Exploring the Learning Benefits and Outcomes of the IB Extended Essay in Preparing Students for University Studies in Canada:

Student Perceptions of the Impact of the Diploma Programme and the Extended Essay on the Academic Demands of First Year in University

Phase 2 Research Report to the IBO

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OVERVIEW

This report is a part of a two-phase International Baccalaureate (IB) commissioned research project exploring the impact of the Diploma Programme (DP) extended essay (EE) experience on student university success. The objectives of this research project are: 1) To gather evidence of the contributions of the EE to McGill undergraduate students' value of inquiry instruction, inquiry instruction self-efficacy and the importance they assign to inquiry strategies as ranked by experts. 2) To describe and compare IB and non-IB undergraduate students' perceptions of the association between their EE DP experience and their university academic course work experiences, and choices of inquiry opportunities at university. 3) To determine the extent to which variation in the overall value assigned to inquiry instruction can be predicted by IB schooling, non-IB schooling, epistemological beliefs, Knowledge of Science, inquiry self-efficacy, and approach to learning. To accomplish these objectives we have employed a two-phase research design. The first phase, the subject of the previous report, draws on ongoing research at McGill University on inquiry. The second phase, the subject of this report, merges the quantitative findings discussed in this report with a qualitative analysis of student interviews.

Background for Phase II

The IB Diploma Programme (DP) is an academically challenging and balanced programme of education and final examinations that prepares students, aged 16 to 19, for success at university and life beyond (International Baccalaureate Organization, 2007). It has been designed to address the intellectual, social, emotional and physical wellbeing of students. One of the core elements of the DP is the EE, requiring students to undertake in-depth independent research into an area of interest through the lens of one of the DP subjects they are studying. The world studies EE option allows students to focus on a topic of global significance, which they examine through the lens of at least two DP subjects.

A major outcome at each level of the International Baccalaureate curriculum is to actively engage students in learning content with increasingly greater responsibility for how to inquire in a systematic and scholarly manner over an extended period of time. At all curriculum levels of the IB, becoming "an inquirer" is a central outcome of instruction (IBO, 2007). At the IB Diploma level, the extended essay (EE) then represents the continued emphasis on learning content through inquiry and increasing expertise in learning how to inquire. The IB describes the goals of the EE to include providing students the following opportunities (International Baccalaureate Organization, 2007):

- Pursue independent research on a focused topic
- Develop research and communication skills
- Develop the skills of creative and critical thinking
- Engage in a systematic process of research appropriate to the subject
- Experience the excitement of intellectual discovery.

These goal statements emphasize the notion of "develop" and "experience." Clearly, the

emphasis is on active learning on the part of the student. However, what is less clear is what instructing should mean, in order to support active engagement in the process of inquiry. The emphasis on inquiry and becoming an inquirer may not be the same in all IB schools. For example, The Hong Kong Institute for Education (Hallinger, Walker, & Lee, 2011) reported, on the basis of a survey of 235 IB coordinators and 5 full continuum DP schools in the Asia-Pacific Region, that "…increased emphasis on inquiry-based learning in the DP is needed and a wider range of internal assessment tools (p. 7)."

The research objective for the EE identified by the IB (2007) specifies that research projects should "…explore the learning benefits and outcomes attributed to the EE in terms of knowledge skills, abilities, engagement and other aspects that prepare students for university studies (p. 1)." This study focuses on the learning benefits of engagement in the EE as perceived by fifteen former IB Diploma Programme graduates during the first year of university studies. It necessarily entails the students' perception of what happens during instruction, which supports their active engagement in completing the extended essay (EE). It also includes a description of their inquiry self-efficacy for inquiry tasks making up the process of doing research as widely endorsed by experts on inquiry instruction and learning. In addition, we have asked participants to provide their conception of inquiry and compared it to a normative group of undergraduate students. We have also asked them to estimate the amount of years of inquiry instruction they have been exposed to—in order to determine whether it is related to their inquiry self-efficacy. IB students' conceptions of inquiry are compared to a sample of undergraduates from the same university to see if IB trained students hold the same or different conceptions. IB inquiry self-efficacy scores are compared to non-IB students enrolled at the same university to determine if they are significantly different.

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EXECUTIVE SUMMARY

Background

The research objective of the EE identified by the IBO (2007) specifies that IBO research projects should "…explore the learning benefits and outcomes attributed to the EE in terms of knowledge skills, abilities, engagement and other aspects that prepare students for university studies (p. 1)." A major outcome at each level of the IB curriculum (PYP, MYP, and DP) is to actively engage students in learning content with increasingly greater responsibility for how to inquire in a systematic and scholarly manner over an extended period of time. In fact, IB DP and the earlier PYP and MYP programmes, all hold becoming "an inquirer" as a central outcome of instruction and learning.

At the DP level the extended essay (EE) represents the continued emphasis on learning content through inquiry and increasing expertise in learning how to inquire. This study uses a two phased research process that attempts to distinguish between first year university students who have been schooled through the IB DP and students who have not participated in the IB DP. The purpose of Phase I was to determine how well IB students perform relative to non-IB schooled students on six widely used measures of knowledge and strategies entailed in successful higher order learning.

This Phase II study focuses on the learning benefits of engagement in the EE as perceived by fifteen former IB Diploma graduates during the first year of university. This necessarily entails the students' perception of the quality of the IB DP across three different schools in Quebec and what instruction supports their active engagement in completing the EE and more importantly what students actually believe they learn from participating in the EE. In addition, we have asked participants to provide their conception of inquiry and compared it to a normative group of undergraduate students. IB students' conceptions of inquiry are compared to a sample of undergraduates from the same university to see if IB trained students hold the same or different conceptions. Given the Phase I findings that IB DP students inquiry self-efficacy scores were higher than non-IB DP students, we compared non-IB students enrolled at the same university to determine if these findings could be replicated with such a small sample of 15 students. The Phase II study also includes a description of their inquiry self-efficacy for 7 inquiry tasks making up the process of doing research, as widely endorsed by experts on inquiry instruction and learning.

Results

Results of Phase II are based on a sample of 15 undergraduate students during their first year of study at university. Qualitative results indicated that most students were very positive about the high academic work ethic and the student centered environment and instruction conditions afforded in the three schools offering the IB DP to the students in the study. A careful qualitative analysis of the students responses to the questions about what they experienced during the EE process and what they learned from participation in the EE

revealed a large number of learning outcomes that are entailed in the accomplishment of inquiry tasks and foundational to reading, writing, study and search skills that are necessary to successfully accomplish common university academic tasks in most disciplines. Further analysis of the students' reports of ways that that participation in the EE had aided them in meeting the demands of academic work in their first year courses demonstrated that most of the knowledge learned through EE participation served them to successfully cope with these academic demands. However, the results also show that first year students experienced research primarily through reading it, writing about it, and occasionally discussing it but never through actually doing it as part of their coursework or even outside the classroom. Our specific results replicate those reported by Inkelas, Swan, Pretlow, & Jones (2012) and Wray. (2013).

Results also indicated that eleven of the fifteen students stated that they learned a great deal from engaging in the EE process and simultaneously held conceptions of inquiry suitable to the particular subject they were majoring in while being students in the IB DP. The remaining four students could not express a conception of inquiry or held a conception that was irrelevant to the demands of the EE process. Likewise, IB DP students as a group rated themselves as fairly confident on foundational inquiry tasks and less confident on the more advanced inquiry tasks. All three sources of data measure different dimensions of cognition and yet corroborate each other. Therefore, we are able to conclude with confidence that the IB Diploma Programme, and the EE component of it, positively influence the learning and use of knowledge by 11 of the fifteen students in this study.

The quantitative results of Phase II indicate the mean self-efficacy ratings of IB DP and non-IB first year undergraduates were not significantly different on the advanced inquiry task factors. However, they were significantly different on the foundational inquiry tasks. The self-efficacy rating differences slightly favor the non-IB students. Overall, these results suggest that some form of more direct instruction in teaching students strategies for how to inquire may be warranted in the EE support system for students.

LITERATURE REVIEW

Elisabeth Fox (1985) cited internal school surveys and follow-up studies to note the "particular tribute [IB graduates paid] to the value of the extended essay as a rigorous and stimulating preparation for college" (p. 60). The first Director General of the International Baccalaureate Organization (IBO), Peterson (1987), explained that feedback from both students and teachers convinced him of the curricular merit of the extended essay. Although the research essay started disappearing a decade ago from many high school curricula, (Fitzhugh, 2004), it remains central to the IB Diploma Programme. The research essay is often considered an effective tool for challenging students and engaging them in high-level academic work. Students pursuing the IB Diploma must complete an EE, which, according to the IB guidelines, is reported to entail approximately 40 hours of work and culminate in a 4,000-word research paper (International Baccalaureate Organization, 2007). Essays, which are assessed by trained outside examiners according to established rubrics, are worth up to 3 points toward the 24 points that students must amass to earn the

IB Diploma.

Munro (2003) empirically studied the mark students received on the EE, and its relation to their motivational orientation. He found that students earning the highest scores on the extended essay were equally motivated to increase their knowledge of a topic (a deep motive) and to achieve understanding at a high level relative to others (an achieving motive). By contrast, students receiving the lowest scores on their essays claimed to favor understanding motives over achieving motives. Conner (2009) carried out a study comparing different IB Diploma granting schools on a variety of curriculum features believed to engage students in learning, including the cohort of students enrolled in each school. He concluded from his results that "If engaged students are the goal, then my findings suggest that the extended essay component of the IB program can flourish or flop in very different school sites (p. 35)." Similarly, the findings show that a wide variety of structure and support practices can yield engagement for different groups of students.

Since 2009, there have been several recent survey studies that provide evidence in England, Canada and the United States that IB Diploma graduates who have completed the EE achieve better than students who have not been enrolled in the IB Diploma Programme (HESA, 2011; Aulls & Lemay, 2012). A comparison of IB Diploma graduates to A-Level applicants in UK universities shows that on a variety of criteria the IB Diploma trained population obtains more positive outcomes (HESA, 2011). Results from the Inkelas, Swan, Pretlow, and Jones (2012) study show that the EE does have a significant relationship to students' research confidence and willingness to engage in future research. IB students at the University of Virginia in the United States were significantly more likely to indicate that they felt prepared for college-level coursework involving research than former AP students at UVA. Moreover, the IB alumni felt strongly that their EE experience prepared them to conduct the various facets of the research process, from identifying the research problem to creating the references list, etc. However, the investigators also reported that UVA students' perceptions of preparedness for undergraduate study due to participation in the EE had a low correlation (between .24 to .47) with their current confidence in their research skills as undergraduates.

There is also considerable research that supports the claim that positive learning outcomes are associated with approaches described as inquiry-based in university classrooms in different disciplines (Justice, Rice, & Warry, 2009; Prince & Felder, 2006; Spronken-Smith, Bullard, Ray, Roberts, & Keiffer, 2008a; Spronken-Smith, Walker, Batchelor, Angelo, O'Steen, & Matthews, 2008b). Nevertheless, there are researchers who challenge the warrant of any kind of inquiry instruction to promote valued learning outcomes in education (Mayer, 2004) or in the sciences.

Two instructional dimensions appear to be present in every current kind of inquiry based instructional model described in the educational and educational research literature (Spronken-Smith et al., 2008b; Loyens & Rikers, 2011). First, there must be evidence that college or university students are engaged for substantial periods of time in activities such as the EE. Second, there must be evidence that students are engaged in active learning (Windschitl, 2004; Gergen, 2009). Active learning is based on active thinking and active

communication among all participants. We believe that the EE includes these two dimensions within an instructional model that combines coaching by a supervisor, the provision of ample time for students to engage in the EE and ample opportunity due to small class enrolments and provision for adequate library resources.

Research-Teaching Nexus in Undergraduate Programs

The inclusion of the extended essay as a prominent part of the IB curriculum appears to be predicated on the assumption that the opportunity to pursue research, the development of research skills and the systematic engagement in the research process will be relevant to their success as an undergraduate, in at least the best universities. From a research-teaching nexus policy perspective, higher education experts have argued that there should be a balance between undergraduates experiencing research by reading it, discussing it, learning about research methods and doing their own research. The IB also makes the assumption that the EE will offer the opportunity for pre-university students to engage in learning that will have a positive impact on students' academic adjustment to the freshman year at university (IBO, 2007).

Interestingly, participation in the EE process includes all the aspects that Healey (2005) suggests except learning about discipline-specific research methods. Furthermore, research with undergraduate university students indicates that research methods courses are perceived to be difficult and create considerable anxiety among students (Sizemore & Lewandowski, 2011; Ball & Pelco, 2006; Benson & Blackman, 2003; Marek, Christopher, & Walker, 2004; Papanastasiou & Zembylasb, 2008). The best universities typically hold as part of their mission statement that research and teaching are central to their purpose and function. How undergraduates experience research at university has not often been described qualitatively, and only recently have researchers sought out students' perspectives on how confident they feel about accomplishing a variety of different kinds of inquiry related tasks that are embedded in doing a research essay like the EE (Levy, 2008; Levy & Petrulis, 2007; Pajares, 1996).

The actual importance given to research and research skills in relation to the student experience in undergraduate degree program courses and research activities has been questioned. Moreover, in some universities during the last decade considerable efforts have been made to offer more opportunities for first year students to become more actively involved in coursework and to offer some opportunities to engage in research through courses and other ongoing research activities of the professoriate of the university (The Boyer Commission on Educating Undergraduates in the Research University, 1998; Elton, 2005; Badley, 2002; Brew, 2003; Healey, 2005; Healey & Jenkins, 2009; Justice, Rice & Warry, 2009; Justice, Rice, Warry & Laurie, 2007b; Marek, Christopher & Walker, 2004).

Nevertheless, the typical university undergraduate major often offers limited or no opportunity to actively engage in a self-initiated research study over an extended period of time. The EE is based largely on a student self-directed and/or coaching model of instruction, in the sense that they are given the EE opportunity and offered guidelines for how to proceed as well as individual supervision for a suggested period of three hours over

a period of one year and a half. However, it does not appear that the official curriculum provides for formal IB courses in research methods. Yet, considerable attention is given to making IB students aware of the nature of the challenge of doing an extended research essay based on basic methods that are common knowledge in the humanities and the sciences. Students appear to readily recognize this challenge because of how the curriculum is structured, that is (a) the length of time given to carry out authoring an EE, (b) the use of school guidelines that are developed locally to guide students in their efforts, (c) the individual IB student supervision by IB teachers that requires face-to-face teacher-student verbal exchanges about the EE topic and the management of the EE reading and writing process, (d) the necessity of finding and learning how to use resources from which to get information, and (e) the management of a heavy course load at the same time they are doing the reading, the writing and purportedly the thinking processes that emerge during the authoring of the EE.

Wray (2013) says that in England, IB student descriptions of the EE instruction most often refer to instruction as offering (a) a faculty directed course on ways to manage the complete essay writing process, and issues of writing style or (b) a short power point presentation on how to do research, where students can be made aware of the global procedures for doing research. There is no evidence from the interviews with students and tutors in two universities, done by Wray, that IB students are being presented direct face to face instruction on how to do the reading, foundational search skills, writing skills, and methodological skills necessary to do systematic research framed by an explicit research question. The primary evidence that teaching was occurring was reported in Wray's study to be the written and oral feedback given by supervisors on the EE drafts that students handed in to them. Thus, the IB appears to rely heavily on what knowledge students bring to the program from high school, or on the innate ability of the IB student to read critically, to organize systematic searches of the literature relevant to their topic, to record only the most relevant information, and to possess the knowledge of how to generate a researchable question. Students also are supposed to know how to determine standards of evidence to bring to bear on the research question, how to collect data in a systematic manner and go about the analysis and interpretation of findings. This may be too broad and deep a body of knowledge to expect even excellent students to learn in high school, let alone in the first year of university.

The Inquiry Self-Efficacy of the Learner

Self-efficacy beliefs are people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances (Bandura, 1986). In 1995, Bandura refined his initial definition to "beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations." Later on, he again altered his definition of perceived self-efficacy to "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997). What remains constant in Bandura's concept of self-efficacy is that beliefs furnish the basis for human motivation, well-being, and individual accomplishment. These beliefs also affect the course of action people decide to follow, the amount of effort they exert in particular undertakings, and the amount of time they will persevere when faced with obstacles and

failures. Similarly, self-efficacy beliefs influence individuals' resilience to hardship, whether their ways of thinking are self-hindering or self-aiding, the amount of stress and depression they experience when dealing with demanding environmental exigencies, and the level of achievements they realize.

