The Languages of Inquiry: An English-French Lexicon of Inquiry Terminology in Education

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ABSTRACT

Contemporary curricular reform efforts are underway in many countries toward adopting and implementing inquiry-based approaches to teaching and learning on a provincial and national level. Buzzwords associated with inquiry-based pedagogy have been used to express similar ideas in bilingual educational communities, but rarely with a direct one-to-one correspondence. We present and explain the meaning of 10 initial key terms from inquiry in education, in English and French. They represent the beginning steps to guide teachers and curriculum developers who are exposed to both the French and English inquiry traditions to translate ideas and curriculum consistently.

Nearly every major curriculum reform initiative since the 1980s, in many subjects and different countries, has had inquiry-based learning at its core (e.g., 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 Ministry of Education, 1999, 2004, 2005). Among these is the Quebec Education Program (Ministère de l'Éducation, du Loisir et du Sport, 2001, 2004). However, Quebec educators face several barriers to effectively implementing inquiry in their students' learning experiences. For example, implementing inquiry is too often presented without context, and pedagogical decisions are based on teachers' systematic, interwoven knowledge of child development, subject matter, psychology of learning, and

philosophy and goals, all of which are enriched by personal experiences. In addition, despite the common origins, the English- and French-language educational communities (especially relevant to teaching in Quebec) have come to know about inquiry and to understand it from different literatures. This explains in part why the language of the Quebec Education Program, in its original French and as translated into English, for example, is somewhat different from the language of inquiry encountered in most of the English-language literature on inquiry in education. As a result, the separate development of inquiry traditions in English and French has generated somewhat different terminology. To benefit from both traditions, both English- and French-speaking educators can be assisted by a lexicon of key inquiry terminology that they might read or hear.

The first goal of this paper is, therefore, to summarize the background and reasons for including inquiry as a core goal in our teaching at all levels (Shore, Aulls, & Delcourt, 2008, called inquiry a "curricular imperative," and provided examples of overcoming barriers). Our second goal is to outline the separate paths taken in anglophone and francophone communities and, thirdly, to present 10 initial key terms from inquiry in education, in English and French, with an explanation of the meaning of each term.

Common Roots of Inquiry

First, inquiry-based learning begins with the inquirer's interest in or curiosity about a topic or focus that the inquirer decides to investigate. Western cultural traditions of questioning can be traced back to the classical Greek philosopher Socrates 2500 years ago. Socrates cultivated a dialectic method of inquiry, a form of debate between individuals taking on opposing viewpoints, based on asking and answering questions to encourage rational thinking and the expression of newly formed ideas. Skeptical questioning and independent thinking led students to develop the critical thinking skills required to evaluate the evidence of their claims, and being able to answer the question, "How do you know that?"

Coming to a focus can be a challenge for learners because it involves more than narrowing the topic. It involves defining an authentic question, a personal perspective, or a compelling thesis statement. Inquirers may need to spend considerable time exploring, discussing, and thinking about information they find, deciding what kinds of evidence can support their anticipated conclusions, and generating a plan to

collect that evidence. At this stage of the inquiry process, which is perhaps the most important, inquirers often experience a sense of excitement or optimism about the tasks ahead. This stage explicitly addresses both content and motivation in the learning process.

A second and related common element, alluded to in the reference to authenticity, dialectic, and personal perspective in the choice of topics, is that inquiry-based learning experiences are supposed to enhance meaningful learning. One of the 20th century's most influential thinkers in education, John Dewey (1938), believed that children learn through activity, real-world experiences, and discussion with others that we now refer to as "learning in activity." To be grounded in real experience, education needs to be driven by students' interests and desire to connect with what is most meaningful in their situations. He is widely reported as having stated that, "If you have doubts about how learning happens, engage in sustained inquiry: study, ponder, consider alternative possibilities and arrive at your belief grounded in evidence" (Educational Broadcasting Corporation, 2004, website). He closely linked inquiry and reflection and the weighing of evidence to support one's knowledge and beliefs (Dewey, 1933). Although Dewey's writing is probably more familiar to English than French readers, his works were translated into French as early as 1913 (Boydston, 1979), therefore we have presented this point among the common roots. Dewey's insight that children construct meaning for themselves as a result of the activities in which they systematically engage has a direct parallel in the French literature, also known in English—the work of Jean Piaget. Piaget (1951) also proposed that learners *construct* meaning or reality for themselves in relation to their previous experience, hence the label "constructivism." Learners do not just memorize facts and procedures. Rather, they construct meaning for themselves. They build new understanding shaped by their existing knowledge (including the misconceptions that fascinated Piaget) and that helps reshape their previous understandings.

