The Articulation of Inquiry in Research about Teaching and Learning in the International Baccalaureate

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Abstract
The International Baccalaureate (IB) programs promote an inquiry-based teaching and learning environment for their teachers and students. Given this core pedagogical approach and the important role inquiry played in recent curricular reforms, this exploratory study sought to understand how inquiry is articulated in the IB curriculum; in particular, the present study used the *McGill Strategic Demands of Inquiry Questionnaire* (MSDIQ) as a template to examine the extent to which research cited in the IB literature or independently examining the IB programs has emphasized inquiry-based instruction and learning, specifically attention attributed to the three phases of inquiry--Planning, Enactment, and Reflection. The MSDIQ is a survey instrument that addresses a moderately fine-grained level of processes in which students must successfully engage if they are doing inquiry in each of these three phases. Most research questions in the IB literature were about teachers or instruction and emphasized the Planning phase of inquiry as opposed to Enactment and Reflection. Although many of the MSDIQ items related to self-regulation and metacognitive strategies were not addressed in the IB research, those that were addressed affirmed a link with an inquiry element by providing evidence for their claims about fostering an inquiry-based learning environment.
Résumé

Les programmes de Baccalauréat International (BI) favorisent un apprentissage et un enseignement fondés, entre autres, sur la démarche d’investigation raisonnée. L’importance du rôle joué par cette approche éducative, mis de l’avant lors des récentes réformes pédagogiques, constitue la base de ce présent projet de recherche à nature exploratoire. Ce projet vise à comprendre comment cette approche s’articule dans les programmes scolaires du BI. Afin de répondre à ce questionnement, le McGill Strategic Demands of Inquiry Questionnaire (MSDIQ) a été utilisé comme un modèle afin d’examiner la nature des recherches effectuées sur les programmes de BI, et plus particulièrement, sur les trois phases de cette démarche, soit la planification, la réalisation, et la réflexion. Cet instrument statistique décrit à un niveau assez détaillé les processus par lesquels les élèves doivent s’engager avec succès pendant les trois phases de cette démarche. Nos résultats montrent que la plupart des questions considérées par les recherches portant sur le BI s’intéressaient aux enseignantes et enseignants ou sur l’enseignement et mettaient davantage l’emphase sur la planification comparativement aux phases de la réalisation et la réflexion. Les tâches issues du MSDIQ qui décrivaient l’autorégulation et les stratégies métacognitives n’ont pas été prises en considération dans les recherches du BI consultées. Néanmoins, les tâches déjà exploitées par les recherches portant sur le BI ont un lien avec un des éléments du MSDIQ, soit en déclarant explicitement d’offrir un environnement scolaire basé sur la démarche d’investigation raisonnée.
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<tr>
<td>AP</td>
<td>Advanced Placement</td>
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<td>DP</td>
<td>Diploma Program</td>
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<td>IB</td>
<td>International Baccalaureate</td>
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<td>IBO</td>
<td>International Baccalaureate Organization</td>
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<td>LP</td>
<td>Learner Profile</td>
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CHAPTER 1

Introduction and Literature Review

Evidence of inquiry in education can be traced across the curriculum and at different levels of schooling. This evidence ranges from students asking questions in class to finer-grained observable indicators such as steps involved in the development and implementation of a plan to satisfy curiosity. For the last decade and more, an inquiry-based approach to teaching and learning has occupied the forefront of many debates in reforming education systems (e.g., Alberta Learning, 2004; Boyer Commission, 1998; European Commission, 2007; National Research Council, 1996; Ontario, 1999, 2004, 2005; Québec, 2001, 2004). For some schools and programs, however, it has always been the leading pedagogical approach. For example, the International Baccalaureate (IB) programs embrace inquiry as the core of their instructional practice. As such, they could be considered among the leaders in this domain.

Although educational research on inquiry-based pedagogy is abundant, as are studies on the IB programs, research about inquiry as the IB curriculum’s core pedagogical approach is an isolated topic, not having received the attention it deserves. The aim of this exploratory study, therefore, was to understand how inquiry is articulated in the IB curriculum model. This study focused on addressing two major questions aimed at clarifying the place of inquiry in the IB:

- To what extent does the research on the IB programs emphasize inquiry instruction and inquiry-based learning?
- To what extent is IB research addressing the three phases of inquiry engagement--Planning, Enactment, Reflection--before or after inquiry participation?

Inquiry begins with a quest to satisfy one’s own curiosity about a topic. Teaching by asking questions dates back to the classical Greek philosopher Socrates who, 2500 years ago,
used a dialectic method of inquiry. This form of debate between individuals encourages rational and independent thinking which in turn fosters the development of critical thinking skills. Asking good questions such as “why . . . ?” and “what if . . . ?” helps create all kinds of inquirers. Being able to answer a question such as “How do you know that?” is challenging because it requires the inquirer to evaluate the evidence of his or her claims and decide what kinds of evidence can support the anticipated conclusions.

**Roots of Inquiry-Based Pedagogy**

One of the 20th century’s most influential thinkers in education, John Dewey (1938), believed that children “learn by doing,” that is, through activity, real-world experiences, and discussion with others; however, for education to be grounded in real experiences it needs to be interest-driven. When students are encouraged to provide their personal perspective in the choice of topics, the desire to find personal relevance enhances meaningful learning. Inquiry-based learning experiences are therefore activities in which children systematically engage in to construct meaning for themselves. The work of Jean Piaget (1951) provided a direct parallel in the French literature. Piaget also proposed the idea that learners construct meaning for themselves based on previous experiences and that new understanding helps reshape or correct the misconceptions formed from prior knowledge.

A turning point in the story of inquiry happened with Jerome Bruner, one of the most prominent educational psychologists of the 20th century. He co-chaired a symposium of 35 prominent scientists, educators, and psychologists in 1959, in Woods Hole, Massachusetts, to chart a future vision of US education, including a special focus on science education (in the wake of Sputnik). One of the outcomes from this symposium was a landmark book, *The Process of Education* (Bruner, 1960), a twentieth-century educational “classic” in which Bruner made the
case for a “spiral curriculum”: “A curriculum as it develops should revisit the basic ideas repeatedly, building upon them until the student has grasped the full formal apparatus that goes with them” (p. 13).

Bruner’s view that children are active problem-solvers built upon Dewey’s ideas: Students learn subject matter best, not when presented with the well organized conclusions of a discipline, but, rather, when they approach it in the same manner as an expert in the field, someone who creates new knowledge in the field.

To instruct someone . . . is not a matter of getting him to commit results to mind. Rather, it is to teach him to participate in the process that makes possible the establishment of knowledge. We teach a subject not to produce little living libraries on that subject, but rather to get a student to think mathematically for himself, to consider matters as an historian does, to take part in the process of knowledge-getting. Knowing is a process not a product. (1966, p. 72)

In the following years, Bruner wrote two postscripts, The Process of Education: Toward a Theory of Instruction (1966) and The Relevance of Education (1971), in which he also took into account questions of predispositions, structure, sequence, and curriculum development. Bruner’s theorizing, however, paid less attention to the social and political context of education.

Lev Vygotsky, also a constructivist, added an important dimension to education and influenced models of curricular reforms when he wrote his book, Mind in Society (1978). He proposed that learners construct meaning through dialog, and that there were critical and moving boundaries between what a learner could already do unassisted, with the assistance of a more knowledgeable person (peer, teacher, parent, etc.), and not do at all. This middle zone is referred to as the “Zone of Proximal Development” (ZPD) and extends constructivism to what is known
as social constructivism. Meaning is not constructed in individual isolation but in social interaction when the learner needs and can benefit from it. This became the basis for group activities becoming central to inquiry pedagogy.

**The International Baccalaureate Programs**

A common thread to the above also began in Europe in the mid-1960s. In the post-Second World War decades, increased mobility of families led to the emergence of the International Baccalaureate as a practical solution to satisfy the specified need of expatriate students’ access to their home-country universities, for example, for diplomatic, academic, and business families. The purpose of the IB was to offer an educational program that would be internationally recognized in the admissions processes for universities. The International Baccalaureate Organization (IBO) developed a cohesive international educational continuum. The International Baccalaureate Diploma Program (DP) was the first to be implemented in 1969, followed by the Middle Years Program (MYP) in 1994, and the Primary Years Program (PYP) in 1997.

Commonalities across the three IB programs, noted in the IB document *A Continuum of International Education* (2002), also shared features with notions in the Schoolwide Enrichment Model (SEM) (Renzulli & Reis, 1985). Examples of common threads included:

- a broad and balanced knowledge ranging from the domains of arts, languages and humanities to mathematics, science and technology;
- opportunities for engaging in transdisciplinary learning, individual and collaborative planning, and research;
- developing lifelong learning skills (e.g., self-reflection).

Because the IB is used often in North America as an enrichment rather than core program, these
common attributes also appear in gifted education; and inquiry is also a central priority in gifted education (Aulls & Shore, 2008; Robinson, Shore, & Enersen, 2006).

Although inquiry is not extensively articulated in the publicly available IB documentation, there is a common expectation that students will have repeated experiences to produce in-depth products of their explorations of topics of personal interest across the three programs. This set of ideals that underlies the concept of educating the whole person as a lifelong learner is clearly stated in the IB’ “Learner Profile” (see Appendix 1). In that text, however, the attributes and descriptors that define the IB learners are vaguely explained. Inquirers “develop their natural curiosity. They acquire the skills necessary to conduct inquiry and research and show independence in learning. They actively enjoy learning and this love of learning will be sustained throughout their lives” (IBO, 2005-2011, p. 5).