The inquiry self-efficacy of undergraduate students is a topic with little research. However, recently a research instrument has been developed (Aulls & Lemay, 2012) in which self-efficacy judgments differ along three dimensions which are related to performance and academic achievement. The first dimension is the level of task difficulty. Even students who possess high self-efficacy in a particular area may avoid challenging situations, as the students may not be accustomed to the general level of expertise in these situations. Moreover, students may lack strategies or previous knowledge needed to succeed in the task in question. The second dimension is the generality of an individual's self-efficacy. While certain people feel capable of achieving in nearly any academic setting, others are confident in far fewer settings; others may be virtually without self-efficacy. In general, self-efficacy in one domain is not related to self-efficacy in another. The third dimension is the strength of one's efficacy judgments. In general, self-efficacy in one domain is not related to self-efficacy in another. Shaky perceptions of efficacy are vulnerable to disconfirming evidence, while people with strong senses of self-efficacy continue in the face of poor performance and disconfirming evidence.

These three dimensions of judgments regarding self-efficacy are measured employing questionnaire items which are task specific, that range in difficulty, and that capture degrees of confidence (Zimmerman, 2000a). As regards content, these self-efficacy measures focus on performance capabilities and not on personal qualities (such as one's physical or psychological characteristics). Respondents evaluate their capabilities to carry out particular task demands (for example, figuring out fraction problems in arithmetic), not who they are personally or how they feel about themselves in a general sense. Beliefs regarding self-efficacy are multidimensional in form and vary on the basis of the domain of functioning, e.g. inquiry. Finally, judgments regarding inquiry self-efficacy refer specifically to future functioning, and are evaluated prior to the performance of a given activity; thus, self-efficacy judgments are argued to play a causal role in academic motivation.

An important aspect of self-efficacy beliefs about the nature of research and doing research is the actual creation and shaping of inquiry self-efficacy. People form their beliefs regarding self-efficacy through interpreting information from four primary sources (Bandura, 1986, 1997), namely enactive mastery experience, vicarious experience, verbal persuasion, and physiological reactions. Enactive mastery experience refers to the fact that an individual's previous experiences with the tasks in question furnish the most dependable source of information for efficacy beliefs. Success bolsters self-efficacy, while repeated failures sabotage it. A strong sense of efficacy built on the basis of prior successes is believed to stand up in the face of temporary failures. Instead, vicarious experience has to do with the fact that individuals also set up their beliefs regarding self-efficacy on the basis of the performance of peers when accomplishing the tasks in question. Modeling, it then follows, is another effective source of information about efficacy. When there are no absolute evaluations of adequacy and when individuals perceive similarity between the

model and themselves, vicarious experience influences more profoundly the formation of self-efficacy (Schunk, 2001, 2003). The absence of modeling how to do research was reported by Wray to be a concern that British students had about their IB DP supervising teachers (Wray, 2013). On the other hand, the judgment of self-efficacy is also influenced by verbal persuasion and evaluative feedback from significant others. It is when the individuals who convey the efficacy information are perceived as credible and knowledgeable, and when the information is perceived realistically, that verbal persuasion is most effective. Self-efficacy beliefs developed exclusively on the basis of verbal persuasion; however, are easily outweighed by disconfirming mastery experience.

Self-efficacy beliefs have also received attention throughout the last decade of educational research (Pintrich & Schunk, 2002; Zimmerman, 2000a), primarily in studies concerned with academic motivation and self-regulation (Pintrich & Schunk, 2002). In academic settings, self-efficacy research has focused on three areas. In the first area, researchers have reported that self-efficacy beliefs affect people's career choices, especially in mathematics and science (Hackett, 1995; Lent, Brown & Larkin, 1986). The self-efficacy of undergraduate students is a better predictor of interest in mathematics and the choice of mathematics-related courses and majors than previous math achievement or math outcome expectations; moreover, male undergraduate students have higher self-efficacy in the area of mathematics than do female students (Pajares & Miller, 1994, 1995).

Research has also shown that the self-efficacy beliefs of students are correlated with other motivation constructs, as well as with students' academic performances and achievement. In these studies, constructs have included attributions (Schunk, 2001;), goal setting (Schunk & Zimmerman, 1997), modeling (Schunk, 2003), problem solving (Bouffard-Bouchard, 1989), self-regulation (Bandura, 1991; Schunk, 2001; Zimmerman, 1994, 1995; Zimmerman & Bandura, 1994), strategy training (Multon, Brown & Lent, 1991; Papinczak, Young, Groves & Hayes, 2008), and varied academic performances across domains (Bandura, 1993; Bouffard-Bouchard, 1989). In short, self-efficacy beliefs are correlated with other self-beliefs, motivation constructs, and academic choices, changes, and achievement.

In summary, the self-efficacy beliefs that students hold about inquiry, like in other areas, may have a broad impact on the efforts of IB students to complete the EE inquiry task and later in university to accomplish other kinds of inquiry tasks involved in systematic research in their undergraduate major.

METHODS

Study Design and Research Purpose

A collective case study (Stake, 1995, 1998) was conducted. Case studies are bounded systems that allow an in-depth description, analysis, and understanding of a phenomenon bounded by its characteristics. In this study, the phenomenon of interest was the learning that students associated with the experience of completing an extended essay and how this

learning influenced IB DP students' accomplishment of the academic demands presented in the first year of participation in a highly rated research intensive university. Case studies do not aim to generalize results, but instead aim to provide in-depth description and theorizing about learning. Collective case studies sample more than one unique case to achieve better understanding through comparison of cases within the boundary of the case. In this study, the boundary characteristics of the case refer (a) to the International Baccalaureate curriculum design feature common to all schools offering the IB Diploma, (b) the extended essay as part of the curriculum, and (c) the supervision students receive as they participate in the EE.

The main purpose of this study was to describe the extent to which (a) IB Diploma graduates perceive that participation in the EE has had an influence on their learning while in the DP, and (b) has subsequently helped them during the freshman year of university study. A secondary purpose was to describe IB students' conceptions of inquiry and their inquiry self-efficacy.

Participants

This study uses a purposive, criterion-based sample. In total, 15 IB trained students who have entered into the first year of university, coming from three different CEGEPs (College of General and Vocational Education) were sampled. CEGEP is a post-secondary institution in Quebec (where high school ends in grade eleven) that provides compulsory academic preparation for university. Quebec is the Canadian province in which the study was conducted. The decision to consider students coming from different CEGEPs was based on the fact that previous research has demonstrated that the particular cadre of students rather than the various potential qualitative differences in the delivery of the IB curriculum influences the mark students receive on the EE product. The EE constitutes 3 of the 24 points needed to obtain the Diploma (Conner, 2009). Also, we decided to sample students from the pure and applied sciences and the human sciences. The reason for this was that we assumed that the topic selected for study and the purpose and structure of the EE would be shaped by the discipline that students majored in and would be linked to the current academic demands presented to them in the first year of university. The demographics of the sample are provided in Table 1.

For confidentiality purposes, each participant received a unique ID composed of IB and a number indicating the order in which the participant was interviewed. For example, the first participant was referred to as IB 01.

Table 1

Demographic Table

ID	Gender	School attended	IB Orientation	Studies they are undergoing now

IB01	M	A	Pure and applied science	Physics and Cognitive Psychology
IB02	F	A	Pure and applied science	Biology
IB03	M	A	Human Sciences	Commerce
IB04	M	A	Human Sciences	Commerce
IB05	F	A	Human Sciences	Law
IB06	M	A	Pure and applied science	Physics and Computer Sciences
IB07	M	B	Human Sciences	Law
IB08	F	C	Pure and applied science	Biology
IB09	M	A	Pure and applied science	Economics
IB10	F	C	Pure and applied science	Engineer
IB11	F	A	Pure and applied science	Micro-Biology
IB12	F	A	Pure and applied science	Biology
IB13	F	A	Human Sciences	Psychology
IB14	M	A	Pure and applied science	Physics and Mathematics
IB15	F	B	History	Women studies → History

Data Collection

Students were recruited from a sample of 207 IB Diploma students obtained from the university registrar office by sending out a recruitment letter which offered reimbursement of $150 for participating in a 90 minute interview face-to-face in a private room on the university campus and completing a survey instrument. For the recruitment, we followed the names as presented in the list we received, and the first 15 we contacted responded positively to the invitation.

Participants were interviewed and assessed over a period of five weeks. All interviews were tape recorded and then transcribed by one transcriber who spoke, wrote and read both French and English fluently. A prototype was followed in the same manner for all transcripts and checked by one of the two investigators for linguistic and semantic accuracy, formatting, and readability.

Interview. We designed a semi-structured, in-depth interview to assess our primary constructs of interest. Students were given an interview of 60-90 minutes. The interview aimed at exploring participants' descriptions of the IB Diploma Programme and their experiences in it; describing the EE as a process, describing what they learned from the EE experience and how that knowledge was useful. Following the suggestions of Patton

(2002), we also developed a series of probing questions to both ensure the completeness of the information provided and to help participants enrich their responses.

Appendix A provides an example of a complete transcribed interview to illustrate how the interviewer conducted the interview face-to-face.

Measures

The participants completed the McGill Self-Efficacy in Enacting Inquiry Questionnaire (MSEEIQ), a 32 item instrument measuring "Self-Efficacy in Enacting Inquiry". In Phase I, students completed the McGill Strategic Demands of Inquiry Questionnaire (MSDIQ), a three-part questionnaire that addresses three phases of inquiry, which are (a) planning, (b) enactment, and (c) reflection (Shore et al., 2011). For Phase II, students completed the MSEEIQ, an instrument designed to extend the findings from the MSDIQ. The MSEEIQ uses items from the MSDIQ that relate to the enactment of inquiry. The MSDIQ items relating to the enactment of inquiry were then modified to reflect inquiry self-efficacy by adding "I believe that I am able to …" to the stem of the item (Ibrahim, 2013). For example, item 5 in the MSEEIQ instrument asked the student to rate the item "I believe that I am able to say in my own words what the problem is" on a 11 point scale (Ibrahim, 2013). The MSEEIQ is comprised of seven factors. The first factor was "Self-Efficacy in Creating and Communicating Knowledge" and consisted of seven items (α = .89). The second factor was "Self-Efficacy in Analyzing Data and Writing," and consisted of five items (α = .90). The third factor was "Self-Efficacy in Stating the Problem and Asking Questions," and consisted of four items (α = .89). The fourth factor was "Self-Efficacy in Searching and Managing Information," consisted of four items (α = .90). The fifth factor was "Self-Efficacy in Verifying Data, and Testing Hypotheses," and consisted of five items (α = .90). The sixth factor was "Self-Efficacy in Hypothesizing Outcomes and Reasoning," and consisted of two items (α = .90). The seventh factor was "Self-Efficacy in Designing a Research Study and Collecting Data," and consisted of two items (α = .90).

The highest mean among the MSEEIQ factors in previous research (Ibrahim, 2013) was that for the "Self-Efficacy in Searching and Managing Information" (M = 8.45, *SD* = 1.17). The second highest mean among the MSEEIQ factors was that for "Self-Efficacy in Verifying Data and Testing Hypotheses" (M = 8.07, *SD* = 1.28). The lowest mean among the MSEEIQ inquiry process factors was that of the "Self-Efficacy in Hypothesizing Outcomes and Reasoning" (M = 6.92, *SD* = 1.7). The second lowest mean among the MSEEIQ factors was that for "Self-Efficacy in Designing a Research Study and Collecting Data" (M = 7.41, *SD* = 1.51). These findings conform to what one might expect by having students assign the highest rating to inquiry tasks that are initiated earlier in formal schooling and are largely procedural, in contrast to the lowest efficacy ratings being given to inquiry tasks that demand conceptual knowledge and higher order thinking. For detailed information on the factor validity of the instrument see Ibrahim (2013). The full survey is available from the author via email (Mark.Aulls@McGill.ca).

Data Analysis

Qualitative analysis. The two members of the research team read and coded the transcripts from the semi-structured interview. We followed the basic principles of inductive coding (Corbin & Strauss, 2008), consisting of (1) labeling meaning units identified in the transcripts, (2) organizing data into emerging categories (as well referred to as themes) based on their properties (attributes) and dimensions (location of the property along a continuum or range), and (3) identifying patterns and relationships among coded categories. This type of coding relied on constant comparison of instances (i.e. categories, properties, and dimensions) for relations, commonalities, and difference. In the development of categories, we used two types of codes: (1) in vivo codes and (2) constructed codes. In vivo codes represent the words used by participants during the interview, whereas constructed codes include terms created by the researcher when making inferences about what participants are trying to convey. We passed through the first several readings of all transcripts creating only in vivo codes with examples to assure that low inference would occur and the foundations of themes were true to the voices of the participants. In general, the constructed codes were used when more abstract levels of analysis were reached. Coding was terminated when more than 90% of the entire body of transcribed data was accounted for.

The two coders met initially after coding the same five cases selected at random from the pool of 15 cases to discuss the evolution of the coding system, share in vivo codes, discuss analytic memos, and to establish the face sheet codes that apply to the entire body of data, which are (1) the IB programme as described by the participants, (2) the EE as a process, (3) the supervisor's part in the EE process, (4) what was learned from the EE experience, (5) what was learned that helped students cope with the perceived academic demands of the first year of university, and (6) the feelings students associated with the EE process and their first year university experience. The researchers then divided the cases between them for further coding and then met several more times to update the emerging typology of researcher and in vivo codes, to do reliability checks on new codes brought up by either researcher, and to review their applicability to each set of cases.

Table 2 shows the evolution of the category of motivation from the first coding system we developed until the last one. The full set of codes is shown in Appendix B.

Table 2

Coding Systems

First coding system developed	
Motivation to go to IB	• Challenge
Motivation to stay at IB	• The students in IB DP were there to work. • It was like a working place, environment of studies, of work
	• A good place to learn
	• You feel at ease and the people were really intelligent and nice

Sixth coding system developed

Motivation to go to IB	Challenge	Program
	Social Status	
	Other	
Overall personal and academic experience at the IB	Hard working place	
	Learning and training opportunities	Curriculum
		Trips
		Interchange with peers
		Interchange with knowledgeable professors
	We were a small group	
	Challenging peers	
	We helped each	
	Some course were completely useless	
	Marking system	
	It was pretty good, helpful, I liked it a lot.	
	Other	
Perception of IB as compared to ordinary college		

The computer software MAXQDA (VERBI GmbH Software, version 10, Germany) was used to support the analysis of our data.

Quantitative analysis. Descriptive statistics were calculated for each inquiry factor on the MSEEIQ. Independent samples *t*-tests were used to test the significance of the difference between the mean Likert scale score for each inquiry task comparing two groups of students (IB and non-IB).

RESULTS AND DISCUSSION

The results will be presented to first establish how students perceive the DP distinct from the EE. The next results describe what students perceived to be the process they went through to accomplish the EE. Then we describe evidence for what students perceived they had learned from participation in the extended essay. The evidence is based on the inductive categories derived from open coding and transformation of these categories into themes through axial coding. We then analyze how students perceived the EE experience and the IB experience to help them cope with the academic demands of university courses. During this analysis, we also try to determine how often and how many students were presented with the experience of research by reading about it, interpreting it for specific purposes and actually carrying out an extended project or experiment, which entails fundamental inquiry tasks included in academic research within a particular discipline. The consequences of this analysis led us to attempt to extract from the interview data the conditions that were alike and different when the IB DP is compared to the academic demands of the first year of study in a research-intensive university. We did this to help us explain the most typical barriers that students reported they faced in meeting the academic demands of the first year of university and to contrast them to the demands that the students reported as being overcome by what they had learned during the completion of the EE while in the IB Diploma Programme. In order to use other lenses into what IB graduates learned about inquiry, we attempted to compare the IB group's conceptions of inquiry relative to 280 other undergraduate students sampled from three universities, including the one they were attending. Our rationale here was to see if proportionally more IB students conceptualized inquiry more along the lines of research than learning or teaching. The second lens we used to triangulate against results from the interview data analysis was to determine the students' self-efficacy as inquirers using the MSEEIQ, which is a 32-item questionnaire based on a Likert scale of 11 points. Students rated themselves on the 32 items measuring how confident they felt in accomplishing the inquiry tasks. We compared the mean scores on each subtest a group to 207 IB students at the same and two other universities, and 144 non-IB students. First, we wanted to see if the efficacy ratings appeared to match the qualitative results and then we wanted to determine if the IB students were efficacious to the same extent on the same or different factors and subtests than the non-IB students. The qualitative, conceptual and self-efficacy data were then triangulated with the other qualitative results as a means of establishing the validity or trustworthiness of these results.

