	P
Between:	9,936.969	4	2,484.242	6.950	0.000
Within:	32,883.927	92	357.434		
Total:	42,820.896	96			

Scores on identification of assumption differ highly across Sites. SS and MS for between groups are 9,936.97 and 2,484.24 respectively and SS and MS within group are 32,883.93 and 357.43 respectively. The F (4, 92) = 6.95 with p-value = 0.000 is highly significant and implies that scores on identification of assumption differ significantly across Sites.

Chapter Five: Findings & Discussion

5.1 Introduction

This discussion section considers the possibilities that have led to a number of divergent results from the testing and resultant scores that arose out of the research and analysis if the same within the previous chapter. Earlier in this paper it was noted that Ennis (2005) argued a perspective that stated "one basic criterion for an assumption is that it fills a gap in the reasoning". Here, it has been discovered that grade 12 students enrolled in different school curricula score widely different scores on the Connell Critical Thinking Test. That there are a number of differences in critical thinking skills between those students who are enrolled on different school curricula that is sourced from the USA, the UK and on the International Baccalaureate curricula. And that a number of observational relationships could be evidenced between students' GPA and scores in the Connell Critical Thinking Test when compared to a number of variable factors that included retuned SAT scores. However, the main difference is where a number of demographic variables were present that provided evidence that impacted considerably affecting students' critical thinking skills. This Chapter looks at the underlying causal factors of these divergent responses and considers a number of additional variables in respect of the choices of curricular options available to educational institutions, the levels of professionalism with the sector and of the theories that underpin curriculum and pedagogical approaches. However the Chapter begins by assessing how critical thinking informs societal debate and how a lack of critical thinking can undermine processes of democracy, in order to understand why these divergent tests results have occurred.

5.2 Curricular Analysis

It has already been evidenced that Site A recorded the greatest GPA mean scores however this does not necessarily provide for a comparative response within the Connell Critical Thinking Test, at least without additional analysis. Based upon evidenced gleaned from statistical analysis it is fair to suggest that a level of correlation can be evidenced. Site C has recorded a low GPA score when compared against its peers in this research however it has also scored poorly, as a collective when assessed for critical thinking, suggesting a level of correlation between the two tests. This is a factor that can be further confirmed when compared against its recorded SAT

means score. Here also, this establishment scores badly when compared against its peers. However site C also grades low when demographics are considered. Here, the student cohort resides within a relatively low income group and classification and have a higher percentage of parents who have not attended university. Indeed the recognised school figures are also indicative of the demographics of this particular establishment in that it has the lowest of all fees within the sample population. However whilst this is not an indicator on its own, it does provide a further picture of the demographic grouping that utilises this particular establishment as well as providing further evidence of linkages between educational achievement, critical thinking and demographics. However, it is fair to suggest that findings here merely reinforce previous research studies that suggest that students from lower incomes brackets under achieve in education. These include Baird, Horobin and Illsley, (1970); Jencks, (1972); and Ramsey and Finkelstein, (1981), however within these particular studies, there was no correlation to studies that witnessed an overlap in ethnic origin or where different first languages were used, nor was the settings of an international educational establishment used as the basis for research. Instead those particular studies simply sought a correlation to income levels and low educational attainment. Similarly these particular studies also emphasized the likelihood for a level of retardation as a result of low income levels. However here, whilst they invariably ended up discussing aspects of extreme poverty on the life chances of young scholars, this paper does not suggest a similar outcome. Instead this paper seeks to suggest how differing demographics can influence educational achievement via the utility and adoption of critical thinking tests. In terms of this particular aspect, this paper has provided early evidence of a correlation between these two factors, particularly in light of the assessment of the combination of SAT and critical thinking scores of a single and random participatory group of students when compared with more affluent peers.

That said, however, this paper doesn't suggest that these preliminary results can be universally applied. There are a number of variables that are present within both this and other similar studies. For example, regional biases, gender and individual motivations as well as learning styles, impact of teacher and student relations all impact on the ability of the student to develop to his or her full potential. Indeed, this is a factor that this paper has already discussed within the earlier literature review. Additionally, there are a number of issues that relate directly to the

development of the person, particularly in the adolescent years. One factor that has been recognised by this research is the possibility that different curricular courses may have a potential negative or positive impact upon the results of the Connell Critical Thinking Test results. Here, it is noted that site C, which had the lowest scores as well as the lowest average results for demographics utilised the Common Core State Standards which forms part of the US curriculum. Site A, which scored the highest in the Connell Critical Thinking Test also utilised US curriculum however, here, the Connecticut Standards are utilised the underpinning educational approach and philosophy. However whilst site C utilises these standards for mathematics and English, site A uses them across the board and enforces compliance via having a benefit of all subjects being mandatory.

Site B uses the English curriculum and bases its exam system on the GCSE's. However whilst its SAT scores were not forthcoming for this research, it is noted that the final recorded grades for the Connell Critical Thinking Test were also higher than that of site C, despite having a broad spectrum of parents whose educational levels are, broadly speaking, spread across the lower ranks of these scales recorded for this research. However the parent groups can be considered as being high achievers when income distribution and earnings are taken into account. As such, it is conceivable to consider that a domestic ethos has been instilled into children via their parents own attitudes to learning. Whilst this is pure conjecture, it is noted that with a vast majority of participants speaking English as a native language, that there exists a cultural attitude that positively impacts upon teaching. However it is unknown whether or not such a score could be reproduced had these students been studying a curriculum that was not borrowed from their own state. However where the International Baccalaureate's Diploma Program and IGCSE's were utilised (in site D the variances again proved to offer for a difference in results. Here the critical thinking scores were also down on sites A and B but within this particular cohort exist a mainstay of the central demographic. As such, this provides further evidence of the impact of curricular formulation upon critical thinking skills. Popkewitz (1999) argues that the divergent findings within this research are not surprising since divergent curricular programmes are likely to produce different results. He suggests that deficient learners will share a series of common traits that are intrinsic of the pedagogical approach within which they have been immersed. In essence, therefore, it is arguable that the real findings of analysis of this paper do not relate to the

actions and abilities of learners as a collective, but of the efficacy of the curricula that has been used in order to educate these children. He argues further that to be 'critical' is in effect having a skill that seeks to look for failings in an argument and this is a factor that this paper has sought to optimize via the usage of the Connell Critical Thinking Test. Effectively, therefore, do these different curricula produce varying degrees of critical thinking? In this case the answer is yes. In terms of a collective approach, in terms of the students who are based on these courses, the overlapping issues include variables such as local and family demographics as well as the impact of income and parental educational levels. This paper believes that these are responsible for some of the preliminary outcomes evidenced thus far and the results of the testing and their subsequent calculations provide evidence of this. Table 8 shows the total score on the CCTT by curriculum, and it shows also the total of mean score by skill. Furthermore, figure 1 shows total score on CCTT by score, and figure 2 shows score by subscales; induction, deduction, credibility, and identification on assumption.