**The Diploma Program (DP).** The late 1960s and the early 1970s marked the period of major development for the DP (Tarc, 2009). At a world history conference organized by the International Schools Association, Robert Leach (former head of the history department at the International School of Geneva, Switzerland) first used the term “International Baccalaureate” in 1962 (Spahn, 2001) as a step towards recognizing a program that would be nationally accepted across educational systems. Two other important historical events helped shape the DP: (a) a meeting of over 40 educationalists held in March 1965, in Geneva, that resulted in the DP “Hexagonal” (six academic areas) framework (see Appendix 2) and (b) a curriculum meeting in Sèvres in 1967 that resulted in the development of a seven-point scale, with 1 indicating a very poor assessment and 7 an excellent one. Coincidentally, this period of time (1960-1976) roughly approximated the years following the 1959 Woods Hole meeting that was sponsored by the US National Academy of Sciences and the National Science Foundation.
The DP is a two-year program taken prior to entering university studies. It is built around the “Hexagonal” framework that includes the traditional six subject groups and the three innovative components that strengthen and support international understanding through the curriculum. These include the Theory of Knowledge (TOK) course, a program entitled Creativity, Action, and Service (CAS), and the Extended Essay (IBO, 2005-2011). The TOK focuses on guiding students to examine the nature of evidence and the strength of their judgments based on evidence (Peterson, 1977). Students in the DP are expected to apply this reflective thought process to areas outside the classroom (Anderson, 1994). These critical thinking and metacognitive skills form a part of inquiry-based learning (Chichekian, Savard, & Shore, 2011; Short & Burke, 1996). The Extended Essay provides students the opportunity for sustained inquiry by completing a culminating project that requires learners to research topics of personal interest within any subject area for an independent study; the length of the essay is to be approximately 4000 words. The CAS expects students to commit a number of hours weekly to creative and aesthetic activities or to social service. The TOK and Extended Essay are externally assessed by IB examiners.

The general educational aim of the IB is to provide a “holistic education”; however, students’ perceptions that successful completion of the DP will generally lead to the best universities in the world (Carber & Resi, 2004; Culross & Tarver, 2007; Hertberg-Davis & Callahan, 2008; Taylor & Porath, 2006; Vanderbrook, 2006) created tensions in the dimensions of this curricular aim (Tarc, 2009). Given that a traditional schooling system was based more on structuring learning in order to meet the criteria for the next level of education, the IB intended goals were not well aligned with the standards for university admissions. University academic requirements and national entrance examinations catered to the “absorption and regurgitation
either of facts or predigested interpretations of facts” (Peterson, 1972, p. 40), whereas an “education of the whole person would privilege learning how to learn and include the moral and aesthetic dimensions” (Peterson, 1972, pp. 36-37). Although the International Baccalaureate Office was concerned with quality control, it still used only the examination system to achieve its aims. Herein lies the heart of the contradiction.

Another undesirable potential outcome of this curricular tension was the “backwash” effect; due to the nature of the assessment tool, teachers have been observed to teach to the test (Peterson, 1972; Hertberg-Davis & Callahan, 2008; Hertberg-Davis, Callahan, & Kyburg, 2006; Kauffman, 2005). The need for teachers to validate their own teaching was attached to the students’ exams scores (Mayer, 2008). As a result, IB classrooms might experience difficulty in attaining goals associated with inquiry-based teaching and learning such as modeling skills needed for inquiry and encouraging creative risk taking (Germann, 1991). Moreover, because teachers associated their instructional values with students’ performance on tests, hypothetically, the research questions found in IB studies might be more about teachers and instruction rather than students and learning.

The Middle Years Program (MYP). The MYP caters to students between the ages of 11 to 16. The curriculum is represented as an octagonal framework that includes eight subject groups (language A--defined as the student’s best language, language B, a modern language other than their mother tongue, humanities, sciences, mathematics, arts, technology, and physical education) and emphasizes their interrelatedness by surrounding five areas of interaction (approaches to learning, community service, health and social education, environments, and human ingenuity) (see Appendix 3). The accent still remains on providing a holistic approach to learning with the addition of two other fundamental concepts: intercultural awareness and
communication. Similar to the DP, the MYP also culminates in an interest-driven personal project that may take the form of an essay, but is not limited to this form of outcome.

Although the MYP continues the practices of portfolio and self-assessment introduced during the PYP (to be discussed shortly), these years also introduce students to examinations and testing in order to prepare them for the rigorous DP examinations should they decide to continue in the IB program. Consequently, the MYP also faces inconsistencies in their intentions: providing an inquiry-driven holistic education becomes less engaging for students who are beginning to rely more on knowledge acquisition. “The heavy, almost exclusive emphasis on exam scores in these courses over genuine learning may contribute to students’ sense that the purpose of taking these courses (and by extension, taking on any challenge) is acquisition—acquisition of content, acquisition of credentials, acquisition of college credit, acquisition of desirability in college admissions officers’ eyes—rather than understanding, wrestling with ideas, and intellectual growth” (Hertberg-Davis & Callahan, 2008, p. 210). Moreover, the focus of an inquiry-based pedagogy, the core instructional approach advocated by the IB programs, begins to dissipate during the MYP years. “Guided by the belief that high student performance on the end-of-course exams was the ultimate goal of the course, teachers first and foremost considered what material would be tested on the end-of-course exams. For most teachers, the content included on the exams determined the content to be taught in the course. Belief in the need for student exposure to the entire curriculum and constrained time limits led to one-size-fits all curriculum” (Hertberg-Davis et al., 2006, p. ix). Emphasizing teachers’ ownership of the course content diminishes student involvement in the planning of the curriculum. Not only are students’ interests less likely to be taken into account, students might also be deterred from participating in the construction of the curriculum and in the decision-making process which are key points to
consider in inquiry-based teaching and learning.

**The Primary Years Program (PYP).** The IB PYP targets students from 3 to 12 years old. The curriculum approach is not based on content or disciplinary knowledge, but is rather composed of six transdisciplinary themes (who we are, where we are in place and time, how we express ourselves, how the world works, how we organize ourselves, sharing the planet) surrounding six subject areas (language, social studies, arts, mathematics, science, and personal, social and physical education). The de-emphasis on specific content is consistent with recent curriculum reforms (Alberta Learning, 2004; Boyer Commission, 1998; European Commission, 2007; National Council of Teachers of Mathematics, 2000; National Council for the Social Studies, 1994; National Research Council, 1996; Ontario, 1999, 2004, 2005; Québec, 2001, 2004). One of the goals of the PYP is to foster the development of international students’ characteristics that appear in the “Learner Profile” (LP) (see Appendix 1). These include: knowledgeable, principled, inquirers, communicators, open-minded, thinkers, risk-takers, balanced, reflective, and caring (International Baccalaureate Organization, 2006). Although the LP is respected, values and attitudes are also needed to develop the international-mindedness of the IB students (Leach, 1969). According to the *Making the PYP Happen: A Curriculum Framework for International Primary Education* (p. 24), these attitudes include appreciation, commitment, confidence, cooperation, creativity, curiosity, empathy, enthusiasm, independence, integrity, respect, and tolerance. The International Baccalaureate Organization (2009) stated that “these attitudes should be addressed consciously, professionally, and explicitly within the written curriculum” (p. 35). Meaningful experiences should promote these attitudes and students should learn how to demonstrate them.

The PYP’s curriculum organization consists of the Program of Inquiry (POI) and the
planners (documents) within it. The planners’ framework is organized by the six transdisciplinary themes (mentioned above). The other half of the curriculum consists of skills, knowledge, concepts, and actions that do not readily fit in the POI. The PYP is illustrated by a hexagon (see Appendix 4) that includes the six transdisciplinary themes surrounding the six subject areas. The curriculum cycle is expressed by “How best will we learn?” “What do we want to learn?” and “How will we know what we have learned?”

Finally, the IB PYP emphasizes learning through guided inquiry and student involvement. The planners within the POI are organized into six stages: central idea, teacher questions, activities, assessment, materials and reflection; the planner also includes a section for student-initiated inquiries. This sequence is very similar to Bruner’s (1966) idea of essential elements in a discipline: “There is nothing more central to a discipline than its way of thinking. There is nothing more important in its teaching than to provide the child with its earliest opportunity to learn that way of thinking--the forms of connections, attitudes, hopes, jokes, and frustrations that go with it” (p. 155). The assessment section includes, but is not limited to, teacher and student rubrics, portfolios, peer and self-assessments, checklists, and anecdotal notes. Finally, the reflection section in the POI encourages teachers to evaluate to what extent the planner is achieved in conveying the purpose of the central idea. Under the guidance of teachers, the PYP culminates with a collaborative grade-wide inquiry project, known as the PYP exhibition. It seeks to address the attributes of the “Learner Profile” and the synthesis of the essential elements of the PYP.

Despite a thoughtfully planned curriculum, variations still exist at different levels in the implementation of the IB programs (Kauffman, 2005). This is not surprising given that some schools follow the directives of the IB PYP in addition to adapting to other government-imposed
mandates. Moreover, variations and inconsistencies with the PYP’s emphasis on constructivist learning exist in the use of inquiry and curricular choices within the schools. Kauffman (2005) noted that one school emphasized experiential learning while another focused on academic learning; the latter school also chose a very teacher-directed and structured mathematics textbook as a means to improve performance levels on state tests. It is evident that the IB’s intended educational goals are under tension and struggling to align with the student-level building blocks of an inquiry-based pedagogy it promises to deliver (Shore, Chichekian, Syer, Aulls, & Frederiksen, 2011).

Measuring Evidence of Inquiry in a Classroom

The importance placed on the processes and strategies of inquiry for inquiry-based teaching and learning (e.g., Chiappetta, 1997; Germann, 1991) has helped answer fundamental questions such as, “What strategies are required to successfully implement inquiry in the classroom?” and “What do teachers and students do in a successful inquiry classroom?” The challenge still remains, however, in designing evaluation tools to measure evidence of inquiry in a classroom, and selecting the level, locus, and granularity of the phenomena addressed.

Although there have been rating instruments that measure teachers’ and students’ attitudes toward or beliefs about inquiry (e.g., Reinke & Mosely, 2002), conceptions of inquiry (e.g., Reiff, 2002; Windschitl, 2003), and perceptions or understanding of inquiry (Manconi, Aulls, & Shore, 2008; Windschitl, 2003), none of these approaches directly measured the extent to which inquiry was present in a classroom or school. One of the first instruments to consider this important step was Llewellyn’s (2002) 11-point contrast of inquiry versus traditional classes. Recently, Marshall, Smart, and Horton (2009) introduced their new Electronic Quality of Inquiry Protocol (EQUIP) to address instruction, discourse, evaluation, and curriculum. It is a 19-
element rubric that ranks teachers’ inquiry implementation at four levels: pre-inquiry, developing, proficient, and exemplary. A second recent scale aligned with science-education standards, the Inquiry Science Implementation Scale (ISIS) (Brandon, Young, Pottenger, & Taum, 2009), included 22 items that ask teachers how often they include a set of inquiry-instruction actions. Campbell, Abd-Hamid, and Chapman (2009) also developed two five-point frequency scales, Principles of Scientific Inquiry, one each for students and teachers. All their questions are about what students do at a fine level of granularity and include five sections: asking or framing questions, designing investigations, conducting investigations, collecting data, and drawing conclusions.