Qualitative Results

Students were asked to describe the nature of the IB programme as they had experienced it. We present next the results of their qualitative data analysis by portraying the IB programme experience through the voices of the participants followed by their specific experience with the EE including selection of the topic and support from the supervisor. Finally, we discuss the learning outcomes and the implications at the university level.

How students described their past experience in an IB Diploma Programme. The face-to-face interview began with a discussion about the students' overall experience in the IB DP, and more specifically, the reasons for undergoing the IB DP and their overall personal and academic experience with DP. These students mentioned two main reasons that drove them to go the IB programme. The first reason was the challenge the IB represented, as clearly stated by the IB 02 student: "Okay, well first of all I chose to do the IB because, I'm very… I like to challenge myself and I heard before, prior to entering the IB that it was a very challenging, hard program." This intellectual challenge was a necessary step to future success, basically because the program questioned their former parameters. The IB 08 said:

> *. . .if you want to have a good program in university you really have to work hard. And I like to do things well, so I figured at first that like the best way to achieve as a person would be to aim for good grades, but the IB programme changed my conception of this, and made me realize that it's more about the how likely I am to think about things. And that is important and not necessarily the grades themselves! So, that changed a lot my conception.*

Another reason that moved these students to consider going to the IB was "the possibility of interacting with who they describe as being 'the top of the top' (IB 02)," especially referring to class peers. IB 04 elaborated on this and explained that before entering the program, he heard that IB students were "intellectually curious, people who want to learn, and people who are like relatively high achievers." Thus, the idea of belonging to such a community reassured them concerning whether or not to go to an IB granting school.

In regard to overall personal and academic experience at IB, these students mainly discussed positive experiences. First, they explained the IB was a hard working place. The IB 09 explained: "Well basically the work... A lot of work, by the way! Usually there are 27 hours of class and other stuff, like that's the class plus homework and so it's a lot of work." This amount of work, in some cases, took these students by surprise as they were used to achieving their academic goals at high school without deeply compromising their studying endeavors, as IB 13 mentioned: "Okay, well at first, to say the least, it was a bit of a shock. Because it was a lot of work to start with I had good grades in high school without really giving any effort."

Second, interviewed students elaborated on how learning and training opportunities in the IB programme prepared them for future endeavors. In this vein, three elements of the programme were highlighted: (1) the theory of knowledge course, (2) the EE, and (3) the creative action service, students referred to as C.A.S. Concerning the theory of knowledge course, IB 03 expressed: "And the one we did for theory of knowledge was also pretty useful. It really led us to think about what we learned in class." Furthermore, the

importance of this course was that it taught students critical thinking, as IB 04 shared: "Even though I respect my professors, I'll never take what they say for granted." In regard to the creative action service, it allowed students to do volunteer work and profit from interesting experiences, as mentioned IB 04:

> *I actually had the chance through the C.A.S. to go spend a month in the Philippines doing volunteer work over there. I got a chance to even do artistic stuff like being a choir leader. So things that I wouldn't normally see myself doing, but you did them because you had to but when you were in them, you really enjoyed you were doing so.*

The majority of the students agreed that one interesting feature of the IB programme was the fact that classes were organized as small groups, as such, people knew each other and shared both personal and scholarly experiences and teachers were at their disposition for intellectual discussion.

These students mentioned that in the IB programme, peers were challenging. This was crucial to push the limits a little bit further, as IB 09 said: "The people most, almost all of them who stayed [in the IB program], all of them are hard working. So it's a good environment for working, like it encouraged me to do more, to work with them and yeah…" Even though the IB fostered the search for excellence, which was highlighted by peers, these students explained that they supported each other.

Students discussed two negative aspects of the IB. First, they mentioned some courses were useless and they had no right to avoid taking these courses because, as IB 09 explained, IB is a "bundled program."

> *There was something I wanted to complain about really badly… Oh yes! Biology! I don't know if it is a requirement of the IB or a requirement of my CEGEP but apparently all social science students had to do one science class. It was like a requirement; no you just couldn't go around that. And our science class was already chosen for us and it was biology. And it was probably the biggest waste of time in my life because I have no, I have zero interest in biology. . .*

Some students complained about the marking system as well, explaining that sometimes the decisions were not transparent. In this regard, IB 03 said:

> *But the evaluation criteria were very strange and like we tried as best as possible to conform to the evaluation criteria, obviously to get good marks, but that didn't always work out as we thought it would. So that made it a bit weird. English and French, I guess we had to write essays anyway so that didn't really make a difference.*

Overall, both at a personal and academic level, the students stated that IB was a positive experience. For example, IB 15 said: "In general, it was pretty good, I quite, I enjoyed it, yeah. I liked it a lot." IB 04 went even further when saying: "Well, I'll tell you for starters, it's probably the best decision I've made in the past few years." However, as recognized by IB 02, the performance level is simply not adequate for everybody: "It was good for me

anyway. I think it's not for everybody, I don't think the IB is for everybody. If you are not ready for it or if you don't... I don't, it's just, it was definitely for me, I'm still happy I did the IB."

How Students Perceive Their Experience of the EE Process. Students' perceptions of the EE as a process to some extent is shaped by the guidelines that each school prepares to guide them through this process. Perusal of several of these guidelines on the internet shows common curriculum features. They explain what the EE is, the nature of the process it entails, the steps students should follow in producing the EE, the nature of the role of the supervisor, how the completed EE will be evaluated, and the points that can be earned and counted toward the IB diploma. In order to initially gain insight into the EE process, carefully read the example we provide in Figure 1 from an authorized IB Diploma Programme[1].

Step	Due Date	Consequences for Missing Step
Spring EE Meeting w/Jars EE instructions presented and explained	March 21 or 22, 2012	You'll be one step behind everyone else and may not get an advisor.
Research Proposal/This must be turned in to Mr. Sullivan room B-7.	May 4, 2012	This is your first assignment for the next year's TOK class. Unlike most assignments, it will be graded as either complete (100%) or incomplete (0%).
EE Research Overview- F-3 with Mr. Sullivan.	May 23, 2012	This paper requires you to do old-fashioned research- in a library with journal articles and books. The internet might be useful for one or two sites, but serious academic research is still done in print.
Detailed Outline In this step a detailed outline must be submitted to your advisor and TOK teacher to show progress on your paper in preparation for the rough draft due date	September 6, 2012	The detailed outline is a graded assignment in TOK next fall. TO get an A on it, all of your advisor's requirements must be met. After reading your paper, your advisor will fill out the Detailed Outline Response Sheet and send it to your TOK teacher

[1] This material is available online and is not from a school used as a case study school for this study. The materials were used because of their online availability and are intended as an illustrative example.

Rough Draft In this draft you must show your advisor that you can follow his or her advice. This should get back to you in approximately two weeks.	October 26, 2012	The rough draft is a graded assignment in TOK next fall. To get an A on it all of your advisor's requirements must be met. After reading your paper, your advisor will fill out the Rough Draft Response Sheet and send it to your TOK teacher.
Final Draft Three copies are needed. And turned in to Mr. Sullivan in a manila envelope with your name, topic, and advisor's name	January 22, 2013	Completing the final draft by the due date is a grade in your TOK class. The final draft must be accompanied by your folder, accurately and completely filled out.

Figure 1. Process-Specific Steps

Students described the process of participating in an EE in our interview after their description of the IB programme in general. Through open coding we found that the typical student talked about (a) the support he or she received on how to do the EE, (b) self-regulation of the process by the student, and (c) temporary events arising and how they managed them. All of these themes are evident in the sample of student descriptions of what they experienced during the EE process. Illustrative quotes are shown in Table 3.

Table 3

Illustrative quotes for the emerging themes

Theme	Quote	Source
Support	*Afterwards, my supervisors made a lot of commentaries on what needed to be changed so I reworked another 15, 20 hours on it. Then I gave it in again, he corrected it, and once again made me do a couple of small changes. And so then I made the final version, then, by myself, printed the final version, well the pre-final version let us say, then I checked everything, sentence by sentence to correct my English which isn't perfect.*	IB 10 (Biology major)
Self-regulation	*The stage that I liked the most was doing my plan. When my plan was finished, it was the first time in my life that I had done such a big project. When my plan was finished, I thought "Now I have something that is concrete, I am no longer in a void, I can now say that I've done something", you know. Now I had a plan, I had something that was tangible. So that is an experience from the EE, doing a plan.*	IB 07 (First year of Law)
Management of temporary events	*I had two years in CEGEP actually. And, I started in the summer, it took me about I would say four to five months*	IB 13 (Psychology

	to do that. I thought, I actually thought that because well since that was the discipline I had in high school, that it wouldn't take me long to do it. I was very wrong. I pretty much had to write it, again, completely four times. Four times. Completely, from beginning to end and it was 5000 words each time, so it took about four to five months.	major)

The IB policy document states "the EE asks students to engage in independent research through an in-depth study of a question relating to one of the DP subjects they are studying." There is no doubt that the IB students we interviewed perceived their EE experience to be an in depth study in the sense that it lasts a period of one year and a half, and it challenges them to identify a topic that they are knowledgeable enough about to ask a question of significance to them as opposed to what might be judged significant to scholars in an academic domain. The IB guidelines also recommend working with a supervisor between 3- 5 hours total. This includes time spent with the student conducting a concluding interview (IBO, 2007). Selection of a topic and supervisor support were significant points of discussion with the students and are explored in the sections below.

Choosing a Topic for the EE. All of the 15 students recognized that the topic selection was a very difficult part of the EE. Table 4 shows the topics of students extended essays, their familiarity with the topic and the mark received when the EE was formally evaluated by the IB.

Table 4

The Topics Students Selected, its Familiarity to them and the Final Mark obtained from IBO

ID	Topic	Were they familiar with the topic they chose before working on it?	Mark - scores
IB01	The Economic Benefits to the Economy of an Education in Dollars and Cents	He changed fields from Romantic literature to philosophy and was completely uninformed about major philosophers so read for a year from philosophers suggested by supervisor	C
IB02	Literature review on a biology topic	She aimed at doing an applied experiment, but as she did not have time she did some lit. search	C
IB03	The return of investment on education	He superficially knew the topic and he wanted to learn more about it.	C
IB04	The gold standard and inflation	It came out through discussions with the supervisor and his father. A topic that he was interested in.	C

IB05	The Influence of Social Media on Mass Media	Curiosity about Obama's election in 2008 in terms of the impact, the role that social media played in it	A
IB06	Victor Hugo's perspective of children	Did not want to do another lab report so picked something he found interesting in personal reading	B
IB07	The Barbarossa operation	Personal interest in that period	A
IB08	Comparing two ethical theories	She wanted to have a better understanding of a topic she was interested in and she found it was a narrow and manageable topic	B
IB09	A comparison of two method of electrode plating	He was interested in doing this experiment	D
IB10	Animal cruelty	Just personal interest	B
IB11	A comparison between chemotherapy and cellular therapy as treatments for Acute Lymphocytic Leukemia	Initially she wanted to be a physician	C
IB12	How distance influenced the blood splatter on a screen	She found CSI series appealing and she decided to do something related to it	B
IB13	Truths and lies	It came as an interesting topic discussed in class	A
IB14	Spheral conductivity	Personal interest in the topic	B
IB15	Duplessis influence on Quebecois cinema	Personal interest in the topic	A

The issues surrounding the successful selection of a research topic is something that educators should pause to reflect upon since motivation to pursue deliberate study of a topic is usually more likely when the student is free to choose the topic. However, after this condition is fulfilled the contribution of interest and sustained motivation becomes very difficult to predict. Research studies indicate that being interested in a topic and being knowledgeable about it are often very different conditions. Moreover, interest can be simply a curiosity requiring little effort and serious study or it can be a compelling object of inquiry where interest remains over years of time, sustains motivation to learn more, and becomes a broad and deep knowledge.

There also seems to be an emotional component to genuine interests. For example, research conducted in Australia and Canada suggests that both individual interest variables and specific text titles influenced topic interest regarding expository text selections (Hidi,

2000). Examination of processes predictive of text learning indicated that topic interest was related to affective responses, affect to persistence, and persistence to learn more. Combining self-rating scales with dynamic measures of student activities provided new insight into how interest influences learning (Hidi, 2000).

In this study, some students, like IB 07 and IB 10, chose to select topics from high school that they had already studied . As stated by IB 10:

> *That I was going to be able to write about something that I liked and in the end minimize, not the effort, but the time required to do it. It was a subject that I already knew so; it was the subject of animal cruelty. So obviously, I liked doing it because I am very passionate about this subject. I read books, and then so it was fun.*

While this behavior may lead to accomplishing achievement goals, it may also interfere with deep learning outcomes. IB 07 said she did this because she expected to have other concerns occupying her time such as writing applications to universities she hoped to attend. Other students left topics they had read a good deal about and planned to use for the EE because the supervisor encouraged them to do so. Managing this particular situation is important since for the student to succeed there cannot be too great a gap between what the student already knows and the acquisition of new knowledge. And indeed this is probably why the IB recommends students base their EE on a subject they are also studying in the Diploma Programme. Still some students do appear to go beyond topics covered in the IB Diploma Programme courses based on previous interests.

Working with the Supervisor. What happens during supervision is perceived by the students to be a very important part of their experience of the EE process. Students had more to say on this topic than any other topic raised by the researchers during the interview. The supervisor is emphasized by all students as having been especially important to helping them identify sources of information to confirm a topic and to eventually generate a research question. The IB does not have a time requirement allotted for this role, but suggests 3-5 hours over a year and a half for each student. Students were more positive than negative overall about the supervision they received. However, the finding, keeping, and readjustment to supervisors who did not follow-up with scheduled meetings was an ordeal to several students.

The interview data suggest that while some students select the supervisor on the basis of being an outstanding classroom teacher, this criterion is not always sufficient to assure the supervisor will actually show up at meetings, give timely feedback at different points in the project, and fully consider the skills and competencies of the individual student as they guide them through the EE. Illustrative quotes are provided below highlighting the support themes that emerged:

IB 02

> *I guess I was really hoping more guidance out of my supervisor, I think that's what they are there for, for additional guidance.*

IB 04

I say, he's the one who ensures that you are in a, you are in a good path like you are in a good way. Because sometimes we get like out of subject sometimes but he would always bring you to the right way. So I think that's his role, and just clarify all the ideas that we had. Because everything that I had in my mind was all brainstorming, it was all like not clear but then he would say something and it would all clear up. So that was kind of his role and yeah just being there and providing materials that we need too, he would do that for our needs, that was good. Well overall, it's more through discussion I'll say. By discussing with my course supervisor,

IB 08

He made me redo it five times. My supervisor in this exercise was someone who was extremely motivated, he helped with my work, and not only with my research because I didn't do it properly, but everything related to the text's structure, the organization of my arguments, the order, the format.

No, I had access to every single references that I wanted. He, the teacher that was supervising me was affiliated with two other universities and he had access to their libraries and everything. So if I needed anything, I just had to ask.

IB 15

Yeah, no. He was really supportive. He like, I went to him like tons of times with like drafts and like my plan. He helped me change it, I think, almost ten times before I had my final draft and all through it the writing of the paper, I came to him and he gave me advices, and he even told me "Oh you should go look at that library or talk with this, that guy, that girl"…. and I guess the final product also because he gave me like really good comments.

People are not the only resources at an IB student's disposal. In the interviews, students remarked on laboratory and library resources without being directly asked or cued to do so. These reflections do not represent every student's input in the sample but they do represent the full range of unique remarks by the 15 respondents and are spontaneous and not cued by the researcher.