Table 10: Scores by Curriculum

Site	Curriculum	Total Score on CCTT	Total of Mean Score by Skill
Site A	USA Connecticut Standards	65	253
Site B	English National Curriculum	63	242
Site C	USA Common Core State Standards	45	172
Site D	International Baccalaureate	57	242
Site E	USA Connecticut Standards	59	226

Figure 1: Total Score by Site

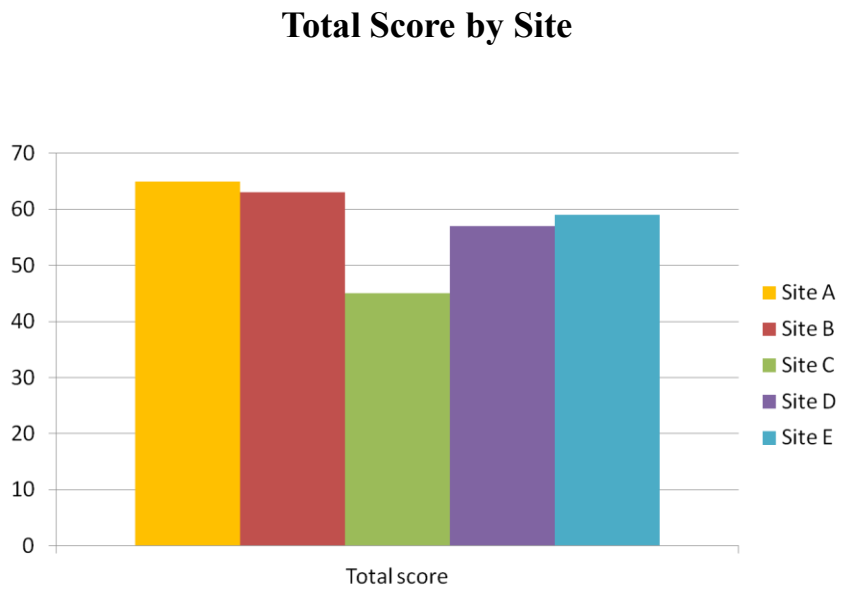
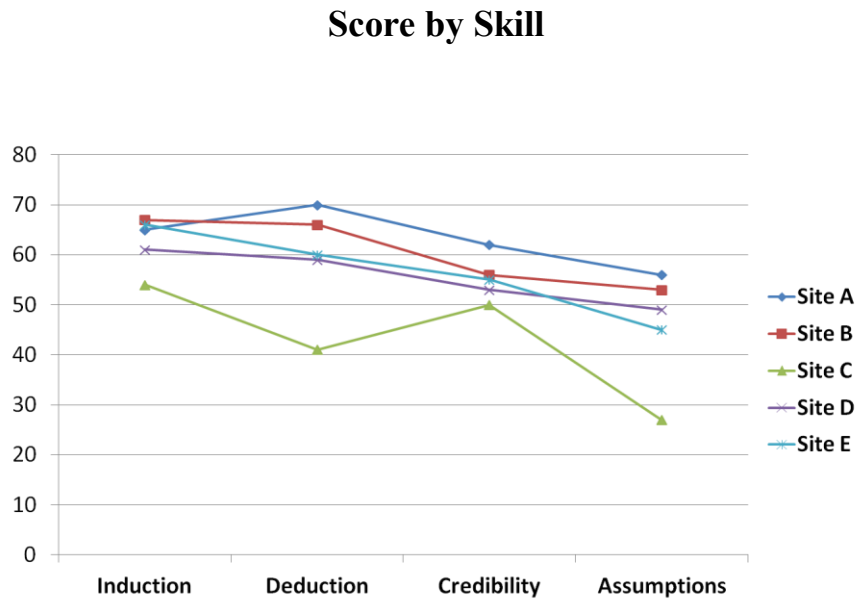


Figure 2: Score by Skill



5.3 Theories of Curriculum

The management of any educational system has long been associated with the concept of a curriculum. The concept is a highly subjective one and the various approaches and concepts that underpin the curriculum are intended to benefit the wider society (Reboul, 1984). However whilst any assessment would agree with this particular perspective, particularly in light of the aspect of societal benefit (such as employability, progression towards the good society and the acquisition of knowledge and skills that are deemed to progress a person to self teaching and critical thinking), the service is in a constant state of flux and remains both fluid and divergent in terms of time and of competing ideological and curricular practices. Here, curricular planner must be aware of the pressures and outcomes that are available to them when deciding which form of curriculum to choose for a particular establishment (Generic, Centre, 2009). The simplest form of definition for a curriculum is that a curriculum can be *'*the learning of those subjects that are most useful for living in contemporary society*'*, (Coe Faculty, 2009). However, it is also argued that a curriculum can consist of 'all planned learning for which the school is responsible', or 'the results of instruction*'*, (Armitage, Bryant, Dunhill, Flanagan, Hayes, Hudson, Kent, Laws & Renwick, 2004).

A central factor in this set of definitions is the assertion of a product, which is the creation of the student who is capable of being effective within the modern world and there appears to some form of consensus over what constitutes curriculum but not defines it. It is the author's view that educations should prepare adults for the world around them. In support of this, Kelly argued that any educational experiences should provide a liberating and empowering experience designed to fulfil ones potential, within the loose confines of our democratic society, (Kelly, 2004). Dewey argued that a curriculum is little more than an end product, from which the end product is the development of a person who is capable of being effective within the wider society and modern world, indeed it is at this point that critical thinking is taken into consideration as a factor in the education sector. Additionally, it is to be noted that Dewey was a foremost thinker on the concept of reflection and this too forms as a phenomenological element of this paper. Indeed, Dewey argued, that any curricular programme should incorporate a number of unspoken components such as social, constructive, expressive, and artistic concepts, (Dewey, 1902). It is

fair to suggest, therefore, that in reality the utility of an operational definition of what constitutes as a curriculum should incorporate a number of aspects of every definition in order that the final curricular product, or output, reaches as many philosophical tenets as possible and that these aspects are threaded through a curriculum and any educational experience. Indeed, Kelly (2004) argued that the educational experience should act as a form of liberation and should be an empowering experience for students that is designed to help growing and aspiring adults achieve their full potential, and where the only constraint should occur within the loose frameworks of society and of the lawful processes. Kelly, therefore, saw the educational process being a catalyst for social change that helped bring increased freedom of thought and expression, respect and acceptance. In essence, this is critical thinking and it is for this reason that the research contained within this paper, as well as the narrative that underpins its discourse is vital to the processes of education. As such, where an educational establishment, such as site C for example, is producing results from tests that are far below that of their peers then it is arguable that the institution is failing in its duty to adhere to the basic philosophical principles of education.

5.4 Processes of Curriculum

Blenkin argues that a curriculum should be a body of knowledge that is transferred from one person to another via communication based educational processes. Within this argument is the idea that education is a process whereby knowledge is transmitted or 'delivered' to students via the deployment of the most efficient form of communication available (Blenkin, 1992). A subsequent form of curriculum is the product where, here, the curriculum can be viewed as nothing more than an attempt to deliver a set of predetermined aims and objectives to those learners who form the cohort. In effect this perspective consists of nothing more that the creation or manufacturing of an intangible item, albeit one that is assessed against existing preset criteria in order to assess effectiveness. Indeed this was the case with the research that took place within the testing for this paper and where it is evident that in some cases, i.e. site C, that that particular institution has fallen short of their requirement to produce a ‘product’, although in terms of social and educational efficacy. However, in these cases, curricular activities and objectives are set, a plan drawn up, and then applied and the outcomes (products) measured, and again, this is a further factor that occurred within this particular research study. Indeed, this particular concept

and perspective is indicative of the changes to educational management that has permeated the sector in recent years and has allowed league tables to grow in importance in some states.

This development of curriculum theory and practice has been attributed to FW Taylor who advocated the concept of scientific management (Accell, 2009). For him, scientific management of education included the creation of simplified employment roles. In order to achieve this Taylor espoused increased controls over all aspects of the workplace and the education sector forms part of this concept, and where increasingly simplified work roles would be developed as a result of these changes. Indeed, here time and motion studies formed part of this particular outcome and it is here that the educational aspect that relates to league tables ad continual testing can be found. (Accell, 2009). All three elements were involved in the conceptual development of modern of curriculum theory and practice. Where this impacts upon the education sector is where Taylor asked four fundamental questions. Firstly, what educational purposes should the school seek to attain? Secondly, what educational experiences can be provided that is likely to attain these purposes? Thirdly, how can we determine whether these purposes are being attained? Lastly, how can these educational experiences are effectively organized? (Accell, 2009).