The McGill Strategic Demands of Inquiry Questionnaire (MSDIQ) is a survey instrument that describes a moderately fine-grained level of processes in which students must successfully engage if they are doing an inquiry-learning activity (Shore et al., 2011). Although the 79 items in the MSDIQ are learner-focused, they also include inquiry tasks involving students and teachers together given the co-constructed nature of an inquiry-based curriculum. The MSDIQ is useful for schools that want to chart their progress of specific inquiry components as it is applicable at any stage during the implementation phase. In addition, MSDIQ items follow a specific order: questions 1 to 29 refer to the Planning phase of inquiry engagement, questions 30 to 73 address Enactment, and questions 74 to 79 cover the Reflective phase which marks the end of an inquiry cycle. I chose to use items in this instrument as a template on which to map the findings regarding the articulation of inquiry in the IB research literature in order to reflect a relatively fine level of granularity of inquiry activities taking place in these programs (PYP, MYP, and DP).

The Limited Extent of Research in Inquiry in the International Baccalaureate
Research in the IBO is conducted by two separate offices, a school division which is responsible for investigating the IB policy and supporting global research and coordination, and an academic division responsible for program development and assessment research. Searches in education databases initially yielded hundreds of articles but a more precise search with selected keywords such as instruction, learning, and inquiry drastically reduced the numbers down to the dozens. Correspondingly, much of the IB literature search focused on themes that were irrelevant to inquiry-based pedagogy (e.g., admissions, internationalism, globalization, program development, policy issues). Given that the primary goal of this study was to address the IB programs and their foci on inquiry, only studies referring to themes relevant to inquiry-based teaching and learning (e.g., instructional methods and skills, students’ perceptions and attitudes, teachers’ roles, teacher student relationships) were reviewed. A detailed analysis of the research questions addressed in these studies is presented in Chapters 2 and beyond.
CHAPTER 2
Methodology

Search Strategy

Initial searches involved peer-reviewed journal articles, dissertations, and books in databases such as Educational Resource Information Center (ERIC), Academic Search Complete (EBSCO), ProQuest Dissertations and Theses, and McGill University’s library catalog. This group of databases was chosen because they were pertinent to the subject area (education) undertaken in this study and provided results with an additional search-refining tool. Various combinations and truncations of keywords such as international baccalaureate, inquiry, instruction, learning, and teaching were used to generate references to journal articles relevant to the purpose of this review. The term “international baccalaureate” was mainly searched as a document title to increase the likelihood of finding studies conducted in the context of an actual IB program. This search strategy was applied using ERIC as well as Academic Search Complete (EBSCO) and produced 103 studies with the words “international baccalaureate” as part of the title. Very limited results were obtained when combining selected keywords with the previous search, namely, 19 articles with the term instruction, 35 with learning, seven with inquiry, 13 with instruction AND learning, and three with inquiry, instruction AND learning. As a means to broaden the search, the term “international baccalaureate” was also searched as part of the abstract in Academic Search Complete (EBSCO). The outcome of this strategy resulted in 73 studies in which the words “international baccalaureate” appeared in the abstract. When similar searching strategies were applied to selected keywords, the results were 26 journal articles with the term instruction, 53 with learning, 15 with inquiry, 23 with instruction AND learning, and nine with inquiry, instruction, AND learning.
Given the paucity of research on inquiry-based teaching and learning in the IB program documentation, and to overcome the perceived criticism of publication bias, a search was conducted through ProQuest Dissertations and Theses. This search resulted in 66 doctoral dissertations with “international baccalaureate” as part of the thesis title and 102 when “international baccalaureate” appeared in the abstract. Within the 66, searching combinations of the same selected keywords as above with “international baccalaureate” as part of the thesis title produced 21 findings which included the term instruction, 21 with learning, 18 with inquiry, 21 with instruction AND learning, and 18 with inquiry, instruction, AND learning. A similar search with “international baccalaureate” as part of the abstract produced 34 dissertations with the term instruction, 35 with learning, 29 with inquiry, 34 with instruction AND learning, and 29 with all three combined. Moreover, a manual search of the references section of the peer-reviewed articles yielded nine additional studies.

The resulting list of articles was increased by other research studies referenced in the International Education Research Database (IERD). The IBO website states that “research plays a central role in the development, quality assurance, and validation of IB programs and services” and has given educational researchers open access to resources such as the IERD, a searchable bibliography of research about the IB or international education. This database is updated on a regular basis and includes over 5000 references, including journal articles, reports, theses, magazine articles, books, chapters, and other generic pieces (e.g., IB conference speeches, news updates from education commissions). A similar search strategy to the one described above was conducted in the IERD, resulting in 339 findings, including journal and magazine articles, reports, book sections, and theses with “international baccalaureate” as part of the title; 210 results appeared when “international baccalaureate” was searched as part of the abstract. A
quick review of these results revealed that 18 out of 120 journal articles identified from the IERD overlapped with the previous database searches. The search in IERD also resulted in 11 book sections (chapters) and two books. Finally, McGill University’s library catalog was used to conduct a book search. The outcome of this search generated 11 books when IB was searched as part of the title.

The *IB Research Notes*, a quarterly publication providing information related to international education research, including summative outcomes of research and discussions of research methods and methodology, is no longer published, but back issues are freely accessible as an archive. Similarly, IB resources (curriculum guides, coordinator notes, and teacher support materials) are found in an Online Curriculum Centre (OCC) that provides exclusive use to teachers and other professional staff in International Baccalaureate programs. Given its lack of public accessibility, no reports are presented from this source. Personal access by the author was limited to one week, following participation in an IB workshop on the introduction to the PYP curriculum model through an affiliated IB school. Given that it would not be possible for most readers of this report to verify these materials, I did not add this source to the available resources. Moreover, most of the online documentation in the OCC included either publications from the IBO geared toward professional development, teacher-generated resources for sharing purposes, discussions forums for IB teachers, or a real-time chat facility for online subject specialists. No peer-reviewed material was available through the OCC that could be useful for this review.

**Selection of Studies**

The list of studies generated from this process was narrowed through the development of inclusion and exclusion categories. In total, 232 studies were identified from these search databases (I removed the duplicates from multiple searches) that directly or indirectly addressed
research that focused on the IB’s core pedagogical approach--inquiry-based teaching and learning. A summary of criteria used to select documentation relevant to the objectives of this research is presented below in Table 1. Studies were included based on the following guidelines:

- Publications were peer-reviewed.
- Studies were conducted from 1980 onward.
- Most publications contained “International Baccalaureate” as part of the document title. Some scholarly products in which the term International Baccalaureate appeared in the abstract were also included in the review because IB was often used as a reference for some aspects related to inquiry-based teaching and learning.
- Publications focusing on the IB that also emphasized gifted children and gifted education--many articles included in this review were drawn from journals such as Gifted Child Quarterly, Gifted Child Today, and Journal of Secondary Gifted Education.
- All publications must refer at least to one of the three programs that are part of the International Baccalaureate: primary (grades 1-6), middle (grades 7-11) or diploma (grades 12-13).
- The participants involved in the studies included students, teachers, administrators, or both.
- Any publications that considered AP programs as a comparative basis for the IB.
- IB curriculum design and implementation, instructional skills and methods, students and teachers’ perceptions and attitudes, learning environments, teachers and students’ role in the IB, the IB’s philosophy of education, and some historical development.

Studies were excluded based on the following guidelines:

- Any publications in comparative education with a focus on multicultural studies, diversity in education, national issues, management studies, and globalization.
• Studies focusing on academic administration (e.g., admissions, enrollment, achievement test scores, policy making).

• Although the IB stresses the “international” component within their programs, any articles referring strictly to the IB’s internationalism were excluded due to the absence of any other features concerning either teaching or learning.

• Online courses, educational technology, program evaluation, demographics, urban education, and sociology of education.

Given the scarcity of the literature regarding inquiry in the IB, a total of 180 documents were eliminated during the selection process; 24 articles were retained from peer-reviewed journals, 11 dissertations from ProQuest Dissertation and Theses, eight books, and nine other articles from searching the references of previously retained articles. The methodology for the present study is essentially descriptive. There have not been enough quantitative studies to do a meta-analysis or other form of systematic review. This is consistent with the present goal to learn how and to what extent the research literature about teaching and learning in the IB provides insight into how the IB promotes inquiry.
Table 1.

*Inclusion and Exclusion Categories for Articles on Inquiry and the IB*

<table>
<thead>
<tr>
<th>Inclusion categories</th>
<th>Exclusion categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>All publications with “International Baccalaureate” in their title or abstract</td>
<td>Social/emotional development</td>
</tr>
<tr>
<td>All publications with the above criterion AND that include all or any of the following searched keywords: instruction, learning, and inquiry</td>
<td>Politics of education</td>
</tr>
<tr>
<td>IB program implementation</td>
<td>Demographics</td>
</tr>
<tr>
<td>IB curriculum</td>
<td>Admissions/enrollment statistics</td>
</tr>
<tr>
<td>IB teachers’ motivation, perceptions, values, and philosophy</td>
<td>Achievement test/scores (ACT or SAT) for comparative purposes</td>
</tr>
<tr>
<td>AP programs</td>
<td>Urban education</td>
</tr>
<tr>
<td>Teaching practices/methods</td>
<td>Diversity in education/multiculturalism</td>
</tr>
<tr>
<td>Effective teaching/instruction skills</td>
<td>Program development/evaluation</td>
</tr>
<tr>
<td>Assessment practices</td>
<td>Policy making</td>
</tr>
<tr>
<td>Teacher-efficacy beliefs</td>
<td>Culture in education</td>
</tr>
<tr>
<td>Student achievement/performance/academic success</td>
<td>Globalization</td>
</tr>
<tr>
<td>School climate</td>
<td>National issues</td>
</tr>
<tr>
<td>Classroom learning environment</td>
<td>Third world countries/kids</td>
</tr>
<tr>
<td>Student attitudes</td>
<td>Management studies</td>
</tr>
<tr>
<td>Student perceptions</td>
<td>Comparative education</td>
</tr>
<tr>
<td>Student engagement</td>
<td>Social acceptance</td>
</tr>
<tr>
<td>IB administrators’ practices</td>
<td>Internationalism</td>
</tr>
<tr>
<td>Gifted students</td>
<td>Sociology of education</td>
</tr>
<tr>
<td>Historical development</td>
<td>Cultural preservation</td>
</tr>
<tr>
<td>Inquiry-based teaching</td>
<td>Cultural awareness</td>
</tr>
<tr>
<td>IB philosophy of education</td>
<td>Social climate</td>
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<tr>
<td>Attitude change</td>
<td>Ethnicity</td>
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<tr>
<td>Pedagogic behavior</td>
<td>Online courses</td>
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<tr>
<td>Teacher-student relationships</td>
<td>Educational technology</td>
</tr>
<tr>
<td>Teacher’s role</td>
<td>Gender differences</td>
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<tr>
<td>Teacher’s time</td>
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<tr>
<td>Educational environment</td>
<td></td>
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<tr>
<td>Teacher behavior</td>
<td></td>
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<tr>
<td>Administrator behavior</td>
<td></td>
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<tr>
<td>Critical thinking</td>
<td></td>
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<tr>
<td>Curriculum Design</td>
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</tbody>
</table>