Learning Outcomes. Students responded to one semi-structured question as well as follow-up probes during the interview, and focused on what they perceived to be among the most important learning outcomes of completing the EE. Table 5 lists all the in vivo and researcher categories generated in the responses of the 15 students to the question "What were all the things you learned from doing the EE?" and elsewhere throughout the interview.

Table 5

Themes and Categories for What Students are Learning from the EE

The EE as a learning experience	• *Learning more and more about the topic* • *To go search for information, to learn what is important in that information and to do something new with it… a way to generate new information* • *You have to do more than read and understand, you have to create links and make the information your own* • *I learned how to do research and the hardest part is to organize what I learned (to mix may topics and subjects together that are not normally made to go together) into categories before writing as a plan to follow as I write.* • *But then you realize limitations are really important…Okay, so what was wrong with this experiment?* • *Research can be very long before you get actual results- the experience of doing a long project* • *Organization and planning- Well, what the overall structure of a really big formal paper is like- Planning before you begin- Managing the doing of research while doing many other things* • *A big formal lab report and paper must include… the introduction, the discussion, the conclusion and the limitations- It is the first time that I got close to the overall structure of a really big formal paper with an introduction, the discussion, the conclusion and the limitation* • *I got rigor in my work* • *I learned about methods of writing a research essay* • *Doing research and participating in an inquiry activity* • *Writing an extended piece of work- The way to structure a long project* • *Learned library research skills* • *Learning that research can be fun rather than a chore* • *Understood the structure of a lab report* • *Realization that the lab(s) was to form us for the big papers. It made me appreciate all the steps we do for the lab* • *The experiment (design of it) was hard but working with the data was to learned the formalities of research* • *Learning New concepts on my topic* • *Learning about areas of physics I wanted to know about* • *Learning new concepts about my research topic*
Learning from Doing the EE	• *Personally I was never very concerned about doing research later so I consider doing this (EE) as "painting by numbers"- Research methods more than any theoretical or creative aspect of EE- How to gather and build up information so that it results in a body of knowledge- Analysis of ideas- Problem solving- More a problem solving experience- I had a question to answer and a series of recommended steps to follow- Being creative- Problem solving and being creative- Boding with the field- That*

	in conducting research I was the main author…, I started thinking like "I want this data, I need to find it!" What it's like to go in depth into a subject- Doing in depth analysis of a subject.
Self-regulation strategies	• *Self-regulation of the solving of problems that arise* • *How to organize my ideas (before, during and after writing)* • *I give myself steps to realize those goals* • *How to organize my ideas in an essay that will have some coherence* • *How to organize an argument that brings the leader to a conclusion that is not too farfetched* • *I'm more organized regarding work… essays, exams, everything I have to do* • *How to organize a coherence argument* • *Organization of time to write "no matter what"* • *Don't procrastinate* • *I learned to reach out for people (Help seeking)* • *Independence* • *How to formally report what I learn (for an experiment)* • *How to select a research question* ***Organization for a research paper*** • *To be more disciplined* • *Planning how to do future research* • *Getting used to having to plan even when you work a lot anyway* • *Set goals that are attainable* • *Setting learning goals* • *Pacing of the research steps (in terms of time allocation to each step)* • *Select a motivating topic* • *How to select a research topic* • *Finding a topic takes time* • *Planning a research topic that matches prior knowledge enough that the learning curve is not too steep* • *More check points as you do the research essay to guide pacing and to find out where you stand* • *Balancing your time between courses, social life and the EE* ***Searching*** • *Trying to find information* • *How to get information* • *How to structure the search for information from a credible source* • *How to use the library* • *Use multiple authors to say all I want to say,* • *To find and use sources I understand ,* • *How to better find information*

	Reading strategies • *Reading academic papers not just books* • *Read critically* • *Separate the important and unimportant information* • *Use many authors to say what there is to say(about a topic)* • *How to gather and record information from books* • *Note taking to efficiently remember what was read,* • *Try to use everything that I read* • *It was really just reading (referring to the research as reading as opposed to the writing of EE)* • *Summarize as you build your ideas (read multiple documents)* ***Essay Writing Strategies*** • *The first time I spent so much time rewriting; it describes my whole experience* • *Rethink and rework (drafts)* • *Skill in synthesizing a draft* • *Arrive at a complete conclusion* • *[So we have a thought, we arrive at a conclusion* • *Our conclusion makes us go back to the beginning and we redo it. We arrive at a second conclusion we find that this conclusion is still not complete, and we didn't arrive at the end yet, and so we go back at the beginning and we do the whole argument again.]* • *How to bring the reader to the conclusion I have drawn from my research.* • *Circular reasoning would be a good word to describe my (writing) experience.* • *When we have like a lot of data it is not easy to get to a conclusion.* ***Motivation*** • *You have to be motivated, determined…I think it's especially that and the rest are competencies.* • *You really have to enjoy doing what you do to pursue a project that takes you so long and so much time. (perseverance)* • *Motivation to persist* • *Research can be motivating.* • *Be motivated when you do a search on your topic*
Feelings related to doing the EE	• *Positive feelings: happy, satisfied, enjoyed, unpressured* • *Negative feelings: overwhelmed, a bummer, kind of disappointed, angry, very disappointed*
Overall appraisal of the EE	

Self-evaluation	• *Self-evaluating and responding to unexpected situations* • *Not to procrastinate* • *Lax in self-monitoring pacing of the research steps* • *I grew from doing the project as well as learned some things* • *Never to underestimate opinions because they come from experience* • *Being more independent and taking responsibilities* • *I learned that research can be somewhat fun* • *I learned a lot about myself (in vivo)* • *I learned to use others criticisms and complements to apply it to my work instead of being angry about it* • *And it opened my eyes upon a lot of, a huge aspect of my life. How I saw everything. The fact I couldn't, for example, judge people from their opinion.* • *It wasn't just about the project anymore, it wasn't just about the grade anymore, and it was about something I did* • *It's something I was proud of, It's something that I grew on me…sort of.* • *I learned never to underestimate opinions, other's opinions as extreme as they may sound. (Like Kant himself, I thought it was very extreme, and I thought that it would be easy to be against him sort of speaking.)* • *I learned to be more serious in my work* • *To be more resourceful* • *To have a lot of patience* • *To see and accept help from others* • *To accept criticism from experts and peers*
Other	• *Pride of ownership and supervisor- student and student talk*

Table 5 indicates that students elaborate most on the first theme of the experience of EE as research. The second and third themes that occur are self-evaluation and self-regulation. Closely following is the fourth theme of learning from doing the EE, which includes the literacy skills of reading, writing and searching. The remaining themes are organizing for the EE and motivation, but are far less elaborated than the other themes.

Overall, the open coding resulted in 123 in vivo categories that represent student responses to the question "What did you learn from participating in the EE?" There are 10 themes. Each of the themes then is elaborated on by seven or more in vivo subcategories or category properties. The two grand themes that organize all 10 themes appear to us to refer to (1) learning what the EE entails as a process of inquiry and its representation as an essay structure, and (2) self learning through meeting the cognitive and social demands of participating in the EE process over a year and a half. The self learning done by the student includes (1) evaluation of self in terms of what to do, what not to do, (2) literacy and

organizational skills that underlie the quality of the research experience and learning how to accomplish inquiry tasks that make up systematic inquiry and (3) motivation to inquire. One other researcher-generated category is ownership of the EE process and product. Both negative and positive feelings are part of students' responses to the interview and lead to the last researcher-generated category.

Four of the categories reveal that learning about the EE includes learning (1) the basic structure and procedures for doing humanities research or pure and applied science research reports on an experiment, (2) learning strategies for the independent self-regulation of research, (3) literary skill competencies like reading and writing strategies, and (4) search strategies. All of the literacy strategies have been shown in the educational psychology research literature to be relevant to explaining student learning differences in different subjects in post-secondary learning contexts (Onwuegbuzie, 1997; Shore, Birlean, Walker, Ritchie, LaBanca, & Aulls, 2009; Zimmerman & Bandura, 1994; Zimmerman & Kitsantas, 1999).

One of the "other" categories refers to the quality of the verbal interactions between the students and the teacher. For some students, doing the EE was a very lonely activity while others depicted it as more like a community of learners supporting each other. This category also concerns student dialogue with the supervisor, parents and friends. Students point out that they appreciated having regular supervisor feedback on their EE through all its phases not only the first phase of planning or when it is turned into a final draft. Yet, only about 50% report that they were getting such feedback. However, everyone got feedback at least on the final draft manuscript before sending it out to be formally evaluated. Only seven reported having to revise a draft two or more times over the one and a half years. Some point out that student research topics spill over into basic courses and trigger rich discussions, which can be helpful to the research inquirer.

What students learn from participating in the EE appears primarily to be a function of the interaction between the self, the cognitive strategies, and the literacy skills necessary to navigate the EE as a research process. Students not only learn more about how to do the academic and social tasks entailed in the EE, they also view themselves changing as learners. Students who are exposed to very similar IB organizational guidelines for the steps of doing the EE and standards for interpreting the essay quality, appear to place a differential emphasis on the self and cognitive dimensions of the EE learning experience. There is no evidence in the interviews that any supervisor or teacher directly taught students how to do reading, writing or search skills, although some modeling of strategic learning undoubtedly happened when a supervisor acted in her role as a mentor to the student. Indeed, the data show that the supervisors were depicted by students as having undertaken several kinds of teaching roles, including combinations of (1) mentor, (2) model, (3) guide, and (4) manager. Research (Aulls & Ibrahim, 2012) suggests that teachers deemed by university undergraduate students to be good and poor teachers are distinguished by the number and quality of the roles they play this is an important area for future research on the EE process.

What learning is given the heaviest emphasis? The previous analysis has described the major themes and categories that elaborate what the group of 15 students perceive they have learned from participation in the EE. The excerpts from interviews with the next cases offer further elaboration on the individual differences in student emphasis on what is learned. While we could have attempted to determine the emphasis for all 15 cases, our intention is only to illustrate that there are individual differences associated with the emphasis given to some of the themes. Because post-secondary and pre-university students are seldom asked to inquire at length about topics or phenomenon in their lives, many felt they were facing their first academic assignment that genuinely challenged them. Part of that challenge would appear to be originating from their individualistic nature as learners.

Example 1: IB 01. He appears to place more emphasis on **self learning** when telling his story of what happened during the EE experience as learning:

> *Well, I did my EE in philosophy. I almost did it in literature from the Romantic period. I spent the Fall and Winter learning about the major philosophers so I could be in a position to identify a topic. I mean well it was not easy. It was a challenge not only in terms of organizing my time and getting myself to work and everything but it was also a challenge to sort of keep the will to work and find a question to answer and finish. Yes, actually I had my idea before coming, before entering the IB. And actually this EE, this project, was one of the reasons why I decided to go in the IB. I thought it would be interesting and educating experience.*
>
> *Yeah, I'm the kind of person that when there is something to be done, I like to try to start it or at least plan it already. You know from straight on, even if I know I have time, I guess a lot of IB students are like that too. Because, you know, it was in my mind and I knew I had this big work coming up. . . And so, I did not know, you know, so like what I did, actually, is that at the beginning of summer, I decided, every morning I took about one hour where I worked on my essay. . .Writing in the summer all at once that's what made it possible, in the sense that I just wrote and then I just, I wrote and then I had sort of this rough draft of 5000 "wordish" with perhaps 3000 words in the foot notes of the essay, like this brute material on which I could start working. And then things became, started to become more manageable.*

Example 2: IB 05. For some students the processes of **searching and reading** seemed to be emphasized most as what was learned from doing the EE. In contrast writing is ignored as a "research part" of the EE. Student IB 05 comments on the importance of the reading part of the EE.

> *Oh definitely EE helped what I am doing now at university but it's not easy to explain this. I guess…it helped me to learn how to read academic papers. Most people never read journal articles based research. It taught me how interesting it is to read which I have to do a lot of now at university. You learn to read things that most people do not read and think is boring. It helped me understand the rationale behind what's in an experts book."*

Example 3: IB 11. The largest number of students remarked on the **writing strategies** that they acquired to accomplish the EE as shown in Table 2. IB 11 offers a typical example of a writing strategy that was discussed by most IB students. She says:

> *The EE is a way to generate new information from what you have got. You cannot just rewrite what you have read. Which was really hard….You have to do more than read and understand. You have to think. What I means is that you have to create links by yourself and that you arrive at something that is yours. I think it's the most valuable thing I have learned. The rest is the competencies like summarizing and all.*

Example 4: IB 10. Several students found that EE introduced them to **study skills** that were useful because the project required extensive reading and recording of notes and ideas in order to end up with learning a large body of new information. IB 10 is one of the students who acknowledged that the EE was the first time she needed to take notes as a means of selectively rehearsing new information and relating it to prior knowledge. However, upon entering the first year of university she found that:

> *Everything is fast at university. You are too busy meeting course requirements to have the time to do a research project. I have three 50-page labs to complete in the Engineering program. That is a lot more demanding than the EE project. Now at McGill, like for the EE project, I write everything down but at McGill I am more selective about what I record and I am a little faster than when at IB. For example if the assignment is worth only 2% of the mark, I am not going to spend 20 hours as a perfectionist on it like I did at IB.*

Example 5: IB 12. She majors in biology at the university. From her view the EE was a **problem solving experience**:

> *I don't know it's like you get more independent. You are free to do anything during EE but you take responsibility for what you choose to do. It's like a completely different thing than doing labs in science. Just finding a way to derive an equation and solving the problems that I faced [in order] to explain blood spatters at a crime scene …it's a way of working that I learned more than the content…at least that was my experience.*

IB 12 seems to be talking about how the authentic nature of the problem she selected motivates her to be self-regulatory and to persist in tracing down books from libraries in another country and using Google scholar to research the equation she needed, and then to derive the equation and/or to identify parts of it. Thus, like a number of other students who we interviewed, IB 12 was alluding to the acquisition of stronger self-regulatory strategies during EE participation that carried over into her freshman year at university.

Meeting the Academic Learning Demands of the University. What is the nature of the qualitative data that might be argued to act as evidence of a learning transfer between EE and university academic demands when comparing the categories for what was learned from the EE and how it helped to meet the academic demands of the university? One kind

of evidence is when elements learned during IB DP are also mentioned as sources of help in meeting the first year university demands. For example, IB 08 refers to the reading skill of summarizing information while reading many sources to collect data for the EE argument and then directly mentions the use of summarizing as a tool for merging lecture notes and reading notes to make sense of the growing body of information being presented in a biology foundations course during the first year of university.

Less direct evidence is provided when students mention ways of successfully participating in academic work at university, which can be mediated by knowledge or skills mentioned as being introduced or used in the IB DP programme. For example, several students cited the search for information and problem solving as learned during IB DP and their use is also described as helpful in meeting academic demands during the first year at university.

Students also acquire new knowledge or skills that are not part of what was learned during participation in the EE. We consider the evidence for this to be when skills, strategies and knowledge are reported as being used in academic tasks presented at university which are never mentioned by any of the cases when recalling what was learned while enrolled in the IB DP. Examples of new knowledge introduced at university include (1) the need for always being accountable, (2) recognizing that the standard for deep learning begins with understanding rather than simply recalling facts, (3) the use of research skills to learn new knowledge, and (4) beginning to regard theory as very important to furthering one's understanding.

During the interview the 15 students contributed 1780 words to attempting to answer what they learned from participating in the EE that helped them during their first year at university. Through open coding we were able to inductively derive 13 "helping" categories. Of these 13 categories only two literally replicated a category of learning attributed to one of the themes representing what students said was learned from participation in the EE process. It is these two themes and the categories elaborating on them which afford the strongest direct evidence of knowledge and strategic skills learned as an IB student through the process of completing the EE that the students revealed helped them to meet the academic demands of their university courses.

From all the students said in our interviews, it appears that it is only through the courses students take that the experience of empirical research is encountered. Students in this study offered no evidence that they were voluntarily participating in a research study headed by a professor or a team of professional researchers. Moreover, basic course work requirements are set by the university that prevents first year students from seeking independent funding from the government or private funding agencies for student research or even initiating an honors thesis.