Taylor's view of the education sector was that it sought to prepare people for a life of work. Therefore, the successful application of this would undoubtedly lead to education being seen as an industrial asset from which a trained workforce could be provided. This does not raise the prospects for increased critical thinking of the younger generations, particularly when Taylors main objectives in relation to simplified working practices and time and motion are considered Secondly, this particular aspect of time and motion studies has long been associated with the micro management of a workforce, raising question over the efficacy of critical thinking in terms of its applicability to this new form of society and where the education sector is reformed in order to progress this ideal. However, in light of this, and of the research that has been conducted for this paper the question of whether micro management can be successfully applied to the education sector remains to be seen, particularly since so many variables are in existence there. These include, but are not limited to, class dynamics, ability, lessons studies, tutor/learner relationships, environment, motivations, learning styles and so on. A further factor to note is that Taylor's theory is more concerned with the creation of a form of vocational education and this is,

again, more indicative of the results that were gleaned from the testing of site C and not of the others, particularly in relation to a number o demographic issues such as family income, previous educational achievement etc. Here it is to be noted that vocational education is primarily concerned with skills whilst academic knowledge inevitably provides the person the ability to question, and this is the main difference between the test outcomes of the various sites and participants that were utilised for the study and has an impact on the ability of people to question decisions made in their name. Here, it is to be remembered that education has already been identified as a pre-requisite to the good and harmonious society that thinkers such as Reboul *et al* hoped that the education sector will aspire to.

The final aspect of theories of curriculum is the process. Here, educational experiences are not a physical thing, but instead they form the basis for the interaction between teachers, students and knowledge. In other words, the curriculum is what occurs in the classroom and what happens during this time. In effect, therefore, it is a form of dynamism that is unrivalled and unparalleled. Effectively, therefore, the curriculum consists of nothing more than a series of documents that are implemented in order to increase the transfer and flow of knowledge between those conducting the teaching and those are being taught (Connexions, 2012). Stenhouse, (Infed, 2006) argued that in this context, the curriculum is the process whereby the vehicle of education and the transfer of knowledge and its proposal is put into practice. Stenhouse, however, is not concerned with targets and league tables; instead he is concerned with the acquisition of knowledge. At the heart of Stenhouse's theory is the concept of effective communication. He argues for the increased application of debate in class since this allows for the dynamics between both teacher and pupil to improve and where increased critical thinking skills are developed as a result. It also has an added benefit of serving to improve inter personal communication and other communicative skills such as listening and speaking. For him, these result in an improved cognitive and communicative ability. Social meliorates, such as Stenhouse, it is to be noted hold a perspective that education is a tool for the reform of society, where change can be created and where the intelligence of the individual is a crucial factor in this process. This is critical thinking at its peak and it is the education sector that will develop this process intelligence. Critical thinking forms a crucial element in this process and development. Indeed, the sociological

aspects of this particular discourse go much further than testing the critical thinking skills of individuals; it potentially impacts upon the future course of the wider society.

5.5 Critical Thinking and Professionalism

At first glance, the prospect that levels of student critical thinking and educational professionalism may be a non sequitur, however when compared with the previous discourse, it can be argued the development of skills that are conducive to the development of student's ability to increase critical thinking evidences a level of congruence. However, researching a definition of professionalism within the education sector is not a particularly difficult one. The concept of professionalism is highly subjective. Any concepts of *professionalism* are fluid and can mean different things at different times to different people. And, as a result, every authority and institution within the education sector will possess its own particular definition of this concept, with which they externalise to the wider community. So rather than searching for definitions of a professional we should also be considering competence within the workplace? Considering this, Richey wrote:

> 'Competence refers to a state of being well qualified to perform an activity, task or job function. When a person is competent to do something, he or she has achieved a state of competence that is recognizable and verifiable to a particular community of practitioners. A competency, then, refers to the way that a state of competence can be demonstrated to the relevant community. According to the International Board of Standards for Training, Performance and Instruction (IBSTPI), a competency involves a related set of knowledge, skills and attitudes that enable a person to effectively perform the activities of a given occupation or function in such a way that meets or exceeds the standards expected in a particular profession or work setting' (Richey, Fields & Foxon, 2001: 203)

If this is correct then surely the issue of a competent tutor is for more important than a professional that carries himself as such and is applicable to the case of those educators who operate within site B since these actively apply UK standards of education and testing to their practice.

> 'In the UK fully qualified status in professional occupations is normally awarded by a professional association or registration body. Both the requirements and the routes for qualifying vary between professions, although the majority include an academic component combined with or followed by a period of assessed practice. In recent years there have been pressures on professions to broaden their entry routes while at the same time becoming more rigorous in the way that they sign off practitioners as fit to practice.'(Lester 2009 pg 224)

The most relevant part to this for those students who have been exposed to the ability to critically reflect is contained within the last three words of that quotation, *fit to practice*. The ability of those who work within the teaching profession to develop the skills of their cohort is an intrinsic factor in this debate. The development of critical thinking, therefore, is of paramount importance to the success of the education sector, regardless of the curriculum that is utilised or of cohort or of the location of the establishment. However whilst this particular discourse evidences a level of failure in respect of the teaching profession to accelerate the levels of critical thinking of their cohort, and in terms of the curriculum chosen, of the outcomes of SAT and other scores, particularly where such divergent scores are produced from the testing that has been produced in this paper, it is evident that there exists a plethora of possible variables why this is the case. Indeed, whilst demographics, pedagogical and curricular approaches, as well as numerous other factors may be at play here it is for these reasons that grade point averages, for example, provide such a wide variance in results. Indeed, when it comes to issues of professionalism, it is fair to assess whether or not an educational practitioner who fails to develop their cohort's cognitive abilities in order to progress their critical thinking skills is actually being professional or not when compared to the ideals of the sector.

There are issues regarding the status of professionalism within education, not least to as who (and why) should be classed them as professionals. Teachers have long had this persona of being within a profession, something historically attached to sectors where HE certification is essential, for example, finance & accounting, surveying and medical practice. Considering that the world of academia has a notorious reputation for self-interest and jealousy, it is surely not unsurprising that educational practitioners ultimately adopt such a stance once entrenched within a similar environment. As such it is arguably a negative by-product of the earlier, formative years. Much

of this is clearly at odds with the utilitarian ideals of education and ultimately raises a question: considering that a possible by-product of HE education is a form of egoism, can the consequence of conduct in the educational staffroom, for example, be the perpetuation of self-interest within the wider society? Clearly there is an assumption here that educational practitioners are guilty of selfishness whilst amongst their peers, this though is not without foundation and can be easily documented. The irony is that, considering the reach of education into the wider society, through its plethora of establishments, and other institutions such as adult & community learning, work based learning *et al*, this sector is well placed to deliver the good society. The ability to help develop critical and reflective thinking at an early age is a factor in this creation. A failure to develop these skills in the cohort is indicative of a lack of professionalism and, as such, is indicative of a further strand of variable that impacts upon the grades and scores that arose out of the tests that underpin this paper.

5.6 Education as Liberation

One further analytical issue to consider here is that the difference in critical thinking scores between the various sites is that site E provides the closest responses to the overall average of the four of the five sites that provided scores in relation to this research. With the average GPA being 3.36 site E offers a level of control to the overall research hypothesis and, as such, its results, in terms of GPA, is a suitable guide towards the level of critical thinking in terms of those who reside at either above or below this average figure. With this, much has already been discussed in relation to sites A and D with regards to their own particular results in relation to critical thinking, particularly in relation to the attributes and demographic score, and in light of the previous discussion in relation to site C, this serves to further concretise information relating to this particular phenomenon regarding possible issues concerning social class, parental educational levels as well as income. However in consideration of critical thinking, it is to be remembered that Reboul (1984), argued that authentic education should take into account the developmental concept of critical thinking via a promotion of the autonomous individual thought among students he considered that there was a correlation between education and liberty. With this, it can be considered that there is an expectation upon scholars to learn how to learn and evolve to a level where they surpass the education system in terms of directed teaching.

Similarly, when critical thinking is considered, this paper has already considered that the aim of critical thinking is based upon an individual's need and desire to seek an adaption to his or her own environment, but where there is a desire to participate in the democratic system. Further to this, Clifton (2012, p.9) held a perspective that considered that an intrinsic factor in the education system should be the acquisition of knowledge in order to help children to become effective thinkers is a progressively and more important and immediate goal of education, in addition Clifton considered that teaching students to be ethically and morally solid is to teach them to be effective thinkers. It is here where critical thinking can be found.