Inter-rater reliability for the assignment of statements to categories in this table was performed in two steps by five members (two faculty members and three graduate students) of the High Ability and Inquiry Research group. Each reviewed the quotes in Table 2 and indicated whether or not they agreed with the link between the item and the statement. Levels of agreement with the initial categorization, ranged between 79% and 94%. I then took into account most of the members’ suggestions and made changes to Table 2 which increased the levels of agreement to between 83% and 98%.
CHAPTER 3

Results

The IBO website states that “research plays a central role in the development, quality assurance, and validation of the IB programs and services.” This is one of the reasons why I selected to work exclusively with publicly available documentation as opposed to material reserved only for IB staff (e.g., workshop handouts, the online curriculum centre). In addition, the attributes that appear in the “Learner Profile” (LP) (IBO, 2005-2011) act as a guide for school development and provide a basis upon which teachers can make important decisions. Individual teachers, faculty groups, school administrators, and school governors use the LP when discussing student progress or when reflecting on questions regarding classroom, assessment, and reporting practices, as well as daily life, management, and leadership; therefore, it is at the forefront of all IB teachers’ efforts to develop in their students the LP’s attributes. Unfortunately the same emphasis was not placed on research conducted in the IB programs--very few studies referred to classroom practices, and only occasional evidence of some enactment of inquiry-based pedagogy.

The IB programs offer learning environments that allow for intellectual peer interaction and adhere to a curriculum (accelerated) appropriate for the gifted and talented (Poelzer and Feldhusen, 1997). Correspondingly, many of the articles were based on interviews with gifted students. Overall, the research questions in the IB literature were divided into three broad areas: students, teachers, and IB principles. Apart from O’Boyle (2009) and Wilkinson and Hayden (2010), the IB studies about students were conducted by authors in gifted education. On the other hand, research about inquiry and teachers and about the IB program principles were not exclusively from authors doing research related to giftedness.
A. Research about Inquiry and Students in the IB Programs

The first area of research focused on issues associated specifically with students enrolled in the IB. They are presented below and grouped under the following three themes:

**Theme A1: The effects of being in an IB program.**

- The short and long-term effects of students’ program on their academic and social life. (Culross & Tarver, 2007)
- Students’ choices between social acceptance and academic success. (Foust, Hertberg-Davis, & Callahan, 2008)
- Effects of students’ stress on their well-being while in the IB program. (Taylor & Porath, 2006)
- The appropriateness of the pace of instruction. (Taylor & Porath, 2006)
- AP and IB students’ perceptions of the non-academic implications of AP or IB enrollment. (Foust, Hertberg-Davis, & Callahan, 2009)
- The challenges that gifted girls face when enrolled in IB programs. (Vanderbrook, 2006)

**Theme A2: Perceptions of students enrolled in the IB programs.**

- Students’ perceptions of teachers, parents, and peers of the IB. (Culross & Tarver, 2007)
- The perceptions and evaluations of students enrolled in AP and IB classroom about their learning experiences in these environments (Hertberg-Davis et al., 2006; Hertberg-Davis & Callahan, 2008)
- The similarities and differences between AP and IB students’ perceptions of non-academic factors (Foust et al., 2009)
- Students’ perceptions about their development of strong writing and critical thinking skills? (Taylor & Porath, 2006)
Theme A3: Benefits of being in the IB.

- Comparing the extent of preparation for postsecondary studies of those who had and had not been in the DP. (Taylor & Porath, 2006)
- Long-lasting benefits from having been in the IB Program. (Taylor & Porath, 2006)
- Students’ view of the worthwhile experience of the DP. (Taylor & Porath, 2006)
- The nature of the process of transition and transfer from the students’ perspective. (O’Boyle, 2009)
- Changes observed in students after having participated in the DP. (Wilkinson & Hayden, 2010)
- Intellectually gifted females’ experiences about enrolling and remaining enrolled in AP and IB programs. (Vanderbrook, 2006)

B. Research about Inquiry and Teachers in the IB Programs

The second area of research focused on issues associated specifically with teachers working in the IB programs. They are presented below and grouped under the following three themes:

Theme B1: Teachers’ perceptions.

- Perceptions about their decision to teach IB and about how it differed from teaching regular classes. (Culross & Tarver, 2007)
- Perceptions about teachers, parents, and peers of the IB. (Culross & Tarver, 2007)
- Perceptions of knowledge, values, beliefs, and teacher preparation that have contributed to transformative inquiry teaching practice. (Twigg, 2010)
- Perceptions of ideals and feelings that are motivating for teachers (Twigg, 2010)
- Perceptions of the kind of support and expertise that could be conducive to the change
process. (Twigg, 2010)

**Theme B2: Challenges of teaching in the IB.**

- Dealing with the challenges or conflicts of interest created by the change process. (Twigg, 2010)
- The stresses and challenges of teaching IB classes. (Culross & Tarver, 2007)

**Theme B3: Role(s) of the IB teachers and conceptualizations of teaching and learning.**

- Teachers’ roles in the PYP implementation process. (Twigg, 2010)
- Implementing change in the school and in the teacher’s own practice. (Twigg, 2010)
- Teachers’ conceptualizations about implementing curriculum and instructing gifted learners in AP and IB classes. (Hertberg-Davis et al., 2006)

C. **Research about IB Program Principles**

The third area of research focused on issues associated specifically with the principles of the IB curriculum. They are presented below and grouped under the following two themes:

**Theme C1: Knowledge of IB programs.**

- The determining factors in a school’s decision to adopt the IB program. (Poelzer & Feldhusen, 1997)
- The IBO’s expectations of students’ knowledge. (van Oord, 2007)
- The kinds of knowledge that are regarded as significant. (van Oord, 2007)
- The extent to which implementing a course and a program affect the current music program. (Rufino, 2007)
- The extent to which a school can offer a unique form of a program based on the respective context and capacity to implement the IB PYP. (Kauffman, 2005)
Theme C2: The IB curriculum and instructional strategies.

- The modifications to curriculum, instruction, and scaffolding in high-poverty urban schools that allow students to experience a sense of success and develop a readiness to take on new challenges in college. (Kyburg, Hertberg-Davis, & Callahan, 2007)

- The extent to which the curricula and the instructional strategies of AP and IB are flexible enough to accommodate the differing readiness levels, cultural backgrounds, learning styles, and aptitudes of all talented students, and the adequate preparation of students for the assessments and subsequent college work. (Kyburg et al., 2007)

Other Characteristics of the Surveyed Literature

The research investigations based on these questions varied in their methodology. All studies used a mixed-methods design that included a combination of two or more of the following qualitative analysis methods: open-ended questionnaires, narrative inquiry, storytelling, reflections, interviews (individual and focus groups), field notes, transcripts, journals, dialog, classroom observations, and self-reports. Only one study used a Likert-type survey scale in combination with other methods mentioned above.

Among the 52 selected documents for this review were 11 doctoral dissertations. Although these had not yet benefitted from full peer review, the topics under investigation were highly relevant to teaching and learning practices in the IB programs. Similar to the peer-reviewed literature, the dissertation research questions also addressed teachers, students, and other miscellaneous topics associated with the IB’s curricular structure. The IB research questions about students included:

- perspectives regarding their programs’ stress levels, long-term benefits and detriments, levels of college preparation, and satisfaction within their program (Saxby Smith, 2009),
• the impact of their perceptions concerning learned global citizenship attributes (Melliger, 2008),

• perceptions about the classroom learning environment and its relation with attitudes toward science (Raiford, 1998), and

• the existence of inquiry in the classroom (May, 2009).

Research topics about the IB instructors included:

• reasons affecting their choices of science-teaching options (Jauss, 2008),

• perceptions, motivations, levels of concern, and personal changes encountered while implementing an IB program (Walters, 2007),

• effects on philosophy of education, self-efficacy, and outlook on education (Getchell, 2010),

• instructional skills, assessment practices, and self-efficacy beliefs (Hutchinson, 2004),

• shared characteristics and instructional methods (Raiford, 1998),

• perceptions regarding the IB curriculum development and assessment and their impact on the delivery of classroom content (Sills, 1996), and

• the types of inquiry that exist among teachers (May, 2009).

Other topics related to the IB’s curriculum included

• conditions that influenced inquiry in the classroom and in the school (May, 2009),

• the understandings of the philosophy and curricular structure of the IB (Sills, 1996),

• comparisons between the recommended IB curricular and program goals recommended effective instruction in general education for gifted/high ability learners (Hutchinson, 2004),

• the concerns of developers and planners during implementation (Rowell, 1983),

• characteristics and practices of the IBO (Stepancic, 2006), and

• conditions influencing a culture of inquiry in the classrooms and the school (May, 2009).
In sum, the topics in the dissertations covered issues related to inquiry-based pedagogy at a much finer level than the IB research publications.