What students reported as learning from participation in the IB programme and the EE. The two categories identified as what students learned from the EE and of that knowledge what helped students cope with the academic demands of university courses are: (1) intellectual rigor and (2) academic skills. Intellectual rigor refers to (a) a thorough process for investigating precise questions in scientific domains and for human domains,

(b) the research methods used, (c) the attention given to what constitutes evidence, and (d) attention to a reasoned presentation of results of the study. Academic skills are referred to by students as critical reading skills, library skills, writing essays in a short period of time, writing reports like scientific papers, writing abstracts, writing summaries, and writing essays. Illustrative examples are shown in Table 6 below.

Table 6

Illustrative quotes for themes relating to learning outcomes

Intellectual rigor	• *EE made me appreciate the scientific process and the scientific thought that helps define theories.* • *In Management and Economics, when it came to the recognition of what knowledge is, that sort of **intellectual rigor**, that's not something you find in everybody here in my classes (at university) but it was very much present amongst the people in IB.* • *During one of my Econ projects (at university) I was in a group and I remember members of our team bringing sources that were **not rigorous** by just going on to the internet to identify and download the sources they were bringing. They did not go to books in the library or on line. Like they were only trying to confirm stuff they already knew. I pushed them to try to consider the reasoning behind a hypothesis that makes it true. I mean honestly they were doing what I did a long time ago in high school.* • *So from my EE I can say it taught me to question what I read.* • *It's not just the experiment, I need to plan different steps and **co-ordinate the whole plan for the research report from beginning to end**. That is something I really did with the EE.* • *Like **I am applying what I learned from my EE methods**…proper citations, everything else, I applied to the research essay I am doing right now in B.COM. for the research project they require of students.* • *Well, so like I think it helped me just learn to like to learn the new knowledge (about his topic) and to be able to answer the questions.* • ***Questioning things** was a very important part of the EE.*
Academic skills	• *If I hadn't the practice from doing the EE, I wouldn't be as good as I am right now at writing essays in a short time period.* • *The EE needs to be done with **a certain methodology**, now when I am writing my papers I always **plan** it first… what's point A and point B?... and then I go on and find quotes for those point, and then **really prepare to support each point**. I learned that from my EE. Now I really always prepare my*

	thoughts for all my (university) essays and papers. • *I learned to write **abstracts for some of my lab reports** through the EE, now at university you have to do that for every lab report. Also they expect you to write your reports like scientific papers. I learned the structure for that from the EE.* • *EE made me learn to focus, **made me strong under pressure**, that is all those hours in the library working on the EE to develop library skills that let me work faster. It made me grow as a student and as a person, really.* • *IB **really does like teach you how to write essays**. In all my classes, we write tons of essays during a semester. I really do well on my (university) papers and essay exams.* • *Like **writing essays for exam, IB prepared me really, really well** to do this in History.* • *I had to question a research paper that was published and then write an essay about it.* • *Well **for EE, questioning things was a very important aspect of it**. I've gotten more precise and **I use a lot more sources** now.*

The student responses above appear to us to qualify as evidence of what students learned from doing the EE that transfers to a wide range of university academic tasks as well as inquiry specific tasks used to carry out systematic inquiry: (a) essay writing, (b) research essays, (c) journal reports as scientific papers, (d) critical reading of books and published research, (e) summarizing many sources of information on a particular topic, (f) structuring lengthy lab reports of 50 pages, (g) asking precise questions, and (h) abstract writing for laboratory reports and papers.

The New Learning Barriers at University

To fully understand the influence of the EE on how students fare in accomplishing academic demands during the first year of university, we need to know not only the influences of knowledge acquired during the EE on meeting the academic demands of university courses, we also need to understand barriers to the use of knowledge and skills acquired through participation in the EE at university. For example, students may face university academic demands for which knowledge or strategies acquired through the EE are irrelevant, such as doing well on multiple choice tests used to determine midterm or final grades in a course. In fact, several students mentioned that as valuable as the DP had been in preparing them for the university, they would have appreciated some coaching in how to study for and take multiple choice exams because they were never given such exams by their IB DP teachers. Indeed in theory, the influence of the EE may have been greater if the midterm and final exams in all the courses were essay exams or the final mark was determined by a research project done throughout the semester.

One perceived barrier is the gap between the IB DP as a process and the schooling environment they experienced in the first year of university. As we qualitatively analyzed

students' responses to our question, we realized that a large proportion of their responses identified learning barriers arising in the first year of university that participation in the EE and related learning outcomes they report really could not prepare them for. As shown in Table 7, the IB DP environment is on many dimensions very different from the environment students encounter during the first year of university. Some students pointed out to us that really the IB DP environment afforded conditions that are more likely to promote students' learning of inquiry skills and participation in inquiry than the first year of university offered them. Indeed their observations are completely in agreement with the research literature on the teaching and research nexus reported earlier in the literature review (Healey, 2005). Ironically, in the typical research intensive university the undergraduate program in the junior and senior years probably returns back to the environmental conditions that the 15 university students reported in their description of the IB DP environment.

Table 7

A Comparison of Dimensions of the IB Diploma Programme and the University Environment

	Competition	Class Size	Model of instruction	Pace of INFO Presented	Number of Exams	Reading Demand	Writing Demand	Library Resources
IB	low	Low	Student Process Centered	Medium	Many	High	All essays	Inconsistent In quality
UNV	High	Very high	Teacher Content Centered	Very Fast Paced	Mid-term and final exams	Highest	Multiple choice and short essays	Excellent in number and quality

The competition dimension seems especially dramatic for IB DP students who describe themselves as spending two years with 7 to 25 fellow students whom they have got to know well and with whom they share the value of hard work, curiosity, and a wide range of academic knowledge in a social environment conducive to sharing and acting as a community of learners (Brown & Campione, 1998; Bell, Urhahne, Schanze & Ploetzner, 2009). The first year of university, especially in the sciences, is spent in classes of 100 to 700 students. IB DP students who are used to knowing the teacher as a person as well as a scholar often cannot get close to the professors in the lecture hall, seldom enter into dialogue with a professor, and seldom are encouraged to come by the office as they did as IB students.

A large university class size can act as an impediment to being an active learner (Lake, 2001; Feldman, 1984; Dillon, Kokkelenberg & Sean, 2002), although the university in this study has made a serious financial commitment to techniques like pair share where the professor uses Socratic questions, puts the questions on a white board, gives students time to share with a neighbor how they would answer the question, offers some added information or asks the pairs to use a clicker to indicate their choice of possible answers to

the question listed on the whiteboard. Special technology then displays instantaneously the frequency of students choosing each alternative answer and students are invited to discuss one more time what the best answer might be, and then the professor asks for a second round of selecting the best answer followed by revealing the answer and explaining why it is the best answer.

Due to the first two environmental barriers (competition and class size), first year students at the university are often exposed to teacher centered and content centered instruction while in the IB DP they were more often exposed to student centered and process centered instruction. The latter is more in line with modern constructivist learning theories of conditions that are more optimal for student learning and active involvement in a course as well as higher class attendance (Lammers & Murphy, 2002; Maloney & Lally, 1998).

IB 07 offers his own insights into the contrast between IB DP as a learning environment and what the university offers him in the first year.

> *In the IB we had smaller classes. . .and it allowed a lot for helping each other and discussing topics and asking questions. But at [University] the classes, well since I'm just in U1, in my first year of university, the classes are huge and I find very, like even if we have conferences where we can go ask questions, I find it very difficult to interact with other students and to get a good learning experience out of my courses aside from just taking notes and learning them before the exam. So I find that there is, less of a frame work around the (university) learning experience. I found you are left alone and you have to work with your things.*

Students in this study also frequently remarked on the increased volume of reading each week in university courses. In the Law program, IB 07 reported reading 150 pages a week. This factor also combines with student perceptions that university professors were covering the course material two to three times faster than in the IB. This combination of environmental changes at university creates very different academic demands on learning for the IB graduate.

Another barrier that arises is the shift from making students accountable through regular exams and feedback at the IB, compared to placing the entire weight of accountability on midterm and final examinations. The typical IB DP curriculum is reputed to present students with daily exams or class preparations so they are constantly being held accountable for their learning. Additionally, they are also getting regular feedback on their academic progress in a DP course, while at university they get a midterm exam and a final exam, which drastically reduces the opportunity to have feedback play an important role in their learning. For some students feedback is often restricted to a mark without explanation or commentary on the student's thinking. At university, the exams in large first year courses are often multiple choice due to large class enrollments and ease of scoring. Conversely, students from three different IB schools tell us that almost all IB exams were essays.

This university normative evaluation practice for first year students is also confusing to some students because university professors place understanding as the starting point for being educated and emphasize theory, but use examination practices that to the student appear to encourage memorization. The ratio of emphasis on being able to account for satisfactory recall of information and to account for construction of new understandings shifts at university toward giving an interpretative account of one's understanding based on explicit reasons. The IB students appear to be prepared for this shift through the EE experience. Connected with the greater emphasis on understanding the content is the fact that theory is much more central rather than tangential to the study of most phenomena. Both of these standards for knowing are pervasive across all 10 disciplines in which students in this study had enrolled, and this shift was frequently mentioned or implied by the students. Now let's consider what the students viewed as barriers to the use of what they had learned from participation in the EE.

Barriers to the Use of EE Knowledge at the University

The two major categories of other barriers were reported to be: (a) workload and (b) work organization.

Work load barriers:

> **Pace.** *The EE was really more of a long term project,…they would prepare us right from the start and tell us the steps. But in university everything is fast…and it keeps going and you don't have time. . .We think we have time but because we always should be reviewing well we actually don't. Now I can't miss even one class because you really do have to understand the lectures because often they go beyond the text-book and assigned reading.*

> **High competition among students.** *In the IB community we were a small group of students, much tighter than here, who shared similar passions and similar interests. It was easier connecting with my IB peers than my university peers. Maybe it's because the B, Commerce program is very competitive and students are less interested in intellectually connecting.*

> **Opportunity to reflect.** *IB made me appreciate science in general, the scientific process and scientific thought, but I have the feeling here at university […] unfortunately university is not making us reflect about how science is constructed and what the limits of science are. I think these are very crucial questions… you know what I mean?*

> **No research opportunities.** *I don't have any big projects, I have essays and presentations but nothing like a thesis or like a big year-long report or anything. All my so-called research papers are at most like a few pages.*

> **The quantity of material and the quantity understood are not the same.** *In Law I sit through a whole class and I don't understand anything…it's all new…there is*

nothing I can relate to the information.. You try and sit and understand the reasoning of the judges…it's impossible when we don't know anything about it already. To make up, I would do a whole day intense study with other peers. In IB, I came to class and I already understood what was presented some. It's the first time that ever happened to me and back then I just worked alone, now I study with a group of students.

Work organization barriers:

A different approach to learning in different disciplines. *It's a very different approach in universities, like I said before its very theoretical, so I had to adapt my learning strategies to that. In Biology I have to make links among the concepts.*

Precision and time demand. *It's not only precision in the question studied but also they push you with time on essay exams.*

Class size disrupts useful intellectual dialogue. *The classes are huge and I find, like even when we can have conferences, I…still find it very difficult to interact with other students and have a good learning experience. So instead, I have to take notes and learn them by myself for the exam*.

All the students but two, from the pure and applied sciences, believed that the EE had helped them succeed in their freshman year at university. These two students were both positive about the other aspects of the IB programme and its influence on their academic preparation for university. One of the two students felt an absence of adequate supervision regarding the planning, enactment and evaluation of an experimental study accompanied by a lab report. The other chose to do an EE on a topic that she had already written extensively about in the past. She felt she learned nothing new by participating in the EE.

Students' responses to the question 'How did the EE help you to meet the academic demands of the first year in university?' demonstrate that they actually had little opportunity to use the knowledge acquired during participating in the EE to carry out research, but they could use it to read and discuss research. Interestingly, reviews of research on how readers identify main ideas when reading expository prose show that study skills are only needed when students have an inadequate amount of prior knowledge of the subject.

Only a few students reported that they were required to do a research essay, project, or research study at university which stretched over a semester or a whole year. During the interview, these two students spontaneously described a university course assignment where they had to identify the topic of interest in a domain, and then generate a hypothesis or research question to be answered through reviewing a substantial body of relevant empirical studies. This result, while based on only 15 first-year university students, does draw those students from 10 different academic disciplines and therefore reflects the academic opportunities offered to first year students in these disciplines. The two students of the 15 who reported participating in such a course assignment were in Commerce and Management. To complete the assignment for a mark in the course, they were asked to

write a collaborative course project report carried out over many weeks. The remaining 13 students reported having been required to write short essays, brief reports, and a few of these students reported taking lengthy midterm essays or final essay examinations. This finding replicates the results Wray (2013) reports from a qualitative study of first-year students in two research intensive universities in the UK.

The science majors reported that they had to write either very lengthy lab reports, or lab reports in the format and style of a scientific paper. Abstract writing based on the EE was viewed by most science students to be a required part of laboratory reports. For all of these kinds of academic demands, students unanimously reported that their EE experience prepared them very well to accomplish the academic demands of the lab reports.

The EE experience also required all students to critically read books and published articles. This is one way to experience empirical research (Healey, 2005). However, only one third of the 15 students in our study recognized critical reading as being associated with, and useful to, the considerable increase in academic reading in their university courses. For example, IB 07 is among the one third. He says:

> *We have to really read what the author wrote, to really listen to what they say but then to be able to have our own opinion. Yeah, maybe being able to bring something to the conversation... this is something , this is something that I learned while doing the EE. Yeah, my global experience of the EE then helped me learn to bring something to the conversation on an academic level in my first year courses.*

Different disciplines appear to be associated with the ratio of students who clearly perceived their EE experience to help them meet the academic demands of courses offered in that discipline. First, only Commerce and Management majors reported having to do a semester-long project culminating in a research paper. Second, in Law, two students reported that so much of the content presented and studied was totally new and was presented at such a fast pace that they could not possibly have assimilated enough to write a research essay as a means to learn or demonstrate their understandings. The Law and Biology students tended to experience this situation. In other subjects like Philosophy and Economics, the students felt they could generate hypotheses about topics studied, but were never given a chance to do so, not even in examinations.

In the sciences, the students were expected to study theory and cope with the textbook description of a theory and even engage in discussion of a theory as part of the academic course demand. Yet science students also reported that even in lab reports, experiments were done to confirm an existing theory, not to generate hypotheses or plan a series of experiments in a manner that would test their theoretical understanding, as opposed to recognizing principles of IB science majors' theory exemplified by doing a prepared experimental exercise. They only saw the EE experience to have taught them how to write a lab report abstract, how to structure a report, and how to apply the stylistic mechanics for formatting tables and figures or citing references. These learning outcomes are less substantive demonstrations of inquiry knowledge than the ones mentioned by students in the Humanities.

Finally, these students described several situations at the university that neither the IB programme nor the EE required activity prepared them for. All these situations had one element in common: the fact that classes were overcrowded, the relationships were less personal, and the proposed educational model was designed, as what one student called "massive-informative" (teacher and content centered instruction), rather than based on reflection and discussion. Notably, in all these cases, the students expressed their preference for the IB experience. Many students explained how difficult it was to learn in a crowded university environment. Also, as a result of a crowded environment, the relationships with the professors and therefore the interchanges concerning knowledge were more limited as IB 12 shared:

> *There was some courses where, I don't want to say it, but the profs aren't really good. So you end up studying yourself. You still attend to the lectures, and you still ask them questions but when they don't answer clearly, it's my responsibility to go see the TA's, or go ask my friends, or go do the research myself for that course. And yeah, to that I'm applying what I've learned before.*

Another consequence of crowded classes was impersonal and individual-centered relationships, something some students found difficult to deal with, as IB 13 noted:

> *Everyone yeah everyone on each of their sides and they don't even try to interact. I guess the only person you can interact with, is, are the TA's, or the teachers but since we are 600 in the class if it's not related to the content of the class, it's not important. They say "Don't come and talk to us, we are busy."*

The Influences of the IB Programme and the EE Outcomes on Student Learning

The interview ended by discussing students' perceptions concerning how the IB in general and the EE in particular jointly impacted their current student life experience at the university.