Though, whilst the importance of critical thinking cannot be denied, Chadwick also argued that numerous studies had already highlighted that schools, and other actors in the education system, do no teach children to think critically (Chadwick, 2012). Arguably this is the case with the cohort on site C. With their Cornell Critical Thinking Tests being far lower than the comparison establishments, it is easy to suggest that the philosophical aspiration of education helping students develop critical thinking is not an aspiration for that particular establishment. Indeed, perhaps it is here where the demographic issues take precedence. For example, much as already been suggested over the role that education plays within those families and communities where education may not be considered as important. As a crossover, the inability to question to the political status quo, as per Reboul's (1984) argument, is indicative of a values system that serves only to reinforce Chadwick's (2012) approach. At this point it is important to note that Site A utilises a holistic adoption of a US curriculum, as does that of site B. With each of these a secular curricular approach is in place.

In reality, it can be argued that these types of educational core values should include, but not be limited to inclusive learning, participation, differentiation and reflection, which is where critical thinking come in. Such approaches are clearly utilitarian in nature and should be promoted at every opportunity. The possible weak point in this approach is that it does not take account of the educational practitioner's own perception of the world. This can only be addressed through effective reflection and it is this that educational establishments do not teach as a matter of course. Without this knowledge, inclusion, participation and the development of democratic systems, as per Reboul's perspective simply will not happen. To elaborate on this, it is fair to say

that the English educational system, for example, has a strong history of being based on Christian philosophy but is wholly secular in nature. Such an approach stemmed from a commitment to democracy, free speech and association (Snook, 1998) and remains in line with Reboul's perspective, as does the US version of the curriculum. With it brings a sense of freedom and respect.

Lastly, it is to be noted that in 1998, the UNESCO 'Values in Education' summit encouraged educational establishments to review their policies in relation to values based education, (UNESCO, 1998). They hoped that 'values' would be taught overtly, rather than the covert as currently practiced. However there is little evidence that the main thrust and content of this summit had much impact and, in turn, failed to project onto local educational polices at the state, or local, level. Considering the aforementioned importance of critical education as a catalyst for shaping society, any subsequent decision not to promote these values onto the educational curriculum can be assessed as being borne out of political expediency. Of course it can be argued that there is a possibility that timetabled values type lessons could be indicative of decay in the wider society and where the wider populous are failing to interject into decisions that are made in their name. This research has evidenced, that the cohort which is most likely to sit back and not interact with the wider democratic, or political processes are those students from site C since they may not still possess the cognitive capabilities in order to critically reflect upon political or other social decisions and discourses. Regardless of this, however, this very discussion serves to further concretise the very fact that education serves as a pillar of society that works for the common good, or a profession.

Chapter Six: Conclusion & Recommendation

6.1 Conclusion and Recommendations

There are two main objectives of every education system. Here, education should be used to impart knowledge and to cultivate wisdom. Traditional societal values have sought to emphasis this role for the education sector as being the first of these two factors. Somehow the imparting of knowledge and cultivating wisdom do not seem the same for those who either manage or oversee educational services and as a result it is the former of these two objectives that has gained primacy in recent years. However, the development of the latter of these two factors, the cultivation of wisdom, is where the issue of critical thinking can be found. Within this particular objective, there lies the ability of the person to question those in power and to reflect upon the important matters of the day. This paper has considered this particular aspect as being the accumulation of truths and where knowledge has been passed from one generation to another. Critical thinking, therefore, serves to maintain the flow of wisdom and to serve the development and increased importance of education upon society and its future development. In order to assess whether this was still the case this study sought to answer four basic questions; firstly how do grade 12 students enrolled in different school curricula score on the Connell Critical Thinking Test? Secondly, what differences or similarities in critical thinking skills, if any, exist between students enrolled in different school curricula, namely, US, UK, and IB curricula? The third question was what the observed relationships, if any are, exist between students' GPA and scores in the Connell Critical Thinking Test? And lastly, are any of the variables (gender, language, and family background) considerably affecting students' critical thinking skills?

In each of these four question divergent results were provided that concurred that the ability of the student cohort in a number of educational establishments are achieving different outcomes in terms of critical thinking and where a series of differentials and variables are impacting upon their ability to increase their levels of critical thinking. However the divergent results highlighted a clear discrepancy on the ability of those students who resided in domestic environments to critically analyse and question. This has a serious impact on their ability to progress in society and to benefit the wider society. As a party to these outcomes, this paper subsequently sought to develop potential reasons as to why these tests produced the divergent results. Firstly the

differential regarding the choice of curricular approaches had an impact upon student's ability to critically think. This is now an obvious factor when the historical influences of a number of competing curriculums are taken into consideration, as is the debate over what should constitute and comprise as a curriculum. This is an important factor since there are evidently a number of underlying philosophical perspectives that serve to guide and direct curricular direction. Here, for example, there are a number of issues regarding the contentious issues that serve to constrain education as a shaper of society and how this can be achieved via the development of critical thinking skills.

Utilising the Cornell Critical Thinking Test, this paper tested the levels of critical thinking in comparison to a number of accepted league tables and efficiency and found that where issues concerning deduction, or the "the process of reasoning in which a conclusion follows necessarily from the stated premises; inference by reasoning from the general to the specific" and induction, "the process of deriving general principles from particular facts or instances", had allowed for a level of coefficient whereby those student who resided in the higher income brackets did extremely well, as opposed to those from lower income families. Indeed, with regards to the latter of these two cohorts, the second groups produced scoring records that were inferior to those others. However, this paper also found out that the choice of curricular programme was not conducive to the creation of critical thinking within this cohort, evidencing that curriculum development has a positive as well as a negative impact on the ability of students to critically think. Indeed, this latter aspect, curriculum, has since been cited as a reason for this failure.

The choice of curricular programmes, it has been found can potentially impact upon the ability of learners to develop their critical thinking skills. This paper cited a number of historical and philosophical examples as to why this may be and opted for the progressive development of Taylor's scientific management model as a tool for education services today. Within this model, the need for increased critical thinking is not needed as much as those, for example, where students intend progressing to university. As such, this type of curricular programme is designed specifically in order to aid the progression to the workplace and not to further or higher education. Critical thinking skills, therefore, is not a prerequisite for such an eventuality. However scientific management has also impacted upon the wider industrial workplace and has

effectively led to a situation where critical thinking is not needed there either. As such the correlation between lower levels of education and the unthinking workforce can be found and developed as a further model of research. The impact of this development upon the wider society is potentially immense. Education is supposed to provide for the transfer of knowledge and the cultivation of wisdom; however it is evident that parts of the education sector are no longer achieving this particular objective. However with education being considered as a tool for the benefit of the wider society and that of the ideals of democracy, the ability of a class of people, who are unable to critically think or reflect upon pressing matters of the day, has the potential for undermining the values of the wider society. This seriously undermines the future development of society and serves to undermine the ability of the education sector to provide for its objectives in a fashion that benefits both its cohort and society.

6.2 Limitations & Implications

The study sample was 100 grade 12 students from four private schools in Dubai in the North of UAE. Because the size of the sample was not big, and only one test was administered once, the results of this study cannot be generalized to a bigger population.

The differences between the schools that participated in the study constitute another limitation. Site A was a private school that gives a US curriculum that is aligned to Connecticut Standards, Site B was a private school that gives curriculum aligned to the English National Standards, Site C was a private school that offers US curriculum that is newly aligned to CCSS and NGSS, Site D was a private school that offers IB curriculum, and another US curriculum school that is aligned to CCSS and Connecticut Standards in Site E. This fact would suggest that differences in critical thinking scores might also be related to differences in instruction in each site, in addition to the vision of each school.