**Mapping the IB Research onto the MSDIQ**

Most of the research questions in the IB literature (49%) were about teachers, 30% about students, and 21% about the IB curriculum. By searching and mapping similarities found between the inquiry tasks defined in the MSDIQ and the IB publicly available inquiry-research literature, it became evident the extent to which the IB research emphasized the three phases of inquiry learning. Table 2 portrays how elements of inquiry during the Planning phase (52%) substantially outnumbered those mentioned during the Enactment (34%) and Reflection (34%) phases. Table 2 also presents illustrative quotes from the IB research either affirming a link to the inquiry element (as represented by the MSDIQ item), providing contradictory information in relation to an inquiry element, or indicating the absence of an inquiry element (indicated by a blank row). Interpretation of the content in Table 2 is in the Discussion section that follows.
### Table 2

*Using the MSDIQ to map elements of inquiry addressed in the IB publicly available inquiry research literature*

<table>
<thead>
<tr>
<th>MSDIQ Questionnaire Item</th>
<th>IB Research that Affirms a Link to the Inquiry Element (as Reflected in the MSDIQ Item)</th>
<th>IB Research Indicating a Contradiction to the Inquiry Element (as Reflected in the MSDIQ Item)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefaced by the Question “How important is it in inquiry-based learning and teaching . . .?”</td>
<td>“One parent echoed these comments that students had greater ownership of their work and that they were more responsible for their own learning compared to primary” (O’Boyle, 2009, p. 47).</td>
<td></td>
</tr>
<tr>
<td>1 - for the student and teacher to have co-ownership of the question</td>
<td>“Several teachers at the Neighborhood School mentioned that inquiry is both students and teachers asking questions. One intermediate teacher wrote that inquiry is <em>using questions to</em></td>
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<tr>
<td>2 - for the student and teacher to share construction of the curriculum</td>
<td>“An examination of the respondents’ narratives revealed that most perceived that valuing children’s contribution to the inquiry process, by seeking to empower them through providing them with a structure of sharing and learning together, assists the teacher when transforming to inquiry-based teaching” (Twigg, 2010, p. 49).&lt;br&gt;“And several teachers gave students the responsibility to drive the curriculum” (Kauffman, 2005, p. 253).</td>
<td>“Most AP and IB teachers perceived the students in their courses as a homogeneous group of successful, self-motivated, and driven students. Accordingly, the curriculum and instruction within AP and IB courses was largely one-size-fits-all and fast-paced, rather than in accordance with expectations of individual students” (Hertberg-Davis et al., 2006).</td>
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<tr>
<td>3 - for the student and teacher to share decision-making</td>
<td>“In our math classes students complete independent portfolio projects created by the</td>
<td>“Guided by the belief that high student performance on the end-of-course exams</td>
</tr>
<tr>
<td>4 - for the teacher to listen as much as he or she speaks</td>
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<tr>
<td>“Through their images and labels, teachers identified how they continually deal with the following dilemmas met during their inquiry-based teaching practice: promoting children’s questioning skills, enhancing collaborative partnership among children and timing” (Twigg, 2010, p. 52).</td>
<td></td>
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<tr>
<td>students in consultation with the teacher” (Gazda-Grace, 2002).</td>
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<tr>
<td>was the ultimate goal of the course, teachers first and foremost considered what material would be tested on the end-of-course exams. For most teachers, the content included on the exams determined the content to be taught in the course” (Hertberg-Davis et al., 2006, p. ix).</td>
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<tr>
<td>5 - for the student to work in a nurturing and creative environment</td>
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<tr>
<td>“Teachers’ beliefs that AP and IB students were a homogeneous group, and that any differentiation of the curriculum for students would entail “dumbing down” the content, led them to make few, if any, provisions for academic diversity in the classroom” (Hertberg-Davis, Callahan, &amp;</td>
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</table>
“One primary teacher wrote *I choose not to be king of my classroom . . . I choose to encourage and facilitate a child’s learning . . . I trust a child to be curious and wanting to learn*” (Kauffman, 2005, p. 253).

“These students made their decisions to leave the programs precisely because they believed that the curriculum, instruction, and learning environment of the classes were inappropriate for their individual needs. All of these students indicated that they originally took the courses because they desired greater challenge than that offered in non-AP or -IB classes, but that the way AP and IB courses were taught did not allow them to succeed, feel welcome, or learn in the ways that they liked to learn” (Hertberg-Davis et al., 2006, p. xi).
<table>
<thead>
<tr>
<th></th>
<th>for the student to extend inquiry beyond the classroom</th>
<th>“Although teachers are encouraged to discuss these issues, they are not made explicit in the subject content provided in the various mathematics subject syllabuses” (van Oord, 2007, p. 380).</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>- for the teacher to tap into the student's and his or her own interests</td>
<td>“The required extended essay is one area where students have more latitude to choose topics of personal interest” (Kyburg et al., 2007, p. 205). “What motivates me as an inquiry teacher is the flexibility in the style of teaching, as it offers the children the opportunity to really discover what they want to learn about a particular unit, as well as questions and inquiry points coming from the teacher.” (Twigg, 2010, p. 50). “Most students did not question the importance of what they were learning, whether or not they found the content interesting, or the teachers’ instructional methods” (Hertberg-Davis &amp; Callahan, 2008, p. 209).</td>
</tr>
</tbody>
</table>
| 7 | - for the teacher to explore his or her own interests | “Faculty further felt that the program allowed

| 8 | for the teacher to explore his or her own interests |  |
| her interest | them to draw upon their strengths, as the structure allowed for great flexibility‖ (Culross & Tarver, 2007, p. 58). |
| 9 - for the teacher to address his or her needs and student's needs | “Other modifications to curricula included selection of coursework or texts that might especially appeal to minority students’ interests‖ (Kyburg et al., 2007, p. 204). “Classroom observations and teacher and student interview data indicated that educational opportunity tended to be extended to traditionally underserved gifted learners in school environments where AP and IB teachers recognized the diversity and complexity of their students’ backgrounds and were cognizant of potential limitations of students who were less “They believed that their AP and IB teachers did not adjust the course content to meet their unique needs. One student who decided to leave the IB program at his school described the program’s expectations for how his work had to be completed as inflexible and limiting” (Hertberg-Davis, Callahan, & Kyburg, 2006, p. ix). “One student who decided to drop out of the IB program expressed her frustration with the lack of modifications made in her
prepared to engage in challenging academic study” (Kyburg et al., 2006, p. 203).

Teachers have the flexibility to change and adapt to what is available or not available, in terms of needs and ability of the children” (Twigg, 2010, p. 50).

| IB English classes to meet her needs” (Hertberg-Davis & Callahan, 2008, p. 206). |
| “Despite feeling that they had some flexibility in their choice of instructional methods, IB teachers, like their AP counterparts, were never observed adjusting their instructional methods to meet the diverse needs of individual learners in their classrooms. It seems that the generally held belief among AP and IB teachers that their students were a purposefully homogeneous group of learners left them feeling as though they should not—and ultimately need not—make |
any modifications to their instructional methods to meet the various learning needs and styles of the students in their classrooms” (Hertberg-Davis et al., 2006, p. x).

| 10 - for the teacher to provide a mentor | “Teachers considered individual student needs as they arose, particularly when a student seemed to be falling behind, and generally provided after school help for struggling students rather than providing scaffolding or other support during class time” (Hertberg-Davis et al., 2006, p. ix). |
| 11 - for the teacher to model skills needed for the inquiry | “Students who identified themselves as coming to AP and IB courses without requisite background skills (i.e., writing, study, and time management skills) |
| believed that they were never given an opportunity to catch up to the other students in the class and were expected to use skills that they had never been taught” (Hertberg-Davis & Callahan, 2008, p. 206). |
| “The most common suggestions made by the participants were to encourage more consistent reflection, revisiting, sharing and guided discussions; flexibility in planning and time for planning; informal discussion sessions; and continued professional development either out-of-school or in-school” (Twigg, 2010, p. 52). |

| 12 - for the teacher to give the | “IB students frequently noted that the |
amount of time needed, be flexible with time

curriculum in AP and IB courses often felt rushed and overwhelming due to the hurry to cover a great deal of content in time for the exams” (Hertberg-Davis & Callahan, 2008, pp. 202-203).

“One thing I’ve noticed about IB or pre-IB . . . is how oriented they are in tests that we have to take . . . it seems like the teachers are always working to get us full of the knowledge that we need for the tests” (Hertberg-Davis et al., 2006, p. 51).

“Although they indicated the pace was hectic at times . . .” (Taylor & Porath, 2006, p. 155).
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<tr>
<td>13 - for the student to organize time and space</td>
<td>“They valued the breadth and depth of the curriculum . . . and time management skills that they honed and carried forward into postsecondary school and beyond” (Taylor &amp; Porath, 2006, p. 155).</td>
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</tr>
<tr>
<td>14 - for the student to understand the goal of the task</td>
<td>“The heavy, almost exclusive emphasis on exam scores in these courses over genuine learning may contribute to students’ sense that the purpose of taking these courses (and by extension, taking on any challenge) is acquisition—rather than understanding, wrestling with ideas, and intellectual growth” (Hertberg-Davis &amp; Callahan, 2008, p. 210).</td>
<td>“The IB participants focused on the...”</td>
</tr>
</tbody>
</table>
challenge of memorizing the content, not in comprehending the material” (Vanderbrook, 2006, p. 140).

| 15 - for the student to divide the task into a coherent sequence of do-able steps |
| 16 - for the student to make a concept map or web or cluster |
| 17 - for the student to foresee possible outcomes of the activity |
| 18 - for the student to understand key concepts |

“Images such as *building with blocks one at a time* denote how introducing new concepts to young learners (three-four years), using their own language, assist the children’s understanding rather than trying to move outside of these experiences” (Twigg, 2010, p. 52).
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<tbody>
<tr>
<td>19-</td>
<td>for the student to understand instructions</td>
</tr>
<tr>
<td>20 -</td>
<td>for the student to describe his or her own problem-solving strategies</td>
</tr>
<tr>
<td>21 -</td>
<td>for the student to have previous experience with similar activities</td>
</tr>
<tr>
<td>22 -</td>
<td>for the teacher to encourage honest criticism of ideas</td>
</tr>
<tr>
<td>23 -</td>
<td>for the teacher to encourage creative risk-taking</td>
</tr>
<tr>
<td>24 -</td>
<td>for the student to connect old and new knowledge</td>
</tr>
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</table>