Each of the students discussed whether the IB contributed to their current academic demands at university. Students' responses differed from feeling that IB provided them with the necessary training to face university academic demands to finding it hard to appropriately respond to the new university academic demands. IB 11 explained his transition from the IB to university was smooth thanks to the fact that he was prepared to face this challenge:

> *But it wasn't a problem. I actually, I was happy to see it that I wasn't worried to come to (the university) either. I had tested myself with EE. The translation English to French, the transition between the two languages, it wasn't hard. . .You need to know what you need and, I didn't know a lot about the subject so I didn't really know what I needed…. And while being at IB I did a lot of readings. And at some point, I started to have like a structure. I would go see my supervisor, she told me "Okay do this, don't do*

that"… I mean, I was prepared for (this university).

In general, the students who had difficulties in adapting to the new university academic scene were students who were pursuing an academic career different than the orientation chosen while at the IB.

Some students elaborated on how the IB contributed to their social skills, their organization, and the development of a questioning attitude. For example, IB 09 explained that while at the IB, the class was used to receiving different professionals from different fields, and because of this he realized how important social networks were for future work endeavors.

Additionally, all students recognized that both work load and strategies developed at the IB helped them with regard to organization and even more with discipline, as the IB 10 explained:

> *What did I learn here? To maximize my time, in the sense that we sometimes have a lot of readings, a lot of homework to do, and I do not have the time to do it all, so to keep the essential, to see what I can just skip. For example, there are certain readings that I know that I do not need in order to succeed.*

Finally, these students retained from IB both the enhancement of questioning material and developing their "own argument" For example, IB 04 said:

> *Though more than anybody else I'd say, I am often there raising my hand saying "Well that is not absolutely true sir, I would probably like to review that, is there another way you can put it?" I'll still do that once in a while here; however, that was something that was very, very common that everybody would do at (name of the IB school). So I mean, they are very, very different experiences, both really, really great schools but very different experiences*.

Many students acknowledged that doing the EE facilitated their response to current work demands, especially in terms of accuracy and preciseness. IB 04 explains:

> *But, never copy and paste, but you would read through it and you would have your first, initial hypothesis, and you would try to find the parts in those texts that you could stick back in a larger text that actually confirmed what your hypothesis was. Now I've realized that that's called formation bias and I would never do that again, and I have a very, very different approach to the way I'll do research from now on. Again, intellectual rigor is the number one thing I pull out of the EE.*

Also, IB 05 shared her experience on how the EE training was helping her in dealing with university examination demands:

> *Okay, I think I will use the example of my final exam in philosophy of last December. I got an A- in that exam and the professor doesn't usually give high grades. I did not*

> *think I was going to get a good grade. I used the same competencies during my exam that I had used during my EE. It is to say, to take a great variety of authors who say different things, use them to create my own argument, insert their voices into my speech, make it coherent, and to make sure it defends a position that it is mine…So I built like an analysis that didn't have, that I had taken, so taken something from the other papers and to bring forth my own view of everything that was really something that was hard to do and that I was able to do because I did it in my EE. Not as well, I didn't do it as well in my EE as I did in my exam but on that exam I really used everything that I had learned from doing my EE*.

In relationship to organization, the most important feature that students highlighted was planning ahead, which according to them, was a training that many new peers were lacking. As a final example, IB 09 discloses the value of planning a lab report at university:

> *Academic work is much more long term than regular anything, regular work, or a regular paper. So I need to plan different steps, it's not just do the experiment and that's the whole task. You have to coordinate every part of the task from the beginning to the end. And the work itself is really not that different from a regular lab report but it has to be more organized in every aspect. Logistically, but also the content since it's much thicker. It's more the formatting, division, the sub-titles, and all the different parts… that didn't help yet, but I think knowing how to really structure and to present in paper the full research will be important.*

Overall, the sources of IB DP support seem good in the eyes of the students. But making arrangements with a university library to give access to IB students seems an especially good one. Three of the five students had very high praise for the experience. Two found the EE experience unrewarding because they received a final mark of a C without ever having had an indication during the year and a half that their progress was not satisfactory.

There is also definitely an issue of concern that several students shared about the marks assigned to the final EE project. Several students among our cases were misinformed regarding the EE final essay when they were told it did not count toward university entry requirements. As a consequence they did not take the exercise seriously and made a low mark. Later we found out from the Registrar that indeed it counted toward a university entry requirement. All cases that complained about the IB mark joined in with most of the other cases in requesting written feedback on their EE, not just a mark. We have to side with these students and wonder if it should not be an area of future research by the IB.

Conceptions of Inquiry

The IB curriculum encourages students to become inquirers. The EE is in fact an assurance that students will be required to actively engage in the process of inquiring in a manner appropriate to their self-selected major in humanities or the pure and applied sciences and other areas. We have asked students to deliberately describe their conception of inquiry in order to compare it to what they have learned through participating in the EE and what of that knowledge they found helpful in their first year of university. We collected both a

spontaneous verbal description of inquiry in the last part of the interview and a written description following the completion of the MSEEIQ questionnaire. Table 8 presents the conceptions of inquiry given spontaneously during the interview by each of the 15 cases.

Table 8

The Conception of Inquiry Held by Each Case

1	2	3	4	5	6	7	8
An individual reading and writing task	A request or demand	No reply …	Hypothesis testing	Answering a question	Being guided by a researcher that knows what they are talking about	Solving a problem with understanding	Answer a problem through research

9	10	11	12	13	14	15
Define your own problem and find your own answer	A process of finding answers to a question		An extended lab report	Questioning or curiosity	A type of learning	Searching for your own information

Four students perceived inquiry to be associated with asking, testing and answering questions. Three associated inquiry with problem solving (one with problem finding and the other two with problem solving). Two students associated inquiry with particular tasks involved in the accomplishment of the EE. Two gave very literal denotative meanings similar to the definitions in a dictionary that are so general that they could not serve to direct a student to act as an inquirer. One person simply has no associations with the word inquiry to offer. Two students associated inquiry with learning. One of the two seemed to associate inquiry with being guided by a researcher who "knows what they are talking about." As one might anticipate, two of the three students that identified inquiry as problem solving were in pure and applied science, and three of the four persons conceptualizing inquiry as being associated with question asking/testing were in the Humanities. Yet only four out of the group of 15 described a conception of inquiry useful to accomplishing the EE task. How do we make sense of this finding?

Based on a sample of 240 Science and Education majors at the same university as the group of 15 students in this study, Getahun (2013) carried out an Open and Axial coding of their written conceptions of inquiry. He reported three themes into which virtually all the categories fell. He also reported 13 subordinate categories derived from students conceptions of inquiry. These categories elaborate on the meanings of the superordinate categories. They are listed in Table 9.

Table 9

Super-Ordinate and Subordinate Categories of Undergraduate Students' Conceptions of Inquiry and its Importance

Super-ordinate category	Subcategory
Inquiry as a learning process	• Gaining information/knowledge • Developing knowledge • Self-learning and knowledge construction
Inquiry as an instructional process	• Adaptive form of teaching • A tool for assessment • A means of empowering students • Teaching for in-depth understanding • Active/interactive form of teaching
Inquiry as a research/scientific process	• Problem solving • Hypothesis testing • Researching for understanding • Discovery • Improving practice

Based on Getahun's (2013) inductively derived categories, the IB students in our study all conceptualize inquiry as research or a scientific process. He found that only 13% of his normative sample of 240 undergraduate students at the same institution conceptualized inquiry as research or the scientific method.

These findings suggest that the IB students in this case study all conceptualize inquiry as research and that the participation in the IB programme and EE is likely to be the primary influence on the conceptions they held.

Quantitative Results

Inquiry Self-Efficacy Ratings

The validity of a case study is enhanced by comparing multiple sources of data (Creswell, 2003; Stake, 1998). In this section of the results, we compare our qualitative themes describing what students learned from completing the extended essay and other elements learned that were also of help in meeting university academic demands as well as participants' ratings of how confident they were that they could accomplish different kinds of inquiry tasks that make up the inquiry process and inquiry instruction (MSEEIQ results). Students responded to items relating to inquiry self-efficacy using an 11 point Likert scale ranging from 1 (definitely cannot) to 11 (definitely can). MSEEIQ descriptives for the 15 IB students that were interviewed are provided in Table 12. Mean scores of 7 and 8 correspond to ratings of beyond "probably can," but below "definitely can."

Table 12

MSEEIQ results for the 15 IB students who were interviewed

Factors	15 IB
Creating and Communicating Knowledge	M=7.40 SD=1.29
Analyzing and Writing Data	M=8.11 SD=1.04
Stating the Problem and Asking Questions	M=8.20 SD=1.57
Searching for Information	M=8.85 SD=.96
Verifying Data and Testing Ideas	M=7.64 SD=1.18
Hypothesizing Outcomes and Results	M=7.21 SD=1.52
Collecting Data	M=7.43 SD=1.77

We then compared the mean inquiry self-efficacy scores of an IB group of 207 students and a non-IB DP group of 144 students using an independent samples *t*-test. Because 7 *t*-tests were performed, there is an increased risk for Type I errors. To account for that, a Bonferoni adjustment was applied, meaning that alpha of .05 was be divided by 7, yielding a value of .007 (Field, 2009). Therefore only p values lower than .007 are considered significant. The mean Likert scale rating of how confident students feel about their ability to accomplish 7 kinds of inquiry tasks was significantly different on 2 of the 7 inquiry task skills. However, those differences did not favor IB DP trained freshman.

A *t*-test revealed a statistically significant difference between the mean factor scores of IB students and non-IB students on the following two factors:

1. Stating the Problem and Asking Questions

There was a significant difference in the mean factors scores of IB students (M = 7.89, SD = 1.60) and non-IB students (M = 8.37, SD = 1.43), $t(349) = 2.901$, $p = .004$.

2. Hypothesizing Outcomes and Results

There was a significant difference in the mean factors scores of IB students (M = 6.81, SD = 1.58) and non-IB students (M = 7.40, SD = 1.61), $t(349) = 3.408$, $p = .001$.

A *t* test failed to reveal a statistically significant differences between the mean factor scores of IB students and non-IB students on the following five factors:

1. Creating and Communicating Knowledge

There was not a significant difference in the mean factors scores of IB students (M = 7.66, SD = 1.33) and non-IB students (M = 7.85, SD = 1.38), $t(349) = 1.347$, $p = .179$.

2. Analyzing and Writing Data

There was not a significant difference in the mean factors scores of IB students (M = 7.93, SD = 1.32) and non-IB students (M = 8.06, SD = 1.33), $t(349) = .855$, $p = .393$.

3. Searching for Information

There was a significant difference in the mean factors scores of IB students (M = 8.50, SD = 1.15) and non-IB students (M = 8.80, SD = 1.06), $t(349) = 2.384$, $p = .018$.

4. Verifying Data and Testing Ideas

There was a significant difference in the mean factors scores of IB students (M = 8.01, SD = 1.28) and non-IB students (M = 8.32, SD = 1.24), $t(349) = 2.275$, $p = .023$.

5. Collecting Data

There was not a significant difference in the mean factors scores of IB students (M = 7.40, SD = 1.52) and non-IB students (M = 7.53, SD = 1.69), $t(349) = .852$, $p = .395$.

The results suggest that the groups are confident about different skills. However, the overall distribution of inquiry self-efficacy ratings are quite similar across the groups. The means show that the average student in both groups rate each of the 7 inquiry task factors just below "probably can" (Likert scale value of 7) but below "definitely can" (Likert scale value of 11).

Both groups rated their "searching for information" self-efficacy factor highest and "hypothesizing outcomes and results" self-efficacy as either the lowest (IB) or second lowest factor (non-IB). Suggesting both groups are most comfortable with the task of searching for information and less comfortable hypothesizing outcomes.

Summary of Quantitative Results

Student self-efficacy ratings across IB and non-IB groups fall between 6.81 and 8.80. This places their own confidence that they can accomplish the 7 kinds of inquiry tasks between "probably can" and "definitely can." Eighty-seven percent of the item content for these inquiry tasks overlapped with the knowledge they reported acquiring or using to accomplish the year and a half extended essay. The mean inquiry task comparisons surprisingly favored the non-IB group over the IB sample on 2 out of the 7 factors. But this occurred only with the most basic of the inquiry tasks, and there were no significant differences between groups on the more advanced inquiry tasks, such as "analyzing and writing." Since the correspondence between the data from the students regarding the EE process and their engagement with it is quite high, we rule out a mismatch between the MSEEIQ content and the content of their description of the EE process and what they learned from doing it. The evidence for the factor validity and reliability of the test is also very strong (Ibrahim, 2013; Aulls & Lemay, 2012). The qualitative data suggest that the IB students could talk about and deliberately use skills and strategies they also rated in terms of self-efficacy. Therefore, we tentatively conclude that the non-IB students could have inflated their scores more than the IB students who demonstrated strong qualitative evidence in the interviews that they are very knowledgeable as a group about how to accomplish the basic inquiry tasks presented to them.

Summary of the Qualitative and Quantitative Results

Overall, the 15 students interviewed were very positive about the IB DP curriculum experiences. Students perceive the EE to be especially helpful in building their inquiry self-efficacy, in aiding them to feel more independent in completing lengthy writing assignments and in promoting self-regulation of research skills associated with using printed resources as sources of data. For example, searching for information on a self-selected topic of academic interest or generating a research question that might be addressed by the information gathered to support one or more claims within the structure of an argument. The EE experience was less helpful for two pure and applied science students who later majored in science at university. Only one of the IB DP students who chose to do a laboratory experiment and keep a written record of his thinking was actually able to complete the EE lab report. Another had to abandon the experiment and instead do a literature review related to the student's topic and/or research question. However, these experiences did not appear to keep them from identifying positive ways how the experience of the EE aided them in coping with the demands of science courses at the university, especially in preparing successful lab reports of up to 50 pages in length.

Many students did report that they acquired self-regulation skills of reading and writing through the EE experience that would be in our opinion required in university courses that offer a balanced exposure to research in a course through reading research, writing about its meaning, engaging in discussion about parts of a research study and hypothetically in partial participation in self-directed study during the course, or in enrichment opportunities offered by volunteering to participate in a university professor's research projects.

Our analysis of the interviews identified a number of learning outcomes mentioned by a large percentage of the students participating in the EE: (a) organization skills (organization of steps to accomplish goals, organization of prose until coherent, organization of time while doing a lengthy essay writing project, learning to ask for help in a timely manner), (b) reading skills of summarization, synthesis of many sources, and note taking or otherwise recording important information, and (c) writing and reasoning skills of crafting an argument and arriving at conclusions. Along with these skills, students almost unanimously mentioned that doing the EE had improved their confidence in their ability to accomplish the academic demands of undergraduate study and to estimate the time needed to do an essay assignment in a course. This confidence is supported by the overall high university self-efficacy ratings.

When these reports of skills are specifically reviewed to determine their contribution to the range of skills entailed in doing research, as it is normally referred to in a university scholarly context, we consider them to be among the foundational skills needed but otherwise incomplete. These qualitative findings are supported by the results of the MSEEIQ where IB students ranked themselves lower in self-efficacy on the more advanced inquiry tasks than the fundamental ones. Moreover, it is unlikely these foundational skills would allow a student to comfortably and independently engage in empirical research in

her academic major to complete an honors' thesis. Finally, the conceptions of inquiry held by IB students were associated with research while the non-IB students associated inquiry more with learning and/or instruction.

Conclusion

Our overall results are in agreement with recent research reported in the literature. Inkelas, Swan, Pretlow, and Jones (2012), carried out several focus group interviews with 18 undergraduate students at the University of Virginia (UVA) as part of a larger project to determine what research skills former IB students perceived to have an influence on how well freshman were coping with inquiry demands arising in courses offered at UVA. This process of qualitatively gathering data through the focus group method of interviewing has different purposes and limitations than the 60-90 minute one- to-one interview used in this study. Nevertheless, we replicated the following results reported by them. They are (a) the EE provides familiarity with the steps of a lengthy essay, (b) the EE increases students confidence in doing research essays, (c) the EE improves gathering and evaluating sources of information, (d) the EE provides preparation for college level writing, (e) the EE improves management of time on writing projects, and (f) the EE increases basic knowledge of a formal academic style appropriate to a field of study.