Another limitation of this study is in the instrument used in the research. The Cornell Critical Thinking Test is a set of multiple choice questions. Multiple choice test questions received many criticisms as they are not able to precisely determine or assess students' critical thinking skills. Bloom (1956) argued that multiple choice test questions can only measure the lower thinking skills such as knowledge. Moreover, Ennis (1993, 181) states that "another problem in the use of multiple choice test lies in differences in background beliefs and assumptions between test maker

and test taker." Also, the use of one measurement, which is in this case the CCTT, during 50 minutes can be considered only as an indication not an in-depth examination of students' critical thinking skills. But, the fact that this study has found differences between scores in critical thinking skills suggests that more in-depth studies would permit to explore how students build up and apply critical thinking skills. Thorough studies might for instance comprise experimental group of students who are taught by teachers who already received training on Robert Ennis or Richard Paul' models of critical thinking. Studies might also include pre- and post tests in order to examine any possible changes in students' critical thinking skills. Furthermore, studies that focus on observing students in class in order to observe particular strategies that promote critical thinking skills would also bring insights on how critical thinking skills might be taught, learned or developed. Moreover, interviews with teachers and students can also be helpful in examining teachers' and students' perceptions toward critical thinking thus finding out ways in which these skills can be enhanced.

Due to all what I mentioned above, this study cannot determine whether it is the curriculum taught or other factors that are responsible for students' critical thinking scores. However, this study showed that high school students are able to think critically and apply various skills such as: induction, deduction, credibility, and assumptions to solve problems.

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Appendices

Appendix A

14 January 2014

TO WHOM IT MAY CONCERN

This is to certify that **Ms Malika Boucif–** Student ID No. **120080** is a registered part-time student on the **Master of Education** programme (following the pathway in **Management Leadership Policy**) in **The British University in Dubai**, from September 2012.

Ms Boucif has completed all the taught modules and is currently doing her dissertation. With this regard she has designed a study to measure students' critical thinking skills. She would like to administer a critical thinking test to about 20 students of Grade 12 from your school who would be willing to take the test. The Test would take approximately 60 minutes to complete and could be done in the computer lab at your school.

We kindly request you to assist her so that she can conduct her visit to the school for the research purpose efficiently.

This letter is issued on Ms Boucif's request.

Yours sincerely,

Nandini Uchil
Head of Student Administration

Appendix B

A letter to the Administrator

Malika Boucif
Villa 52, Altawash Street, Jumeirah, Dubai
E-mail: 120080@student.buid.ac.ae
Tel: 00971 50 14 2[redacted]

Dear Principal

I am a Master's student of education at The British University in Dubai. I have designed a study to measure students' critical thinking skills. I am contacting you to describe my study and ask your permission to recruit students at your school.

With your permission, I would like to administer a critical thinking. My dissertation supervisor has approved my use of Cornell Critical Thinking Test which measures students' skills in induction, credibility, deduction and identification of assumption. The *Cornell Critical Thinking Tests* develop a clear picture of your students' critical thinking abilities. The tests can be used to teach critical thinking skills, to predict students' performance on your state proficiency exam, or for AP programs, critical thinking courses, college admissions, careers, and employment.

I would need about 20 Grade 12 students from your school who would be willing to take the test. All consent forms and permission slips have been approved and I would be happy to share them with you prior to recruiting students. The Cornell Critical Thinking Test, level X takes approximately 45-50 minutes to complete and can be done in the computer lab at your school. The Test is multiple choice questions.

I will report only group scores as opposed to individual scores. I can guarantee that all participants will be made anonymous and your school will be given a pseudonym to ensure its anonymity as well. Your school's results will be available at the end of the study if that is of interest to you. I believe only positive results could come of this study, as it may increase students' awareness of their critical skills and may lend insight into the acquisition and assessment of these important skills.

I welcome the opportunity to meet with you at earliest convenience. My schedule is very flexible. If you are interested, please contact me at the e-mail address or phone number mentioned above.

Thank you

Malika Boucif

Adapted from : Walter, J.M (2009). Assent to Participate in Research . *Evaluating the Effects of Credit-Based Transitional Programs on High School Students' Critical Thinking Skills*. ,p 86

Appendix C

Assent to Participate in Research

My name is Malika Boucif and I am a Master's student of education at The British University in Dubai. I am conducting a research to measure students' critical thinking skills. I am asking you to take part in this research study so I can learn more about how students develop critical thinking skills and different ways these skills can be assessed. The test will take approximately 50 minutes.

If you agree to be in this study, you will be asked to take a multiple choice questions test in February 2014 in the computer lap at your school. This test is the Cornell Critical Thinking Test which measures the overall critical thinking skills in induction, credibility, deduction and identification of assumptions. You do not have to answer any question you don't want to and you can stop participating at any time. No one will be able to know how you responded to the questions and your name will never be used. At the conclusion of the study, responses will be reported as group results only. Your individual results will be made available only to you if you request so. Being in this study is entirely voluntary. Your decision whether or not to participate will not affect your grade, GPA, or class standing in any way.

Please talk about this study with your parents before you decide whether or not to participate. I will also ask your patents to give their permission for you to participate.

You may ask me any questions about this study. You can contact my dissertation supervisor Dr. Chadwick Clifton at his email: cliftonchadwick@hotmail.com or contact me by email: 120080@student.buid.ac.ae or call me on 00971 50 14 2[redacted]

By signing below, you are agreeing to participate with the understanding that your parents have given permission for you to take part in this project. You are participating in this study because you want to.

Please return this form along with your parent's/guardian's signed consent from to [name of teacher] by the end of the week. Please keep the additional copy for your files. Thank you.

_____
Name of Student

_____ _____
Signature of Student Date

_____
Name of Parent

_____ _____
Signature of Parent Date

Adapted from : Walter, J.M (2009). Assent to Participate in Research . *Evaluating the Effects of Credit-Based Transitional Programs on High School Students' Critical Thinking Skills*. ,p 90

Appendix D

Parent/Guardian Consent

Dear Parent or Guardian:

A. PURPOSE & BACKGROUND

My name is Malika Boucif. I am a Master's student under the supervision of doctor Chadwick Clifton from The British University in Dubai. I am conducting a study to analyze high school students' critical thinking skills. I would like to ask for permission for your son/daughter to participate in my study.

B. PROCEDURES

Your son/daughter will take a test of critical thinking in February 2014. This test is the Cornell Critical Thinking Test which measures overall critical thinking skills in induction, credibility, deduction and identification of assumptions. There are no "trick" questions on this test. It takes around 1 hour to complete and will be taken in the computer lap of your son's/daughter's school.

C. RISKS & DISCOMFORTS

All information will remain completely confidential. No student will be identified by name. You are able to remove your son/daughter from the study at any time and his/her grades, GPA, or class standing will not be affected in any way.

Confidentiality: My records will be handled as confidentially as possible. Only my supervisor Dr. Clifton and I will have access to test results. Results will be kept on a password protected computer. No individual identities will be used in the reports or publications that may result from this study.

D. BENEFETS

Students will be able to test their critical thinking abilities. Moreover, the information gained from this research may help education professionals better understand how students' critical thinking skills can be taught and assessed.

E. COSTS

There will be no cost to you or your son/daughter as result of taking part in this study.

F. PAYMENT

There will be no payment to you or your son/daughter as result of his/her taking part in this study.

G. QUESTIONS

If you have any questions or concerns about participation in this study, please contact me or Dr. Clifton at **cliftonchadwick@hotmail.com or 120080@student.buid.ac.ae or call me on 00971 50 14 23200**

Should you or your son/daughter feel discomfort due to participation in this research, you should contact your health care provider.

H. CONSENT

PARTICIPATION IN RESEARCH IS VOLUNTARY. I understand that I can choose not to have my son/daughter participate in this study, or to withdraw my child from participating at any time. Declining participation will not interfere with my son's/daughter's grades. GPA, or class standing in any way.

I will discuss this research with my son/daughter and explain the procedures that will take place.

I have a copy of this consent form to keep.