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“They [students] rarely described encountering challenges with the curriculum that focused on improving abilities, such as pushing student thinking and developing potential” (Vanderbrook, 2006, p. 140).
<p>| | |
|   |   |<br />
|---|---|---|
| 25 | for the student to set aside preparation time |   |
| 26 | for the student to brainstorm his or her ideas |   |
| 27 | for the student to make a plan |   |
| 28 | for the student to have different plans in advance to accomplish the task |   |
| 29 | for the student to have back up plans at the end should the project stall |   |
| 30 | for the student to feel free to use imagination |   |
| 31 | for the student to keep motivated |   |
| 32 | for the student to have self-motivation |   |</p>
<table>
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<tbody>
<tr>
<td>33 - for the student to get a high grade</td>
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<td></td>
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<tr>
<td>34 - for the student to win a prize</td>
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<tr>
<td>35 - for the teacher to give sensitive feedback, positive reinforcement, praise for persistence</td>
<td>.</td>
<td>“The teacher gave students no indication of whether they were correct or incorrect; she just acknowledged the statement and encouraged further testing” (Kauffman, 2005, p. 255).</td>
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<tr>
<td>36 - for the student to ask questions</td>
<td>“A kindergarten teacher wrote A student constructs his/her own understanding through questioning and actively searching out answers” (Kauffman, 2005, p. 252).</td>
<td>“Another teacher wrote that student(s are taught to ask important questions and how to find answers independently” (Kauffman, 2005, p.</td>
</tr>
<tr>
<td>37 - for the student to restate or reformat the problem</td>
<td>“The students in IB focus on theme-based problems that they generate themselves. They develop and examine theme-based problems that are significant to themselves and to the social or cultural context” (Poelzer &amp; Feldhusen, 1997, p. 171).</td>
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<tr>
<td>38 - for the student to make suggestions</td>
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<td>39 - for the student to share emotions, feelings, ideas, and opinions</td>
<td>“IB participants did not mention the existence of formal peer support systems, such as the creation of study groups” (Vanderbrook, 2006, p. 143).</td>
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<td>40 - for the student to develop expectations of what will happen next</td>
<td>“The teacher encouraged students to make predictions and asked questions to check comprehension. This was the first of two</td>
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instances in which I saw a teacher, at any school, discuss the attitudes with his/her students” (Kauffman, 2005, p. 255).

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<td>41</td>
<td>for the student to offer hypotheses about outcomes</td>
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<td>42</td>
<td>for the student to make careful observations</td>
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<td>43</td>
<td>for the student to identify where to obtain data</td>
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<td>44</td>
<td>for the student to recognize hidden meanings in data</td>
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<td>for the student to record data</td>
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<td>46</td>
<td>for the student to classify data</td>
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<td>47</td>
<td>for the student to search for resources beyond textbooks</td>
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<td>“The Choice School focused, more than the other schools, on gathering information on abstract themes” (Kauffman, 2005, p. 250).</td>
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<td>48 - for the student to search the Internet and World Wide Web</td>
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<td>49 - for the student to separate relevant and irrelevant information</td>
<td>“They valued the breadth and depth of the curriculum, and the critical thinking . . .” (Taylor &amp; Porath, 2006, p. 155).</td>
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<td>50 - for the student to apply previous knowledge to new concepts</td>
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<td>51 - for the student to understand how preconceptions affect learning</td>
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<td>52 - for the student to be aware of how the inquiry event affects him or her personally</td>
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<td>53 - for the student to keep an open mind to change</td>
<td>“Some of these curricula are very structured; others encourage more open-ended inquiry. I also saw an emphasis on inquiry when not using these programs. Some teachers used inductive or</td>
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deductive reasoning as part of their inquiry” (Kauffmann, 2005, p. 255).

“Teachers at times asked students open-ended questions and encouraged them to think deeply on their activities” (Kauffman, 2005, p. 256).

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<th>54 - for the student to address doubts directly</th>
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<td>“In an intermediate class, the students worked on Hands-on Equations. This is a program representing algebraic equations with manipulatives. As students finished, they moved around the room helping their classmates” (Kauffman, 2005, pp. 255-256).</td>
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<th>55 - for the student to assist others to make observations</th>
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<td>“In an intermediate class, the students worked on Hands-on Equations. This is a program representing algebraic equations with manipulatives. As students finished, they moved around the room helping their classmates” (Kauffman, 2005, pp. 255-256).</td>
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<th>56 - for the student to find patterns in data</th>
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<td>57 - for the student to value personal judgment</td>
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<td>58 - for the student to verify data or information</td>
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<td>59 - for the student to compare and contrast data with someone else’s</td>
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<td>60 - for the student to anticipate and respond to arguments in opposition to one's view</td>
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<td>61 - for the student to seek different viewpoints</td>
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<td>62 - for the student to test ideas and hypotheses</td>
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make predictions and provide reasons for those predictions. The teacher also asked the students to compare the characters to themselves, and asked other questions for comprehension” (Kauffman, 2005, p. 256).

| 63 - for the student to have a mental representation of the task |
| 64 - for the student to construct new knowledge |
| “A first- and a third grade teacher turned this model around: the teacher questions students to help them understand concepts, or inquiry is guiding children, by asking key questions, to draw conclusions for themselves” (Kauffman, 2005, pp. 252-253). |
| 65 - for the student to interact with or manipulate his or her surroundings |
| 66 - for the student to communicate |
| “For Matteo, there was a lot more discussions |
one's learning with others

this year, rather than copying off the board, or
listening to a lecture. Thus it seems that
teachers’ pedagogical styles were favored
because they encouraged more active learning
than in primary” (O’Boyle, 2009, p. 46).

67 - for the student to consider
diverse means of communication

“Lower grades explained that inquiry was asking
powerful questions, how to complete research,
how to articulate (orally and written, as well as
artistically) their findings” (Kauffman, 2005, p.
253).

68 - for the student to organize the
presentation of the project

69 - for the student to present data in
tables and graphs

70 - for the student to use vocabulary
appropriate to the audience and topic
| 71 - for the student to accept that more than one solution might be appropriate |
| 72 - for the student to apply new knowledge to future experiences |
| 73 - for the student to record methods, results, and conclusions |
| 74 - for the student to explain the results | “Rather than requiring one acceptable choice of answer, the examiners have some latitude to accept answers if a student presents a logical justification” (Rufino, 2007, p. 52). |
| 75 - for the student to question the findings |
| 76 - for the student to reflect upon his or her inquiry experience |
| 77 - for the student to discuss what | “The teacher also asked the students to compare |

"Rather than requiring one acceptable choice of answer, the examiners have some latitude to accept answers if a student presents a logical justification” (Rufino, 2007, p. 52).”
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<th>has been learned compared to what was known before</th>
<th>the characters to themselves, and asked other questions for comprehension” (Kauffman, 2005, p. 256).</th>
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<td>78 - for the student to evaluate the inquiry experience</td>
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<td>79 - for the student to follow-up the project with a new set of questions</td>
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Due to the prevalence of the Planning phase in the IB research and the heavy emphasis on student performance during exams, it was not surprising to find that the IB research questions highlighted teachers and instruction rather than students and learning. Correspondingly, six of the eight MSDIQ inquiry tasks that addressed only teachers were also referred to in the IB literature (Culross & Tarver, 2007; Hertberg-Davis & Callahan, 2008; Hertberg-Davis et al., 2006; Kaufmann, 2005; Twigg, 2010; & Vanderbrook, 2006). All five inquiry tasks addressing both students and teachers were present in the IB literature (Hertberg-Davis & Callahan, 2008; Hertberg-Davis et al., 2006; Gazda-Grace, 2002; Kaufmann, 2005; O’Boyle, 2009, & Twigg, 2010). Only 21 of the 66 MSDIQ learner-focused items were addressed in the IB research literature (Anderson, 1994; Culross & Tarver, 2007; Hertberg-Davis & Callahan, 2008; Hertberg-Davis et al., 2006; Kaufmann, 2005; O’Boyle, 2009; Rufino, 2007; Taylor & Porath, 2006; Twigg, 2010; Vanderbrook, 2006; & van Oord, 2006) (also see Figure 1). With a relatively lower focus of studies on students and a heavier emphasis on teachers and the Planning phase of inquiry, IB students are less likely to be diversifying or exchanging roles in the classroom, as is expected in an inquiry-based pedagogy. The IB teachers’ instructional methods were designed for an inclusive student population which failed to fully recognize the diverse needs of individual learners (Hertberg-Davis et al., 2006). Despite the fact that inquiry-based instruction is anchored in a co-constructed curriculum and in shared interests, the results from IB research did not always provide evidence for these claims.
Figure 1. Number of MSDIQ items addressing teachers, students, or both and its presence or absence in the research questions found in the IB literature.

Planning. Items in the Planning phase were highlighted the most in the IB research. All five items deemed equally important to students and teachers such as co-ownership, co-construction, sharing decision making, and tapping student’s and teacher’s interests and needs were addressed, but not always in a consistent manner; four of the five items included illustrative quotes from different articles that affirmed a link to an inquiry element (as reflected in the MSDIQ item) and, at the same time, also indicated a contradiction to that same inquiry element (see Table 2). For example, Hertberg-Davis et al. (2006) found that some IB teachers chose coursework or texts that appealed to diverse students whereas others did not modify the course content to meet their students’ needs, which eventually led frustrated students to leave the IB program. Additionally, most teachers’ purpose was to teach only the content that would be tested at the end-of-course exams. Although the required extended essay in the DP is one area in which students have the freedom to choose topics of personal interest, some studies provided
evidence of teachers addressing their own needs and interests more than those of the students. Hertberg-Davis and Callahan (2008) observed that most students were not critical of what they were learning or the way they were being taught--students and teachers did not always share in decision-making. Another feature considered key to inquiry pedagogy is for the student and teacher to share construction of the curriculum (Chiappetta, 1997; NRC, 1989). Whereas several teachers handed more responsibility over to the students to drive the curriculum (Kaufmann, 2005) or offered learners the opportunity to discover what they wanted to learn about a particular unit (Twigg, 2010), some teachers perceived the IB program as a largely one-size-fits-all rather than a co-constructed and individually-tailored curriculum. This perception did not act in favor of students from rural areas, students from low socio-economic backgrounds, and minority students. For many of these students, disproving racial stereotypes, attending and graduating from college, and escaping an undesirable lifestyle acted as additional motivators for taking and succeeding IB courses (Hertberg-Davis et al., 2006). Only one of the five items—for the student and teacher to have co-ownership of a question-exclusively affirmed a link between IB and the inquiry task in question (Kaufmann, 2005, O’Boyle, 2009).

Listening to others and encouraging honest criticism of ideas were two of the eight specific inquiry tasks addressing teachers only that were absent from the IB research. Because the IB program structure provided teachers with greater flexibility, Culross and Tarver (2007) hypothesized that teachers could be addressing only their needs or interests by drawing upon their strengths. Completely absent from the IB inquiry literature was the role of an inquiry-oriented teacher, namely for the teacher to:

- provide a mentor,
- model skills needed for the inquiry,
• provide the amount of time needed (flexibility with time), and
• encourage creative risk-taking.