Wray (2013) also carried out a qualitative research study on IB graduates in two British Universities. He did 27 one-to-one semi-structured interviews of 60 minutes in length that were similar in item design to the one we developed. His basic results are compared to our qualitative results in Table 15.

Table 15

A Comparison with the Wray (2013) Qualitative Results

Wray (2013)	Aulls & Peláez (2013)
Theme: Overall Reactions to the EE	
Students were very positive about what they produced during this activity and expressed positive feelings about the EE experience because they explained it had helped them to "make sense" of the subjects they had studied was a commonly expressed idea.	In general students were positive about completing the EE experience. However, some situations (e.g., other demands, lack of time, lack of support) were commonly associated with students who expressed negative or neutral feelings during the interview. Similarly, some students literally stated that they "enjoyed doing" the EE while others did not. In general, those who enjoyed it, got A marks on EE and those who did not enjoy it described it more as a "requirement" rather than a challenge with marks of C.
Theme: Learning from the EE	

The students discussed the opportunity they had been given by the EE to pursue a topic of their choosing. Choosing the topic enhanced the students' interest on it. The IB students were clear that they had learnt from their EE experience. This learning concerned not only the content of the material they had studied for their EEs, but also aspects of study skills and what might be called 'study awareness'.	All students reported that they chose their topics and most shaped it in discussions they had with their supervisors. In general, choosing the topic fostered their interest; however, in some cases, students chose topics they were already very familiar with, or topics they assumed to be easier to develop regardless of interest value. All students mentioned they learnt from doing the EE. There were differences though concerning the type of learning each student highlighted. However, most of these students mainly learned: (a) about the topic, (b) necessary library or laboratory strategies and critical reading and writing strategies to conduct such an endeavor, (c) organization and planning, and (d) self discipline and work ethics.
Theme: Criticism of the EE Experience	
But there were some disappointments for the IB students. These mostly focused on the support they were given for their EE work while at school. All claimed to have had some introduction to methods of carrying out research, but for many this was not very memorable.	In this study, some students expressed disappointment with some aspects of the EE process, especially concerning supervisor support. The type of support the students referred to were: (a) documentation and orientation on how to do the EE, (b) materials necessary to do the EE (e.g., reading and laboratory material), and (c) guidance and advice from the supervisor. Among these three aspects, a lack of supervisor support was discussed as being the major source of disappointment. Lack of support from the supervisor was associated with quality of learning students described as not being enriching.
Theme: The impact of the EE on undergraduate study	

Students were less than positive about the ways the EE was underused in their university work. Several students expressed some disappointment that they had had little chance to use the skills they thought they had developed through their work on the EE. It is important to note that the majority of students in the sample were in their first year of university study.	All students were in their first year of university, and 13 of 15 mentioned they did not yet engage in research so they could not compare training provided by the EE and transference of the training they got to what they imagined to be actually doing research in the field or laboratory. Instead, concerning the usefulness of the EE, these students agreed the EE was very useful to helping them deal with current university work load demands, to efficiently organizing their work, and to be rigorous by adopting a questioning attitude towards knowledge in general and being more precise and reasoned in their gathering, analysis and interpretation of information.

Our study, the one by Inkelas et al. (2012), and the one by Wray (2013) all provide results based on the students' perceptions. Our results support Wray in terms of the students not finding opportunities to engage in research. However, all three studies replicate one another's results regarding what students learned from participating in the EE and the high regard that most have for the scholarly challenges that the EE presented to them. Furthermore, the design of our study appears to be the only one to offer specific criteria for inferring what students learned from participating in the EE that represents evidence of direct transfer learning of skills. They are skills like the mediation of the accomplishment of university academic tasks through having learned to be rigorous in the procedures used to complete the EE, or by the application of knowledge of skills specific to the completion of inquiry tasks that occurred with research experiences presented in university classrooms as defined by Healey (2005).

In this case study, we also have attempted to meet both the standards of positionality, and of giving the participants ample voice (Creswell, 1998). The first standard is met by making it clear that the authors share a social constructivist view of learning and instruction. Indeed, this led the first author to be interested for over 30 years in the nature of active learning (Jonassen, 2002) and the opportunity for post-secondary students to participate in extended inquiry as a path toward learning subject matter and in-depth scholarship (Elton, 2005). To meet the second standard, we have attempted to give IB DP students a substantial voice in order not to marginalize or disengage them. We have attempted to do this with rather long excerpts from several consecutive cases that elaborate the variability or commonality of a theme and by elaborating themes with categories generated inductively through open and axial coding (Strauss & Corbin, 1998). Occasionally we have dimensionalized variables such as "feelings" to illustrate their intensity (Strauss & Corbin, 1998).

The validity of a case study result is grounded in the reader's sense that the results are dependable, believable, trustworthy and meaningful in their world. One can build in certain design features that methodologically increase the believability of the data, as we have attempted to do, by using (1) purposive sampling, (2) multiple cases, (3) low inference description, (4) by initiating coding using in vivo categories as long as possible to account for the variability in what students say, and (5) by triangulating using three different kinds of data sources (beliefs about learning, conceptions about learning, and reports of all 15 participants regarding what happens as EE).

In our study, we described the perspectives of all 15 students in terms of major themes and their elaboration by categories representing the individual and collective thoughts of the participants. We designed our interview to elicit both the data on what was learned through participating in the EE and evidence that it was used to meet academic demands of university courses. Our categories and themes derived from the analysis of the interviews were compared to the conceptualization students held of inquiry. Results indicated that eleven of the fifteen students learned a great deal from engaging in the EE process and simultaneously held conceptions of inquiry suitable to the particular subject they were majoring in while being students in the IB DP. The remaining four students could not express a conception of inquiry or held a conception that was irrelevant to the demands of the EE process. Likewise, IB DP students as a group rated themselves as fairly confident on foundational inquiry tasks and less confident on the more advanced inquiry tasks. All three sources of data corroborate each other. Therefore, we are able to conclude with confidence that the IB programme, and the EE component of it, positively influence the learning and use of knowledge by the fifteen students in this study.

In closing, we feel compelled to make several researcher observations about the results that may warrant further research on, and/or discussion about, the IB DP curriculum. In our data we found no references by IB graduates to being taught about the importance and nature of methodology in IB courses or informally by EE supervisors. It is evident that some students are beginning to form fuzzy and partial conceptions on their own about matters of methodology without knowledge of its central role in empirical research. For example, some students correctly pointed out that "when searching a domain they should use credible sources of information," and one person implied that "how data are collected and from whom has a relationship to interpretations of the results, etc." Our concern is that their partial conception can easily become misconceptions that will conflict with what they are told by professors during their first year at university. Part of becoming more knowledgeable in a domain is learning the language of research used in that discipline. For example, in his book Talking Science, Lemke (1990) reported a two-year ethnographic study of a secondary science course taught by a very effective teacher. A major finding of the Lemke study was that to be active learners, students must learn the language of the discipline and use it actively to learn to do science. This is no less true for learning how to meaningfully experience research by reading it, discussing it, writing about it and doing it during the IB DP and at university. Again we found no reference in any interview to a student being taught about research methodology by a teacher or through the IB curriculum in the three schools offering the IB Diploma Programme. We think the data on conceptions of inquiry show that eleven students saw the conceptual essence of inquiry to

be either (1) asking, answering or testing questions or (2) problem solving. Again, this is a start in the right direction, but the conceptions of these students were not well elaborated when explained during the interview. It appears that the course "theory of knowledge" did not present methods for doing research, however we would like to suggest that perhaps it should. Moreover, this may also mean that some IB DP teachers have not done a thesis themselves or taken at least a formal research methods course.

In addition, from the view of any university professor, research that is valid or trustworthy is based on empirical evidence, not on argument formed by a claim and its warrants. Yet the IB EE rubric scoring guidelines also appear to place primary emphasis on argument cohesion and coherence, and then the quality of the claims and warrants that make an argument, as judged by a disciplinary expert who evaluates the EE product. It is not that this criterion is not meaningful, but the criterion is appropriate as the basis for evaluating scholarship rather than for evaluating empirical research. In our view, it is the understanding of scholarship that IB DP schools are really developing rather than an understanding of research.

IB DP students may find this to be a source of confusion at university. That said, the typical undergraduate university professor would certainly find the quality of scholarship that the 15 IB DP cases in this study demonstrate to be a welcome knowledge base from which to continue promoting their knowledge of research and to guide their participation in inquiry.

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Appendix A

An Example of A Transcribed Interview with IB 15

ID: IB15

Interviewer: Sandra Peláez

Date: Thu. Feb. 7th

Duration: 40:24

Q: I would like to know what was your experience within the IB program.
A: Well, I did the IB in history, so I like what I found really, really interesting was, even though I was in social sciences, I had like science classes. So, I think through my time in the IB I got a pretty good sense of all types of knowledge I could get without going really deep into it. I think that's one thing about the IB you go like you learn tons of stuff but you might not go really deep into any of them. But I think in history I got a pretty good, I learned a lot and I can like talk about it. It's like now I'm studying, I'm going to study history too, so I'm getting deeper into it too but it's a good start to go to university after.
Q: So did you already started the university or …?
A: Now?
Q: Yeah?
A: Yeah.
Q: Yeah. Okay, no because you said "I'm going to", so …
A: No, because well I am not in history right now, I am going to be in history next semester.
Q: Okay, and now you are?
A: Women studies and international of the women studies.
Q: Oh wow, I like that.
A: Yeah.
Q: So, and you went to what high school?
A: I went to, well my IB program was not in high school. It was in Cegep but in high school I went to Collège François, no, Collège Saint-Charles Garnier in Quebec.
Q: So you went to the IB program in Quebec?
A: Yeah.
Q: And, besides that, you told me well okay I had a broad picture of what science is in general, social sciences, another thing that you got from the IB?
A: I think, what I really liked was, I don't know theory of knowledge which allows us to know better about what we are studying. Not only like the study project but like how to study it. I think that was really interesting because it's one thing to do science, or to do history, or to do philosophy, but to know what it means to do so and how you have to, how you have to do those matières, I don't have the word in English…
Q: Subject, or topics, you know.
A: Yeah topics. And another thing that was really interesting is that we learned how to make research. Like how to write a paper. I think a lot more than in the other programs in cégèp. Like

at the end of cégèp we have an exam, it's called, it's a French exam like just writing exam. They give you like a few texts and you have to write down a paper on it. And to people in the IB it was something really, really easy because we've learned to write papers all through the IB, like we have tons of papers to write. So that's something like...

Q: As compare to those who were in the DEC path, that's what you are meaning?

A: Yeah, yeah. And I think that's something that is helping me a lot in university because I like I know how to formulate a paper. Like pretty easily.

Q: Okay good. And more particularly in relationship with the EE okay? I would like to hear your story, your experience, the problems of doing it, your feelings, how you were mumbling about it.

A: Well, like, it, in my, I was in history so our teacher on the second semester decided that he wanted us to start already even though we still had a year to write the paper. So like on the second semester of IB, he started like asking us to write our introduction and to do so we had to have like also all our plan for our EE. So that like started it really well. I don't know if it's like, I know in the other program in the IB at my cegep, they were not doing this, so that's something that helped me a lot. So that's how I started really…

Q: It helped you doing what? Sorry.

A: It helped me like, having to do part of my EE for a class and not only for…

Q: For the final presentation?

A: Yeah that helped me arrange my thoughts and not to do it at the last second. That's something that I would have done if I not had to write my introduction before, and it like it helped me go through the libraries. I spent like weeks in the libraries reading, I did my EE on the influence of Maurice Duplessis on the Quebec cinema. So it was not something that had so much literature about, so I had to really search deep to really find stuff and to mix history with politics with economy, which I was not really fluent with. I did not know much about politics, and economy, and like not that much.

Q: And how did this subject come out?

A: I'm really, really interested in Québec history and with cinema. I want to do documentaries later. So to me it was something really like that mixed perfectly both my favorite topics. And I think like Maurice Duplessis era is one the most interesting part of Quebec history, even though it's a really dark one and it's a time where like Québec government had a huge influence on culture on everything.

Q: Interesting.

A: So that was probably why I chose those two subjects together.

Q: And the topic came to your mind soon? At the beginning of the process or ..?

A: At first I just wanted to do something about Quebec cinema. Then while talking with my supervisor, he told that was, that might be like too broad to really write something. So I thought about doing something related to like comparison between Quebec cinema and American cinema. And then it didn't like really suit what I wanted to do, so then I went through thinking about like many things that had happen in Quebec and Maurice Duplessis came up I guess.

Q: And how did you choose a supervisor?

A: Well, I had a history teacher in IB that I really liked, who I thought was really, really good, and like he was like he was really good teacher so I ask him if he wanted to be my supervisor. And he...

Q: And he accepted?

A: Yeah, he accepted.

Q: So you decide to start working since the very beginning?
A: Yeah.
Q: Did you have a lot of support from him?
A: Yeah, no. He was really supportive. He like, I went to him like tons of times with like drafts and like my plan. He helped me change it, I think, almost ten times before I had my final draft and all through it the writing of the paper, I came to him and he gave me advices, and he even told me "Oh you should go look at that library or talk with this, that guy, that girl".
Q: That person.
A: Yeah, yeah. So he was really, really supportive. It really helped.
Q: And what mark did you get?
A: A.
Q: Okay, good. So, what did you learn from doing the IB? Oh the EE.
A: The extended. I actually learned to do research. Yeah, at first I didn't know how I would get all the information ready to write a 4000 word paper. Like…
Q: But you were prepared before by doing the, a report or…?
A: Yeah but it was like much bigger and even though it's not, like it's not that big like I don't know maybe it's the build up but like you really want to get a good grade, you really want to do something great because it's such a long process so really want, yeah, go through it, and like do it all the way. So, to me it was really like learning how to do like real research. I went to the archives. I went to like the national library in Montréal, even though I was in Quebec. I spent like a week there really to, so to me what it, what I really learned from it was to do the research and to arrange what I had found because it's really great to have like tons of books but if you don't know exactly what to do with it so. And I learned to, like methodology, mostly yeah. And I guess I learned about my subject, like that's yeah.
Q: And could you say that you had all the information you needed around you? I mean that you had access to the information you needed?
A: Yeah, yeah. For my subject really and I never had much problem to find what I needed and Maurice Duplessis is a subject that is really talked about and I was really lucky because two years before I wrote my paper, there had a been a huge conference about Duplessis in all he had done to Quebec so that was like a really, there was a big book with all the conference.
Q: So you had the right source.
A: Yeah. No, I was lucky. My subject was not a hard one to find like sources and facts about.
Q: So the hardest part was to organize the information and then to combine this political social context with the cinema?
A: Yeah exactly.
Q: Okay good. How would describe, overall, the experience of doing this EE?
A: While I was in it, I said, I'd say, I found it hell. But when I gave my paper at the end I was really proud, and like I really enjoyed doing the research. Like writing the paper was, I mean, a bit long, well not long because it took me to like write the real paper, it took me like three days working nonstop after I've been like maybe I had ten pages of information, I just took quotes and arrange and. But it was hard and like all the working afterwards on it like it was hard. But I really liked it because I really liked my subject. Like it was never a pain to do, to do my work but. Like sometimes like I was really happy when I ended but really proud to so...
Q: And how would you describe this process? As, for example, creative problem solving?
A: Problem solving I guess, because it's kind of a puzzle. I don't know. Like to me it was really looking at cinema and all its parts and what it can be influenced in it and then finding what might

have been influenced it. So it was kind of a puzzle to find all the pieces. Like to see how it was before, during, and after and seeing what happened before, during, or after. So, problem solving I guess.

Q: What's inquiry for you?

A: That is a really good question. I guess to me it might be, like doing research but like getting your own information as well as combining it with information you might find like in secondary sources I guess.

Q: You don't know, its okay. And so for you, the EE, was it an inquiry experience?

A: I don't really think so because, like I said before, I find that inquiry needs to say like that you find some information that are only yours and that you might not necessarily find in books. Like you have to get primary sources of your own, I guess? And like my EE was only about like what I could learn in books because I mean I like I didn't know like sources like proper to my myself, I guess. To me it was more like a research but like historical research more than inquiry. Yeah I guess. If I go with my definition of inquiry.