I give my consent to allow my son/daughter to participate

Name of Parent/Guardian Print Name of Son/Daughter

Signature of Parent/Guardian Date

If your Son/daughter will be participating in this study, please return this form along with his/her assent form to [insert teacher's name] by the end of the week. Thank you.

Adapted from : Walter, J.M (2009). Assent to Participate in Research . *Evaluating the Effects of Credit-Based Transitional Programs on High School Students' Critical Thinking Skills*. ,p 92-93

Appendix E

Demographic Questionnaire

For this research project, I am requesting demographic information. I guarantee that I will make every effort to protect participants' confidentiality. However, if you are uncomfortable answering any of these questions, you may leave them blank.

1. Gender : _____

2. Current Grade:_____

3. Name of the school:_____

4. How many years have you attended this school (including this year)? _____

5. What school did you attend prior to this one? _____

6. Your Grade Point Average (GPA): _____

7. Your scores on: SAT_____IELTS _____TOEFL_____ MAP_____Any other _____

8. Your native language:_____

9. Of your parent(s), what is the highest level of education?

(Please circle answer/fill in the blanks)

High school Undergraduate (BA,BS, etc.) Master's (MA, MBA, etc.) Doctorate (MD, PhD, etc.) Professional Degree: _____

10. Estimated Family Income:

Please circle

Below $50.000

50.000 - $ 100.000

101.100- $200.000

Above $ 200.000

I don't know

Walter, J.M (2009). Demographic Questionnaire. *Evaluating the Effects of Credit-Based Transitional Programs on High School Students' Critical Thinking Skills*. ,pp.99-100

Appendix F

Nile Duppstadt II niled@criticalthinking.com 11/4/13

to me, Mary-Ann

Dear Malika,

Thank you for your inquiry. The English versions of the Cornell Critical Thinking Tests are available for purchase online. I would recommend using Level Z as it's designed for grades 11-12+, although the Level X version would also work as it's designed for grades 5-12+. Often times educators will administer the Level X as the pretest and then Level Z as the post test. I have also seen educators use the same level for both the pretest and post test.

If you would like to translate the test a license agreement must be signed that includes the quantity to be administered, the specified language, administration software (e.g. Qualtrics), license fee, etc. In this case the raw test content would be delivered in .csv, .xml, or .html format via email or FTP.

The software is designed to make the administration and reporting easier. A few example reports and test questions are available online. Just visit the product page and click on the product image or "look inside" link, or just click here to see the Level Z reports and sample questions. The reports breakdown the scores by skills tested (e.g. induction, deduction, etc.) and by group or student. The software uses a web-based administration so all you need to do is install it on your computer or server and then distribute the link to each student. The software will be delivered via CD. If you have any troubles installing just reference our online tech support or give us a call at 831-393-3288 x 205 or 800-458-4849 x 205.

For graduate students working on dissertations we typically offer a 20% discount. You may use coupon code TWENTYOFF when placing your order.

Please do not hesitate if you have further questions.

Best regards,

Nile Duppstadt II
Vice President | The Critical Thinking Co.™ - Empower the Mind!
800.458.4849 x 109 | 831.920.4992 d | 831.393.3277 f
niled@criticalthinking.com | CriticalThinking.com
1069 Broadway Ave., Suite 100, Seaside, CA 93955

Better Grades and Higher Test Scores - Guaranteed™

Sign up for "The Critical Thinker" Newsletter! CriticalThinking.com/enews
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Appendix G

1991 Sherman Ave Suite 200, North Bend, OR 97459 (1-800-458-4849)

Page	Date	Invoice No.
1	01/14/14	10262*

SUMMARY COPY

Bill To

Clifton Chadwick
C Chadwick DXB18770
182-21 150th Avenue
Springfield Gardens, NY 11413-4028

Ship To

Customer No.	Sales I.D.	Reference #	Media Code	Terms
380474	ADM/ADM		P /WEB	XXXXXXXX6695 VISA

Ordered By	Warehouse	Phone Number	Total Wt.	Zone	# Packages	Ship Via
		(718) 553-8740	1.0 Lbs	301	1	U3R

Message:

0

Qty.	B/O	Shipped	Item #	Description	Unit Price	Disc	Extension
1	0	1	05510NCC	Cornell Critical Thinking Test Level X Software 100-Test License	449.99	50	225.00

MERCHANDISE INVOICE TOTAL $ 225.00
SHIPPING & HANDLING $ 60.00
INVOICE TOTAL $ 285.00
CR. CARD: VI, APPR:190633 $ -284.99
CR. CARD: VI, APPR:145568 $ -0.01
BALANCE FOR THIS ORDER $ 0.00

.

Appendix H

The Critical Thinking Co.™
Empower the mind!

Network License Agreement
Proof of License

Licensee: C Chadwick DXB18770

Address: 182-21 150th Avenue
Springfield Gardens, NY 11413-4028
USA

Contact Name: Clifton Chadwick
Contact Phone: 718-553-8740
Contact Email: CliftonChadwick@hotmail.com

License # 10676
License Date: 1/14/2014
Order#: 100006293
PO#:

Product Name	ID	Quantity	Type
Cornell Critical Thinking Test Level X	05510NCC	1	Unlimited

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Appendix I

Site: A

Section Detail Comparative Report (Student)

Test Name: Cornell Critical Thinking Test X

Number of questions71 Average Test Time: 38 min

Minimum Test Time: 31 min Maximum Test Time: 49 min

	Sections (%)				
Student ID	I	II	III	IV	Avg Score(%)
01	56	45	85	70	64%
02	43	41	71	30	46%
03	47	54	78	60	59%
04	73	50	78	40	60%
05	86	62	85	70	76%
06	69	54	92	20	59%
07	73	70	57	60	65%
08	73	70	92	80	79%
09	65	87	100	90	85%
10	82	54	92	20	62%
11	82	66	100	90	84%
12	78	41	50	40	52%
13	78	75	71	50	68%
14	52	70	71	40	58%
15	78	75	92	70	78%
16	60	62	92	60	68%
17	56	79	71	60	66%
18	56	41	71	60	57%
19	47	70	78	60	64%
Summary	**66**	**61**	**80**	**56**	**65%**

Appendix J

Site B
Section Detail Comparative Report (Student)

Test Name: Cornell Critical Thinking Test X

Number of Questions: 71 Average Test Time: 34 min

Minimum Test Time: 19 min Maximum Test Time: 44 min

		Sections (%)				
Id	Student(s)	I	II	III	IV	Avg Score(%)
10	student10	56	50	64	60	57%
11	student11	52	45	71	70	59%
12	student12	82	66	85	50	71%
13	student13	65	50	64	30	52%
14	student14	91	66	92	70	80%
15	student15	65	75	85	60	71%
16	student16	73	50	71	60	63%
17	student17	78	70	100	20	67%
18	student18	60	58	100	80	74%
19	student19	34	41	35	20	32%
20	student20	69	20	57	30	44%
21	student21	82	75	92	80	82%
2	student2	82	79	92	70	81%
3	student3	73	58	85	60	69%
4	student4	86	62	85	70	76%
5	student5	56	37	57	20	42%
6	student6	52	58	78	30	54%
7	student7	56	50	78	40	56%
8	student8	82	66	71	90	77%
9	student9	82	54	35	50	55%
Summary		**68**	**56**	**74**	**53**	**63%**

Appendix K

Site C
Section Detail Comparative Report (Student)
Test Name: Cornell Critical Thinking Test X

Number of Questions: 71 Average Test Time: 38 min

Minimum Test Time: 28 min Maximum Test Time: 49 min

		Sections (%)				
Id	Student(s)	I	II	III	IV	Avg Score(%)
10	student10	60	20	28	30	34%
11	student11	26	33	42	10	28%
12	student12	56	45	35	20	39%
13	student13	60	37	28	20	36%
14	student14	47	50	14	30	35%
15	student15	65	50	42	30	46%
16	student16	60	75	64	30	57%
17	student17	56	50	42	30	44%
18	student18	39	45	42	40	41%
19	student19	52	62	64	40	54%
20	student20	65	62	85	40	63%
21	student21	65	66	78	30	60%
2	student2	34	33	64	30	40%
3	student3	56	50	57	60	55%
4	student4	60	70	78	0	52%
5	student5	43	45	35	20	36%
6	student6	82	58	85	20	61%
7	student7	65	62	28	30	46%
8	student8	56	37	57	10	40%
Summary		**55**	**50**	**50**	**27**	**45%**