Instead of teachers scaffolding or providing other forms of support to struggling students during class time, they only considered helping either on an individual basis as the need arose or after school (Hertberg-Davis et al., 2006). Incoming students with a lack of writing, study, or time-management skills were not remediated or given the opportunity to practice those skills, and consequently fell behind the other students in the class (Hertberg-Davis & Callahan, 2008). IB teachers frequently noted that they felt rushed and overwhelmed due to the amount of content to cover in time for the IB examinations (Hertberg-Davis & Callahan, 2008) and suggested that they needed more time for planning (Twigg, 2010). A student remarked, “One thing I’ve noticed about IB . . . is how oriented they are in tests that we have to take . . . it seems like the teachers are always working to get us full of the knowledge that we need for the tests” (Hertberg-Davis et al., 2006, p. 51). As a result of this sprint toward the tests, students rarely experienced the opportunity to challenge themselves in order to improve abilities such as risk-taking, divergent thinking, and developing potential (Vanderbrook, 2006).

Surprisingly, only five of 17 tasks (29%) associated with inquiry-based learning (students only) during the Planning phase were addressed in the IB inquiry literature. The remaining 12 (71%) that were not discussed included:

• for the student to divide the task into a coherent sequence of do-able steps,
• for the student to make a concept map or web or cluster,
• for the student to foresee possible outcomes of the activity,
• for the student to understand instructions,
• for the student to describe his or her own problem-solving strategies,
• for the student to have previous experience with similar activities,
• for the student to connect old and new knowledge,
• for the student to set aside preparation time,
• for the student to brainstorm his or her ideas,
• for the student to make a plan,
• for the student to have different plans in advance to accomplish the task, and
• for the student to have back up plans at the end should the project stall.

Although these tasks are considered key components to inquiry-based learning (Driver, 1983; Llewellyn, 2005; Québec, 1999; NRC, 1989), they did not appear in my selected studies. Students who did take on a part in the planning process learned how to divide the task into a coherent sequence of do-able steps: “Although they indicated the pace was hectic at times, they valued the breadth and depth of the curriculum, and the critical thinking, . . . that they honed and carried forward into postsecondary school and beyond” (Taylor & Porath, 2006, p. 155). On the other hand, expectations to extend inquiry beyond the classroom were not demonstrated by IB teachers (van Oord, 2007) and the heavy focus on memorizing the content and on examination scores did not contribute to genuine learning; understanding the goal of the task and intellectual growth were no longer the purpose of taking these courses (Hertberg-Davis & Callahan, 2008; Vanderbrook, 2006). IB research was inconsistent regarding some inquiry tasks, such as for the student to work and interact with his or her surroundings or environment, and for the student to understand key concepts. Whereas some IB teachers recognized the dilemmas arising from students’ diverse and complex backgrounds (Kyburg et al., 2007) and dealt with it by promoting children’s questioning skills and enhancing collaborative partnership among children (Twigg, 2010), others did not make any provisions for academic diversity due to their beliefs that IB
students were a homogeneous high-ability group (Hertberg-Davis et al., 2006). In fact, the latter was one of the reasons why some students decided to leave the IB programs: “The way IB courses were taught did not allow them to succeed, feel welcome, or learn in the ways that they liked to learn” (Hertberg-Davis et al., 2006, p. xi). Also, facilitating the understanding of new concepts using the students’ language (Twigg, 2010) was a contrast to the heavy emphasis on knowledge acquisition tied to exam scores (Hertberg-Davis & Callahan, 2008).

The Planning phase is the most comprehensive regarding the range of actors who are being addressed (i.e., students and teachers, only teachers, and only students). Consequently, it is also the phase with the most variability regarding the extent to which the presence of inquiry tasks was observed. Of the Planning items 17% contained some indication of misleading information; in some cases, IB research affirmed a link to an inquiry element (as reflected in the MSDIQ item) and, at the same time, other studies indicated a contradiction to that same inquiry element (see Figure 2). In addition, inconsistencies were most evident in tasks that included both students and teachers such as, for the student and teacher to share construction of the curriculum, for the student and teacher to share decision-making, for the teacher to tap into the student's and his or her own interests, and for the teacher to address his or her needs and student's needs (see Table 2). Although, 15 of 29 items (52%) in the Planning phase were addressed by IB research, only 4 of those 15 items (27%) affirmed a link to an inquiry element making this phase the least supported by evidence from IB research when compared to the other two (Enactment and Reflection).
Enactment. Given the focus of the MSDIQ on inquiry-based learning, 43 of 44 inquiry tasks (98%) in the Enactment phase addressed students, one the teacher, and none referred to both students and teachers. IB research did not offer supporting evidence of teachers providing sensitive feedback, positive reinforcement, or praise for persistence during an inquiry activity. As one student stated in an interview, “The teacher gave students no indication of whether they were correct or incorrect; she just acknowledged the statement and encouraged further testing” (Kaufmann, 2005, p. 255). A similar observation was made regarding students sharing emotions—Vanderbrook (2006) observed that IB students never mentioned any existing peer-support systems such as study groups in which they could exchange feelings, ideas, and emotions.

Specific inquiry tasks referring to learning processes such as asking questions, restating the problem, developing and testing hypotheses, identifying data sources, keeping an open mind to change, making observations, valuing personal judgment, communicating work with others (comparing and contrasting), constructing new knowledge, and considering diverse means of communication were addressed in the IB literature. For example, teachers in Kaufmann’s (2005)
study reported how students asked good questions and checked for comprehension, searched for answers independently, made predictions and provided reasons for those predictions, gathered information on abstract themes, moved around the room helping their classmates, looked for evidence, and offered their own perspectives. Anderson (1994) communicated how IB students focused on theme-based problems that were generated by themselves and not only significant to themselves, but to the social or cultural context as well.

Although the IB literature contained some research supporting claims about how to teach using an inquiry-based approach, 29 of 43 items (67%) addressing students in the Enactment phase remained unexplored (see Figure 3). Examples of some of these inquiry tasks included using imagination, motivation, making suggestions and observations, recognizing hidden meanings in data, recording, classifying, verifying and finding patterns in data, separating relevant and irrelevant information, applying previous knowledge to new concepts, understanding how preconceptions affect learning, anticipating and responding to arguments in opposition to one’s view, using vocabulary appropriate to audience or topic, accepting that more than one solution might be appropriate. From the 14 of the 43 items (33%) being addressed in the IB literature, 13 of those (93%) provided supporting evidence regarding the presence of an inquiry element in the Enactment phase (see Table 2).
**Reflection.** The six inquiry tasks described in the Reflection phase of the MSDIQ address only students. Two of these six inquiry elements (33%) (see Table 2) were present in the IB literature, but not the remaining four—the student questions the findings, the student evaluates the inquiry experience, the student reflects upon his or her inquiry experience, and the student follows-up the project with a new set of questions (see Figure 4). Rufino (2007) observed that IB examiners were flexible when it came to accepting more than one answer to an exam question. If students explained their results and presented a logical justification, the examiners showed some latitude in accepting different answers. Kaufmann (2005) also observed how IB English teachers asked students to compare themselves to the characters in a text in order to contrast what had been learned to what was known before. These examples provided evidence of some aspects of reflection from the inquiry model that were present among IB learners.
Although the IBO advocates that research plays a central role in the development, quality assurance, and validation of IB programs and services, they do not place enough emphasis on the extent to which inquiry-based teaching and learning can actually be measured in classrooms or in schools. The lack of research on this pedagogical approach was also evident in the IB published literature which mostly addressed program impact and outcomes, assessment practices, the development of PYP, MYP, DP, and curriculum continuum. One way of ensuring a smoother transition for students across all levels of the IB programs is for learning processes, as described in the 79 items of the MSDIQ, to be monitored over a given period of time. The template used in this review indicated that observable indicators (inquiry tasks) of an inquiry-based curriculum were only partially being addressed by the IB programs. In fact, most (48% in Planning, 66% in Enactment, and 67% in Reflection) inquiry tasks recognized in the MSDIQ were never mentioned. The 47 of 79 items (59%) that were not addressed by IB research described skills for strategy selection and application during self-regulation, namely those concerned with planning, checking, monitoring, selecting, revising, and evaluating. Also, strategies for promoting
metacognition, a salient feature of good self-regulated learners, such as questioning one’s findings, describing one’s own problem-solving strategies, and making graphic representations (e.g., concept maps) were also missing from the IB literature.

The focus on “teaching to the test” (Peterson, 1972; Hertberg-Davis & Callahan, 2008; Hertberg-Davis et al., 2006; Kauffman, 2005) was apparent as the IB program transitioned from primary to tertiary (specifically from PYP to MYP to DP); this instructional practice could have a detrimental impact on the implementation of an inquiry-based pedagogy. This is the same pressure that might be felt in regular school curricula. Due to such unintended inconsistencies with the IB philosophy and with social constructivism, learning objectives and outcomes could be prone to misalignment.
CHAPTER 4

Discussion and Conclusion

The aim of this exploratory study was to describe how inquiry was articulated in the IB curriculum model by examining the extent to which research about IB programs emphasized inquiry instruction and inquiry-based learning and the importance it attributed to the three phases of inquiry--Planning, Enactment, and Reflection.

The educational objective of the IB--providing an inquiry-based pedagogy--was not always aligned with the intended goals. IB research placed more emphasis on teachers and inquiry-based instruction compared to students’ experiences with inquiry tasks. Given the emphasis on the role and centrality of research in the expansion of their programs as described by the IBO, it was not surprising that students’ learning processes were not a major focus for the IB research. On the other hand, the mandatory participation of teachers in professional development, particularly training on how to use the Program Of Inquiry (POI) and the planners, influenced the direction of the IB research.

Parallel to the heavy focus on teachers was the strong emphasis on the Planning phase of inquiry. This was anticipated given the amount of workshops and training sessions available for newly hired IB teachers. Although the items addressed in this phase overshadowed the Enactment and the Reflection phase, the supporting evidence from IB research did not always affirm the presence of certain inquiry tasks in the Planning phase. In fact, most inconsistencies in terms of research outcomes occurred during the Planning phase, especially in inquiry tasks that addressed both students and teachers.