Q: Okay, another question is what else? You are now at McGill, okay? So in terms of the potential that you got from the EE, how would you breach the transition between secondary school, high school, to IB, and IB and McGill?

A: I think secondary school to IB was a huge step. But that IB to McGill was not such a big one. Like the type of work we do in McGill is like is different. We read a lot more, but in terms of writing essays and papers, I find that IB prepared me pretty well to do this. Like to me exams like are a lot more difficult than questions, short question exams are a lot more difficult than essays or papers or essay exams because I think what IB really does is like teaching you how to write essays. In all of your classes, you write like tons of essay during a semester, during a year. So, like that is something that you really assimilates and when you come to McGill writing a papers are not like, papers I had really good grades on all my papers as well, and my other exams were a lot more difficult at first to transfer.

Q: Okay, okay. So, in attempt to recap, overall what did you learn from your EE?

A: Well, I learned the methodology, how to write a paper, how to arrange your thoughts to come to a conclusion that is well formulated. I learned how to do research, how to arrange before writing my paper what I had learned into categories. And I learned how to mix many subjects, topics together which were not necessarily made to go together, I guess.

Q: Okay, you mentioned to me that you had a supervisor, would you please elaborate a little bit for me on how was the relationship?

A: Well, first of all, I have to say like I had my supervisor was my teacher during a whole year and we were in a class of six students.

Q: Wow.

A: So we were really close to him. Like he brought the class to many trips, so like, first of all, he was a teacher to whom we were really close. So, while I like talked with him about.

Q: Sorry, the six of you studying history?

A: Yes, studying history like in his class so like it was like, first of all, a really good relationship, and like I went to his office to talk about the essay he was always really open and he really told me what he thought about it, and like I could tell him back what I thought. Or if I did not really agree with his view, I like it was really fun because like we could have real discussion that I might not have had with a teacher I didn't know. So, that was really interesting, and it really helped me and like he was a teacher of history of like the Americas and history of Québec also, so it was really his subject. He really knew about it, he was the one who taught us about that

subject in IB so I guess…
Q: So, it was the knowledgeable person, and the appropriate person for the project …
A: Yeah exactly. No, really.
Q: And in terms of relationship, what type of relationship did you have with him?
A: Well a really good one. We were really close to him and like during the IB he went through a very difficult period and we were the group who was there this time, so we even got closer to him. Like we still go, the six of us plus him, to have coffees when we go back to Québec so. Like we have a really, really good relationship with him.
Q: So it was an academic relationship plus a personal kind of with a personal side?
A: Yeah at the beginning it was only academic but yeah we got closer to him.
Q: And, what are the elements that according to you helped to have that relationship in place? Let's say.
A: well, I think it's mostly the way he enacted during the classes he gave. Like since we were really a small group, he would not lecture us the whole time, just like writing on the board and not just like talking by himself. He really had like; it was really a conversation in the class. Like he told us about something, about a subject, about a moment in history, and then we could answer back. Tell us, tell him our thoughts about the subject. So that was really interesting. It's first of all, like we stared linking him as like as a teacher because the classes were so interesting, like I was never bored in his classes. And then like we went on field trips with him. Like Boston, and in Ottawa, and in New York, in Sherbrooke. Like…
Q: And you went to those places for some…?
A: For history classes. Like it was part of our courses, curriculum to do, to go there. And while we were in Boston we were doing history of the Americas, of the United States, so like we were like going through all the Boston Tea Party and stuff like while we were there so like it helped, again like establish a good relationship with our teacher. And, as I said before, he went through really hard passes, his wife died while we were in like his group so yeah it helped to, even if it is a very sad moment, that played a huge role.
Q: Okay, I guess yeah. But that happen while you were doing your…?
A: Yeah, yeah, like even more than that, his wife died a like few days before I was supposed to hand out my paper. So it was really hard at the end to have comments on because he was, he had a daughter, it was a huge deal obviously, so at the end, like while handing out my EE we, like it was a bit harder to get the comments but he was really there like even though there was, he still gave me comments on the paper, and everything, yeah.
Q: Ah good interesting. So, you mentioned to me what contributed to have a good relationship, okay? Do you think that the relationship you had with him affected in a way, the both, the process and the final product of your EE?
A: I guess it really affected the process because he motivated me to do it, and I guess the final product also because he gave me like really good comments. And they were not only like broad comments but he took every section and said "Okay, this is really good, but this is not, and this is not the way to analyze this", so like being really open and being able to respond to him like really helped. But, I think what affect the most the process and the final product was really just like because I really liked the subject I had taken. Like more than my relationship with my supervisor, I think, yeah.
Q: Do you think that having a different relation would have affected your EE?
A: Yeah, I really, that I really think so. My friend had another supervisor in history, who was another of our teachers, which like we had not such a good relationship with him. His class were

like kind of boring and even though he got a really good grade too, he got an A too, like the process was really hard because he didn't like to go get his comments because like the teacher was kind of harsh in handing out his comments and like it was not a nice relationship and…

Q: He was not very receptive?

A: Yeah, so like he really liked his subject too, he was talking about René Levesque, so to him it was something really, really amazing so, it was really funny. He really went through it and got a really good grade because he liked it but the process was a lot more heavy, I guess? Not like…

Q: And a little bit sticky as well.

A: Yeah.

Q: If you have to evaluate the role of your professor, what would you say? What is his role?

A: Well, I think his role is like a lot more larger than, a lot more large than only my EE. I mean, I came to the IB in history only because, I don't know, like in high school I hated history and like I'm going to study history next year so, I guess he had, he played a huge role because he was my first history teacher in IB. And, like he was such a good teacher that he really gave me…

Q: But you did your IB in history? Or in social science?

A: History.

Q: So how is that? You hated it in…?

A: I know, I've no idea, I guess that…

Q: You wanted to make sure that it was bad.

A: No, I think I wanted to do to Preston College in Vancouver and like in high school, like I was not accepted and the only way to re apply was to go the IB, it's the only way if you want to apply a second time you have near my place, and in the IB programs it was the only one that I could related to. Like I don't like sciences like I really, and I'm really happy I did the "système de l'environnement" class but I'm not interest in biology or anything. And not as well as management did not interest me, so history was the last choice.

Q: The least worst choice.

A: Yeah, well in the end I think it's the best program of all four. But yeah, so he played a huge role in making me want to...

Q: Go through it?

A: Yeah, yeah, like after three weeks I loved history and I was willing to go to, if necessary, to the end of my life well maybe not but yeah.

Q: Then you are going to be history.

A: Yeah.

Q: And why did you decide to come to McGill and to study, I'm sorry, to start with gender issues?

A: I have no idea of why I wanted to go into McGill. I guess, I've lived in Vancouver for a year, two years in Halifax, so I wanted to…

Q: Because for family stuff?

A: For family stuff. So I wanted to, I guess, improve my English and...

Q: Which is really good, by the way.

A: Thank you, I wanted to like because I lived in these place while I was younger so my vocabulary was not like university vocabulary and I have not read a lot of like classic, lec, readings that were like higher level than, I don't know, Twilight book even though I don't really like Twilight, but whatever. That kind of literature, like I had not kind of done it so to me it was a way to write better, and read better, and talk better. And I guess the IB, like lots of people from my IB cegep came to McGill, so also it was like a good place to come to study. And, gender

issues, that's a really good questions. I started having a minor in women studies and changed it to having a major because I found it really interesting. I think it's something that is becoming more and more of a primary issue because we have analyzed all type of social differences but more and more what we want is equality and equality starts by having equality between the two biggest categories we have in Earth; Women and Men. So…

Q: It's sad but it's still like that.

A: Yeah, no because I think before we want to have equality between all smaller groups, at least we need to have that in equality because I don't think that like we are going to be able to reach any other type of equality before we do this. So, that's why I went to women studies.

Q: So, you started this, you are going to do a year of gender issues?

A: Yeah, well I started at the beginning of the year in McGill so I did a whole year like having many, many classes in women studies.

Q: And then in September you are going to…?

A: Yeah, well I am transferring university to go to study Quebec history at UQAM. Yeah because like Quebec history is not maybe not the subject…

Q: Domain.

A: You want to study in McGill. Like there is really good classes in many other topics but Quebec history is better I think at like UQAM or UdM since they are francophone high school, university.

Q: But that was planned, part of your initial plan or…?

A: No, not at all. Because I really want, I just wanted to do a general subject class because I wanted to go into journalism and, like to me, I started in IDS and like woman studies just to have general knowledge and then I decided, I think, I prefer to have my general knowledge based in history.

Q: History, yeah, yeah, I understand. Now that you have lived a couple of sessions here at McGill, what is your perception of the tools or the experiences that gave you, the EE, in terms of academic life?

A: Well as I said before, I think on the side of like writing exams, that might not be the thing that reflects the more in IB since in like only a few classes we had short questions exams. But, in terms of like writing essays and writing exams like essay form exams, that I think IB prepared me really, really well to do this. I don't know if it would be the same if, I had been studying in science because it's not all like the same type but like in my history exam in IB we had the three hour exam, and we would just write down like sixteen pages by hand during the three hour. So like I think it helped me just learn to like learn the knowledge and be able to write it down afterwards, like answering to questions. But like I saw that all classes that were related to history in university were much easier to me than other types of social sciences because I guess I learned, being specifically in history, I learned a specific way of analyzing knowledge I guess. Which might not be the same, like in my sociology classes I, it was much more difficult to me because it was not at all the same type. And the…

Q: The same, I know.

A: And the multi answer ques…

Q: Choice.

A: The multiple choice yeah that was, that I find a lot harder than essays. Because like I, in IB we never ever do this, we almost only do essays, so I think that is something that is lacking maybe in preparing us for university.

Q: Okay, okay. And you gave me some general examples on why and how the EE and the

IB help you in your academic life. Would you please give me some specific example, either academic life related, I mean just a general thing, or in one course that you are doing? For example, last week I had to do this and I applied what I learned in the EE.
A: Well, I guess that right now I am starting my research for one of my papers for a seminar I am doing on the city of Québec so I'm like, I went to the archives last week and to me it was just a whole going back to the week I spent in Montréal over a year ago. I spent a week like only at the national library and at the national archives. So like, I guess to me it was like a perfect transition of going back a year ago and like remembering like what I've done, what was the process I've been through to do my research for my essay. Really, I think it's exactly the same because my paper is going to be approximately the same length, a bit longer than it was like when I did my EE, so yeah I guess…
Q: It was kind of reliving…
A: Yeah, no, so yeah I guess that really applies.
Q: Takes a role.
A: Yeah, I think that's the thing that will have mark me the most about this, like really doing the research and getting to know how to do research, really, really helped me.
Q: So you mentioned me, till now, how useful the EE was. What I would like to know now is, according to you, what do you think that, you just mentioned to me something related to the IB in general, but specifically related to the IB, ah sorry to the EE, what did it give you in terms of competencies needed to succeed at the university?
A: I don't know. Well, I guess, it would be related to writing longer paper because to do, like to write a normal paper in IB you, I mean you can do it two days before like you have to hand it out and you can still get a good grade. That's not exactly something you can do….
Q: What happened?
A: That's not exactly something you can do in the EE because it really needs to be like done with a certain methodology that I didn't get anywhere else in the IB. So, I guess when I'm writing like my papers learning that methodology like a, doing a plan, and afterwards like. Before writing down the real essay really finding like point A, okay point A one, point A one, one and like just and then go and having quotes, like prepare to support that point A one point one. That is something that I really did with my EE, that now when I write papers I actually do this rather than like per sound and just write everything that comes to my mind. Now I really do prepare my thoughts before writing down the, an essay or a paper. So I think that is something really related to the EE that helped me in university.
Q: Okay, you described me the relationship you had with your supervisor, okay? Did you have the chance to have a similar relation with someone here, with a professor here?
A: Not really, no. I guess the fact that being six in a class, and being with the same teacher for a year, and going into field trips, and I mean in the IB, like in general, at the IB we are forty students in all four programs and there were like tons of activities only IB and so I think it was much easier to get such a relationship than I would, that I could in university. But I never had the chance really, like since I started last semester I had almost only classes over a hundred students. So it's not easy…
Q: That closer.
A: Yeah, and like even this semester I have like eight, I have seminars we are like eight or ten in the class but even then I don't really have the chance to get such a relationship here.
Q: A while ago, during the interview, you described me what you understood by inquiry, okay? So I am going to come back, I know that you don't like that I will come back, so

could you say that professors that are inquiry oriented that they organized, they organize your classes from an inquiry point of view are different from those who don't?
A: Yeah I think so. Because, I think the organizing class is more about discussions than only giving the lecture in front of class and, not like not having interaction with the students? So I guess, yeah, I guess that's something that would be, I guess I think.
Q: Okay, it's okay.
A: I'm really, I'm that the subject I'm really not sure about, I'm not sure I understand properly the whole concept of inquiry.
Q: Okay, did you have the chance to have a professor like that?
A: I don't know.
Q: Because you don't know what it is.
A: No, yeah, no that's probably I really like maybe it's just because there is probably like a word that would like describe it exactly in French but I didn't grasp exactly what it is. So, I'm kind of, I have difficulties to really say…
Q: Okay, that's okay. The interview is done, I mean I have asked you all the questions, do you have anything that you would like to add, to share, to make us think about?
A: I don't know. I guess something that really marked me about cegep and well the IB, more than cegep because in cegep in a program I didn't have a thousand people in the program, but like we were small groups and I think that's one of the reasons why I learned so much and so well, and I think that I can totally relate that to university. Right now I have classes, in this semester, I have only classes under forty people in the class, under forty students, and I learn so much better than last semester where all my classes were in big auditoriums. I have like no classes in auditoriums, I have all of my classes in small rooms where we really do interact with the teacher where like people say what they think, and there is not only interaction between teacher student but amongst the students. So I think that's something that is really close to the IB and that when I found it in University I started enjoying it a lot more than when I was in big auditoriums listening to teacher fifty feet away from me on their big screens and yeah. I think.
Q: Any other thing?
A: I don't think so.
Q: Well okay. So thanks a lot for you time and your commitment.

Appendix B

Coding Matrix_v6 (IB02/IB03/IB04/IB08-IB15)
Note: As usual, codes highlighted represent new codes and codes in italics are not in-vivo codes

IB			
Demographic information	*Age*		
	Gender		
	School they attended		
	IB orientation		
	Studies they are undergoing now		
	Year at the University		
Motivation to go to IB	Challenge	Program	
	Social Status		
	Other		
Overall personal and academic experience at the IB	Hard working place		
	Learning and training opportunities	Curriculum	
		Trips	
		Interchange with peers	
		Interchangewith knowledgeable professors	
	We were a small group		
	Challenging peers		
	We helped each other		
	Some courses were completely useless		
	Marking system		
	It was pretty good, helpful, I liked it a lot		
	Other		
Perception of IB as compared to ordinary college			
EE			
Generalities	*Topic*		
	Reasons for choosing the topic		

	Grade they got		
The process of doing the EE	*Support received*	*Source of support*	*Supervisor*
			Family members
			Peers at college
			Other
		Type of support received	*Document provided by IB*
			Course organized by the school
			Guidance through informal discussions
			Reading the EE and providing feedback
			Motivation
			Lab material
			Reading material
		Evaluation of support received	*Usefulness*
			Lack of it
	Self-regulation	*Time*	
		Work load	
		Supervisor's advice	
	Use of time	*Temporary events*	
		Time devoted to work on the EE	
The EE as a learning experience	*Learning about the topic*		
	Organization and planning		
	Doing research and participating in an inquiry activity		
	Writing an extended piece of work		
	Self-evaluating and responding to unexpected situations		
	Type of learning process		
	Other		
Feelings related to doing the EE	*Positive feelings*		
	Negative feelings		
Overall appraisal of the EE			

Self-evaluation			
Other			
IB/EE/McGill			
Appraisal of the IB in relationship to their current endeavors	A bonus for admission		
	Academic demands		
	Questioning		
	Social skills		
	Organization		
	Other		
Appraisal of the EE in relationship to their current endeavors	Work demands		
	Work organization		
	Questioning		
	Work load		