Appendix L

Site D
Section Detail Comparative Report (Student)

Test Name: Cornell Critical Thinking Test X

Number of Questions: 71 Average Test Time: 28 min

Minimum Test Time: 10 min Maximum Test Time: 47 min

		Sections (%)				
Id	Student(s)	I	II	III	IV	Avg Score(%)
8	Student8	65	87	57	90	74%
10	student10	60	66	50	20	49%
11	student11	30	29	42	40	35%
12	student12	43	45	78	60	56%
13	student13	82	58	100	50	72%
14	student14	78	58	57	60	63%
15	student15	34	45	35	10	31%
16	student16	60	29	57	10	39%
17	student17	78	58	92	60	72%
18	student18	47	58	100	60	66%
19	student19	47	45	50	50	48%
20	student20	69	45	78	50	60%
21	student21	69	41	85	60	64%
2	student2	91	41	71	30	58%
22	student22	47	50	42	30	42%
3	student3	56	45	57	60	54%
4	student4	56	58	57	70	60%
5	student5	65	66	71	60	65%
6	student6	86	62	64	30	60%
7	student7	86	70	100	80	84%
Summary		**62**	**52**	**67**	**49**	**57%**

Appendix M

Site E
Section Detail Comparative Report (Student)
Test Name: Cornell Critical Thinking Test X

Number of Questions: 71 Average Test Time: 40 min

Minimum Test Time: 28 min Maximum Test Time: 49 min

		Sections (%)				
Id	Student(s)	I	II	III	IV	Avg Score(%)
10	student10	82	66	92	50	72%
11	student11	65	33	78	30	51%
12	student12	65	70	78	30	61%
13	student13	78	58	85	50	68%
14	student14	56	37	64	40	49%
15	student15	73	54	57	50	58%
16	student16	47	41	50	20	39%
17	student17	69	62	35	50	54%
18	student18	56	45	50	50	50%
19	student19	86	62	100	70	79%
20	student20	69	58	85	70	70%
21	student21	26	58	78	50	53%
2	student2	52	50	64	20	46%
3	student3	78	66	85	50	70%
4	student4	78	54	92	60	71%
5	student5	69	50	57	60	59%
6	student6	60	62	78	40	60%
7	student7	65	41	57	30	48%
8	student8	78	70	64	40	63%
Summary		**65**	**54**	**71**	**45**	**59%**

Appendix N

Site: A
Score by Skill Comparative Report
Test Name: Cornell Critical Thinking Test

X01: Induction, X02: Deduction, X03: Credibility, X04: Assumption

Student ID	(X01)	(X02)	(X03)	(X04)
01	52%	79%	46%	70%
02	40%	54%	42%	30%
03	44%	71%	54%	60%
04	68%	63%	50%	40%
05	84%	79%	63%	70%
06	64%	63%	54%	20%
07	76%	58%	71%	60%
08	76%	88%	71%	80%
09	68%	96%	88%	90%
10	80%	63%	54%	20%
11	76%	96%	67%	90%
12	72%	46%	42%	40%
13	80%	63%	75%	50%
14	56%	58%	71%	40%
15	80%	83%	75%	70%
16	56%	79%	63%	60%
17	60%	67%	79%	60%
18	56%	67%	42%	60%
19	48%	71%	71%	60%
Summary	**65%**	**70%**	**62%**	**56%**

Appendix O

Site B
Score by Skill Comparative Report

Test Name: Cornell Critical Thinking Test

X01: Induction, X02: Deduction, X03: Credibility, X04: Assumption

Student ID	(X01)	(X02)	(X03)	(X04)
10	52%	63%	50%	60%
11	52%	71%	46%	70%
12	80%	71%	67%	50%
13	60%	50%	50%	30%
14	88%	83%	67%	70%
15	68%	75%	75%	60%
16	68%	67%	50%	60%
17	80%	67%	71%	20%
18	56%	92%	58%	80%
19	36%	29%	42%	20%
20	64%	46%	21%	30%
21	84%	88%	75%	80%
2	84%	83%	79%	70%
3	76%	75%	58%	60%
4	80%	79%	63%	70%
5	60%	42%	38%	20%
6	48%	58%	58%	30%
7	60%	63%	50%	40%
8	84%	79%	67%	90%
9	76%	42%	54%	50%
Summary	**67%**	**66%**	**56%**	**53%**

Appendix P

Site C
Score by Skill Comparative Report
Test Name: Cornell Critical Thinking Test

X01: Induction, X02: Deduction, X03: Credibility, X04: Assumption

Student(s)ID	(X01)	(X02)	(X03)	(X04)
10	60%	29%	21%	30%
11	28%	29%	33%	10%
12	56%	29%	46%	20%
13	60%	25%	38%	20%
14	44%	21%	50%	30%
15	64%	38%	50%	30%
16	64%	50%	75%	30%
17	52%	38%	50%	30%
18	36%	42%	46%	40%
19	56%	54%	63%	40%
20	68%	67%	63%	40%
21	64%	58%	67%	30%
2	32%	50%	33%	30%
3	56%	58%	50%	60%
4	60%	46%	71%	0%
5	44%	29%	46%	20%
6	76%	58%	58%	20%
7	64%	29%	63%	30%
8	52%	38%	38%	10%
Summary	**54%**	**41%**	**50%**	**27%**

Appendix Q

Site D
Score by Skill Comparative Report

Test Name: Cornell Critical Thinking Test

X01: Induction, X02: Deduction, X03: Credibility, X04: Assumption

Student(s)ID	(X01)	(X02)	(X03)	(X04)
8	64%	71%	88%	90%
10	64%	38%	67%	20%
11	28%	42%	29%	40%
12	40%	71%	46%	60%
13	76%	79%	58%	50%
14	76%	58%	58%	60%
15	36%	25%	46%	10%
16	56%	38%	29%	10%
17	72%	79%	58%	60%
18	48%	83%	58%	60%
19	44%	50%	46%	50%
20	64%	67%	46%	50%
21	72%	75%	42%	60%
2	84%	54%	42%	30%
22	52%	38%	50%	30%
3	56%	58%	46%	60%
4	56%	63%	58%	70%
5	68%	67%	67%	60%
6	84%	50%	63%	30%
7	88%	92%	71%	80%
Summary	**61%**	**59%**	**53%**	**49%**

Appendix R

Site E
Score by Skill Comparative Report
Test Name: Cornell Critical Thinking Test

X01: Induction, X02: Deduction, X03: Credibility, X04: Assumption

Student(s)ID	(X01)	(X02)	(X03)	(X04)
10	80%	75%	67%	50%
11	64%	58%	33%	30%
12	68%	58%	71%	30%
13	80%	71%	58%	50%
14	52%	54%	38%	40%
15	72%	54%	54%	50%
16	44%	38%	42%	20%
17	72%	42%	63%	50%
18	60%	50%	46%	50%
19	88%	88%	63%	70%
20	68%	79%	58%	70%
21	24%	67%	58%	50%
2	52%	46%	50%	20%
3	80%	71%	67%	50%
4	76%	79%	54%	60%
5	72%	58%	50%	60%
6	60%	63%	63%	40%
7	64%	46%	42%	30%
8	80%	54%	71%	40%
Summary	**66%**	**60%**	**55%**	**45%**

Appendix S

Site A
Question Detail Comparative Report
Test Name: Cornell Critical Thinking Test X

Number of Questions: 71 Average Test Time: 38 min
Minimum Test Time: 31 min Maximum Test Time: 49 min