By using the McGill Strategic Demands of Inquiry Questionnaire (MSDIQ) as a template to trace a picture of what IB research described as inquiry-based teaching and learning practices,
it became evident that many inquiry elements were absent from the IB inquiry literature, particularly those concerned with self-regulated learning and the use of metacognitive strategies. These are important elements to consider in inquiry-based pedagogy given that both help students to perform many cognitive tasks more effectively. What seems to be occurring at the primary levels (PYP) is not being carried forward to the secondary (MYP) and tertiary levels (DP). The nature of the instruction and the relationship between students and teachers are changing in the continuum of the IB curriculum. Due to an increasing attention to “teach to the test” in the middle and upper levels, students’ efforts to develop as self-regulated and more autonomous learners seem to be unsuccessful without the continuing support and scaffolding of the IB teachers.

**Theoretical and Practical Implications**

IB schools share a common purpose, and the alignment of this purpose with student learning outcomes depends on a better understanding of IB goals and how they influence and guide classroom practice. Instruments to track progress of inquiry in schools are needed at different levels of implementation. The underlying problem with evaluating perceptions and conceptualizations of inquiry engagement using journal reflections, metaphors, essays, surveys, interviews, and other qualitative techniques is that many of them involve a high degree of inference by the researchers. Also, the diversity in assessment techniques makes comparisons between studies difficult. Only one study from my findings used a Likert-type scale to conduct research in an IB setting. Although we can make no inferences about what is not reported in the IB literature, routine items that occur in all classrooms (e.g., for students to have self-motivation, to feel free to use imagination, to have different plans in advance to accomplish the task) are important to the larger inquiry picture, but those missing elements can only be identified by
administering instruments (surveys, questionnaires, observation grids, etc.) that capture the essence of inquiry. Depending on the purposes, and the concomitant level of granularity needed (e.g., for policy or curriculum planning, teacher workshops, student skill-building), the items in the MSDIQ can be used to build inquiry capacity in learners, classes, or to generate topics for professional development for teachers. Ultimately, the MSDIQ could be useful at stages from thinking about becoming an inquiry class or school, to taking first tentative steps, to systematically building an inquiry tradition and tracking progress on this trajectory, to sustaining an inquiry learning environment.

By examining the range of intellectual tasks required in the successful integration of inquiry into teaching and learning, we can assess the breadth of respondents’ pedagogical understanding of engaging learners in inquiry. Teachers need opportunities to learn about the inquiry approach implicitly and explicitly, to most fully understand all that is entailed in creating an inquiry-oriented learning situation. Subject-matter knowledge alone does not necessarily provide the expertise to conduct inquiry-based instruction (Syer, 2007).

**Limitations**

Although this study was based on a thorough search of the IB literature, it was limited to studies conducted in schools in which the language of instruction was English. Despite the common roots of inquiry in education (Chichekian et al., 2011), the French and English language educational communities have come to know about inquiry and to understand it from different literatures; therefore, a parallel study in the French IB literature would reveal if any similarities of inquiry-based teaching and learning practices exist between both languages. A preliminary look at French and Swiss library catalogues such as Système Universitaire de Documentation (SUDOC) and Réseau des Bibliothèques de Suisse Occidentale (RERO) revealed eight and 11
potential documents to examine, respectively. This appears not to be a large limitation on the results revealed so far.

Another limitation to this study was the lack of public accessibility to the various IB professional development resources due to proprietary restrictions. Workshops and conferences designed to help teachers and schools to better understand and deliver the three IB programs were limited to IB employees or those in the evaluation process of becoming an IB school as was the online curriculum centre (OCC)—a curriculum information and resources web application designed to develop and foster an international online community of practice. “The OCC is organized by curriculum area, with additional areas relating to librarians, special educational needs, calculators, academic honesty and the work of the IB research unit. Each area contains content-specific news and information, relevant IB publications and documentation (including curriculum guides, coordinator notes, and teacher support materials) and, where appropriate, a teacher resource exchange and dedicated discussion forum” (IBO, 2005-2011). All IB teachers have access to the OCC. Due to password-protected sites, other inaccessible IB materials included exclusive IB publications available for purchase from the IB store and IB staff blogs.

This study also solely relied on the observable indicators of inquiry tasks, as described in the MSDIQ, to draw links with the IB inquiry literature. Due to time constraints and limited access to IB classrooms, instructors, and students, other research methodologies (i.e., classroom observations, interviews, surveys) were not used to triangulate the data.

**Future Research**

This study used the 79 items from the MSDIQ as a template to map the findings from IB research. Given this is a validated instrument (Shore et al., 2011), one could decide to work with one or more of the three broader phases of the inquiry process (as in this study), any or all of the
14 factors identified through factor analysis, the 79 original items, or a subset thereof. Each of the 14 factors that emerged through the validation process highlighted the student’s active role in knowledge acquisition that is central to inquiry education. Examples of these factors included Time and Task Organization, Planning to Solve the Problem, Co-Construction, Questioning the Results and Follow-Up Questions, Skills for Collecting and Analyzing Data, and Communication of Results. Using the instrument in multiple ways could highlight the differences, if any, of the results and conclusions obtained from various analyses and may provide a richness that is more difficult to capture when considering inquiry only in its entirety.

The outcomes from this review also indicated that a large proportion of the IB research was done on the suitability of the IB for gifted students for whom inquiry is a strongly supported curricular approach. Given the limited general investigations on the inquiry outcomes of the IB, it might be hard to generalize about the place of inquiry in the IB to populations of more diverse abilities. On the other hand, without this research strand and IB interest within gifted-education research, we would know even less about the presence of inquiry in the IB, the alignment of the IB inquiry goals, and the difficulty in discerning practice.

The topic of inquiry-based teaching and learning in the IB research literature is still at its very early stages. Although this study was able to identify that most of the IB research was about teachers and emphasized the Planning phase of inquiry, it only took into account peer-reviewed articles and had an exhaustive list of exclusion categories. In order to study topics that the IB literature did not yet address very well, such as the ones in the Enactment phase of inquiry, a narrower list of exclusion categories might be necessary as well as methodologies to conduct systematic reviews based on qualitative research (Dixon-Woods, FitzPatrick, & Roberts, 2000). Studies are also needed of Planning, Enactment, and Reflection within the IB with an
emphasis on learners, and on Enactment and Reflection with a focus on teachers. It would also be interesting to know if the implementation of the IB as a platform for inquiry is supported by social-constructivist knowledge, skills, and dispositions on the part of teachers and learners, that extent this is so in comparison to other inquiry settings, and especially if these decrease as the level and testing practices increase.

Given the items in the MSDIQ are observable indicators of inquiry tasks, they can be used as a guideline during classroom observations. This methodology would not only be a replication of the current study, but coupled with a literature-based review would triangulate the data. Another possible future study would be to compare the different levels of the IB programs (PYP, MYP, DP) instead of contrasting DP with AP, as was in most of the cases, or even comparing exemplary IB classes with regular ones.

Inquiry in education refers to teaching and learning partly based on student curiosity and knowledge creation (Barell, 2003; Bereiter, 2002) with the intent that students become increasingly inquiry-literate. Student knowledge, skills, and predispositions that would qualify as “inquiry literacy” include, for example, role diversifications by teacher and student, the goal-driven nature of inquiry, generating or finding problems, using dialog to learn, feeling comfortable with problems being ill-defined (Shore, Birlean, Walker, Ritchie, LaBanca, & Aulls, 2009). The MSDIQ targets the specific inquiry knowledge, skills, and dispositions needed in classrooms. Similarly, the IB “Learner Profile” (see Appendix 1) describes the attributes that define who an IB learner strives to be. A long-term vision of education, as the “Learner Profile” aspires to be, takes much time. Inquiry literacy grows over time in the breadth, depth, and the fluency with which knowledge, skills, dispositions, and beliefs are invoked. Developing into a teacher inquirer takes time and variations will exist at different levels of implementation.
Evaluating the growth of inquiry literacy at the individual and institutional levels might have the potential to form a basis for eventually ensuring its spread across the curriculum and the continuum (PYP, MYP, DP). The outcomes of this study support the need for professional development to help practicing teachers, even those trained in IB professional development, to develop sophisticated conceptualizations of an inquiry-based instructional approach and to fully appreciate the importance of the different tasks that learners and teachers must perform as part of the inquiry process.
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Appendix 1

The Learner Profile


The aim of all IB programmes is to develop internationally minded people who, recognizing their common humanity and shared guardianship of the planet, help to create a better and more peaceful world.

IB learners strive to be:

**Inquirers**
They develop their natural curiosity. They acquire the skills necessary to conduct inquiry and research and show independence in learning. They actively enjoy learning and this love of learning will be sustained throughout their lives.

**Knowledgeable**
They explore concepts, ideas and issues that have local and global significance. In so doing, they acquire in-depth knowledge and develop understanding across a broad and balanced range of disciplines.

**Thinkers**
They exercise initiative in applying thinking skills critically and creatively to recognize and approach complex problems, and make reasoned, ethical decisions.

**Communicators**
They understand and express ideas and information confidently and creatively in more than one language and in a variety of modes of communication. They work effectively and willingly in collaboration with others.

**Principled**
They act with integrity and honesty, with a strong sense of fairness, justice and respect for the dignity of the individual, groups and communities. They take responsibility for their own actions and the consequences that accompany them.

**Open-minded**
They understand and appreciate their own cultures and personal histories, and are open to the perspectives, values and traditions of other individuals and communities. They are accustomed to seeking and evaluating a range of points of view, and are willing to grow from the experience.

**Caring**
They show empathy, compassion and respect towards the needs and feelings of others. They have a personal commitment to service, and act to make a positive difference to the lives of others and to the environment.

**Risk-takers**
They approach unfamiliar situations and uncertainty with courage and foresight, and have the independence of spirit to explore new roles, ideas and strategies. They are brave and articulate in defending their beliefs.

**Balanced**
They understand the importance of intellectual, physical and emotional balance to achieve personal well-being for themselves and others.

**Reflective**
They give thoughtful consideration to their own learning and experience. They are able to assess and understand their strengths and limitations in order to support their learning and personal development.
Appendix 2

The DP Curriculum

from http://www.ibo.org/diploma/curriculum/
Appendix 3

The MYP Curriculum

from http://www.ibo.org/myp/curriculum/
Appendix 4

The PYP Curriculum

from http://www.ibo.org/pyp/curriculum/