					Rights-Only		Rights-Minus-One-Half		
Id	Student(s)	Rights	Wrongs	Unanswered	Score (%)	Score (Raw)	Score (%)	Score (Raw)	Percentile Rank*
28	student28	43	28	0	60	43	40	29.0	14
23	student23	33	38	0	46	33	19	14.0	19
22	student22	41	30	0	57	41	36	26.0	16
12	student12	44	27	0	61	44	42	30.5	12
25	student25	54	17	0	76	54	64	45.5	5
13	student13	44	27	0	61	44	42	30.5	12
29	student29	48	23	0	67	48	51	36.5	7
14	student14	55	16	0	77	55	66	47.0	4
15	student15	59	5	7	83	59	79	56.5	1
26	student26	47	24	0	66	47	49	35.0	10
16	student16	58	13	0	81	58	72	51.5	2
17	student17	39	32	0	54	39	32	23.0	17
18	student18	51	20	0	71	51	57	41.0	6
19	student19	43	28	0	60	43	40	29.0	14
27	student27	56	15	0	78	56	68	48.5	3
30	student30	48	22	1	67	48	52	37.0	7
20	student20	48	21	2	67	48	52	37.5	7
21	student21	39	31	1	54	39	33	23.5	17
31	student31	45	26	0	63	45	45	32.0	11
Summary		47.11	23.32	0.58	65.74	47.11	49.42	35.45	

Appendix T

Site B
Question Detail Comparative Report
Test Name: Cornell Critical Thinking Test X

Number of Questions: 71
Minimum Test Time: 19 min
Average Test Time: 34 min
Maximum Test Time: 44 min

					Rights-Only		Rights-Minus-One-Half		
Id	Student(s)	Rights	Wrongs	Unanswered	Score (%)	Score (Raw)	Score (%)	Score (Raw)	Percentile Rank*
10	student10	40	31	0	56	40	34	24.5	13
11	student11	40	31	0	56	40	34	24.5	13
12	student12	52	19	0	73	52	59	42.5	6
13	student13	39	32	0	54	39	32	23.0	17
14	student14	57	14	0	80	57	70	50.0	3
15	student15	51	20	0	71	51	57	41.0	7
16	student16	45	26	0	63	45	45	32.0	11
17	student17	51	20	0	71	51	57	41.0	7
18	student18	50	21	0	70	50	55	39.5	9
19	student19	25	46	0	35	25	2	2.0	20
20	student20	32	37	2	45	32	19	13.5	18
21	student21	58	13	0	81	58	72	51.5	1
2	student2	58	13	0	81	58	72	51.5	1
3	student3	49	22	0	69	49	53	38.0	10
4	student4	54	16	1	76	54	64	46.0	4
5	student5	32	39	0	45	32	17	12.5	18
6	student6	40	31	0	56	40	34	24.5	13
7	student7	40	31	0	56	40	34	24.5	13
8	student8	54	15	2	76	54	65	46.5	4
9	student9	42	28	1	59	42	39	28.0	12
Summary		45.45	25.25	0.30	63.65	45.45	45.70	32.82	

Appendix U

Site C
Question Detail Comparative Report (Student)
Test Name: Cornell Critical Thinking Test X

Number of Questions: 71
Minimum Test Time: 28 min

Average Test Time: 38 min
Maximum Test Time: 49 min

					Rights-Only		Rights-Minus-One-Half		
Id	Student(s)	Rights	Wrongs	Unanswered	Score (%)	Score (Raw)	Score (%)	Score (Raw)	Percentile Rank*
10	student10	26	43	2	36	26	6	4.5	18
11	student11	21	50	0	29	21	-5	-4.0	19
12	student12	31	40	0	43	31	15	11.0	11
13	student13	29	37	5	40	29	14	10.5	14
14	student14	28	40	3	39	28	11	8.0	15
15	student15	36	35	0	50	36	26	18.5	9
16	student16	44	27	0	61	44	42	30.5	4
17	student17	34	37	0	47	34	21	15.5	10
18	student18	30	41	0	42	30	13	9.5	13
19	student19	40	31	0	56	40	34	24.5	6
20	student20	46	24	1	64	46	47	34.0	2
21	student21	45	26	0	63	45	45	32.0	3
2	student2	28	43	0	39	28	9	6.5	15
3	student3	39	32	0	54	39	32	23.0	7
4	student4	42	19	10	59	42	45	32.5	5
5	student5	28	42	1	39	28	9	7.0	15
6	student6	47	24	0	66	47	49	35.0	1
7	student7	37	34	0	52	37	28	20.0	8
8	student8	31	32	8	43	31	21	15.0	11
Summary		34.84	34.58	1.58	48.53	34.84	24.32	17.55	

Appendix V

Site D
Question Detail Comparative Report (Student)
Test Name: Cornell Critical Thinking Test X

Number of Questions: 71
Minimum Test Time: 10 min

Average Test Time: 28 min
Maximum Test Time: 47 min

					Rights-Only		Rights-Minus-One-Half		
Id	Student(s)	Rights	Wrongs	Unanswered	Score (%)	Score (Raw)	Score (%)	Score (Raw)	Percentile Rank*
8	student8	53	18	0	74	53	61	44.0	2
10	student10	39	31	1	54	39	33	23.5	13
11	student11	24	47	0	33	24	0	0.5	20
12	student12	38	26	7	53	38	35	25.0	14
13	student13	52	19	0	73	52	59	42.5	3
14	student14	46	25	0	64	46	47	33.5	7
15	student15	25	44	2	35	25	4	3.0	19
16	student16	30	41	0	42	30	13	9.5	18
17	student17	51	19	1	71	51	58	41.5	4
18	student18	45	26	0	63	45	45	32.0	8
19	student19	34	37	0	47	34	21	15.5	16
20	student20	43	28	0	60	43	40	29.0	11
21	student21	44	24	3	61	44	45	32.0	9
2	student2	44	27	0	61	44	42	30.5	9
22	student22	32	35	4	45	32	20	14.5	17
3	student3	38	31	2	53	38	31	22.5	14
4	student4	42	29	0	59	42	38	27.5	12
5	student5	47	24	0	66	47	49	35.0	5
6	student6	47	24	0	66	47	49	35.0	5
7	student7	59	12	0	83	59	74	53.0	1
Summary		41.65	28.35	1.00	58.15	41.65	38.20	27.48	

Appendix W

Site E
Question Detail Comparative Report
Test Name: Cornell Critical Thinking Test X

Number of Questions: 71
Minimum Test Time: 28 min

Average Test Time: 40 min
Maximum Test Time: 49 min

					Rights-Only		Rights-Minus-One-Half		
Id	Student(s)	Rights	Wrongs	Unanswered	Score (%)	Score (Raw)	Score (%)	Score (Raw)	Percentile Rank*
10	student10	53	16	2	74	53	63	45.0	2
11	student11	37	33	1	52	37	28	20.5	13
12	student12	46	24	1	64	46	47	34.0	8
13	student13	49	22	0	69	49	53	38.0	5
14	student14	35	36	0	49	35	23	17.0	17
15	student15	43	28	0	60	43	40	29.0	10
16	student16	30	37	4	42	30	16	11.5	19
17	student17	41	30	0	57	41	36	26.0	12
18	student18	36	35	0	50	36	26	18.5	14
19	student19	56	15	0	78	56	68	48.5	1
20	student20	49	22	0	69	49	53	38.0	5
21	student21	36	22	13	50	36	35	25.0	14
2	student2	35	28	8	49	35	29	21.0	17
3	student3	51	20	0	71	51	57	41.0	3
4	student4	50	21	0	70	50	55	39.5	4
5	student5	42	29	0	59	42	38	27.5	11
6	student6	44	27	0	61	44	42	30.5	9
7	student7	36	35	0	50	36	26	18.5	14
8	student8	48	22	1	67	48	52	37.0	7
Summary		43.00	26.42	1.58	60.05	43.00	41.42	29.79	