Jerome Bruner occupies a pivotal place in the story of inquiry. He co-chaired and summarized an important 1959 symposium of 35 prominent scientists, educators, and psychologists, to chart a future vision of US education, including a special focus on science education following the Soviet Union's launch of Sputnik. The National Academy of Sciences and the National Science Foundation sponsored the meeting, held in Woods Hole, Massachusetts. His co-chair was Jerrold Zacharias, an experimental physicist at the Massachusetts Institute of Technology who directed the Physical Sciences Study Committee team whose physics curriculum was published at the same time. Zacharias was a graduate student of the 1944 Nobel Laureate in physics, Isadore Isaac Rabi at Columbia University. Rabi was asked by *Parents* magazine why he became a scientist:

> My mother made me a scientist without ever intending to. Every other Jewish mother in Brooklyn would ask her child after school: So? Did you learn anything today? But not my mother. 'Izzy,' she would say, 'did you ask a good *question* today?' That difference--asking good questions--made me become a scientist. (Schulman, 1993, p. 100)

Asking good questions such as "why . . . ?" and "what if . . . ?" helps make all kinds of inquirers. Asking questions, however, is only part of inquiry.

All the Woods Hole participants were American, with one notable exception: Bärbel Inhelder, Jean Piaget's best-known collaborator in Geneva (this explains why the Woods Hole meeting is part of the common roots of inquiry in the English and French educational communities). The symposium generated a highly influential book, *The Process of Education* (Bruner, 1960), from which came the notion of a spiral curriculum that brings key topics back to children's attention in new forms as their understanding and intellectual skills grow. Also came a key proposal 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. The symposium made several daring assertions; for example:

> Intellectual activity anywhere is the same, whether at the frontier of knowledge or in a third-grade classroom. What a scientist does at his desk or in his laboratory, what a literary critic does in reading a poem, are of the same order as what anybody else does when he is engaged in like activities—if he is to achieve understanding. The difference is in degree, not in kind. The schoolboy learning physics is a physicist, and it is easier for him to learn physics behaving like a physicist than doing something else. The "something else" usually involves the task of mastering what came to be called at Woods Hole a "middle language"—classroom discussions and textbooks that talk about the conclusions in a field of intellectual inquiry rather than centering upon the inquiry itself. Approached in that way, high school physics often looks very little like physics, social studies are removed from the issues of life and society as usually discussed, and school mathematics too often has lost contact with what is at the heart of the subject, the idea of order…. Ideally, interest in the material to be learned is the best stimulus to learning, rather than such external goals as grades or later competitive advantage. While it is unrealistic to assume that the pressures of competition can be effectively eliminated or that it is wise to seek their elimination, it is nonetheless worth

> considering how interest in learning per se can be stimulated. (Bruner, 1960, pp. 14–15)
>
> Bruner (1971) later commented about expectations of students in traditional curricula:
>
> Their motivation was taken for granted. It also accepted the tacit assumption that everybody who came to these curricula in the schools had already been the beneficiary of the middle-class hidden curricula that taught them analytical skills and launched them in the intellectual use of mind. (Bruner, 1971, p. 19)

Children from less favored environments were therefore disadvantaged by traditional curricula, and not given full opportunity to develop their potential.

The third common root that we want to briefly highlight is the role of science and the scientific community in leading the movement to initiate inquiry-based schooling. Given Sputnik, Bruner's (1960) example of a young student-physicist was not accidental. Curriculum change was based on the notion that learning is an active, social process in which students formulate hypotheses, construct new ideas, and generate, evaluate, and select information that is integrated into existing knowledge and experience. One of the challenges remains to discuss inquiry in language beyond that of science, specifically, to extend the language to knowledge, skills, and dispositions that cut across disciplinary boundaries.

The fourth common thread began in Europe as a means to provide educational continuity for the children of diplomats and others posted and moved overseas. The International Baccalaureate (IB) includes explicit requirements for an extended collaborative undertaking (the teacher-guided "exhibition") for 10- to 12-year-olds at the end of the elementary program or a personal inquiry project concluding the secondary and college levels (International Baccalaureate Organization, 2005-2011a, b). Inquiry is not extensively articulated in publicly available documentation, and only broadly in training materials, but there is consistency across languages and the IB is a very popular curricular enhancement in Quebec. There is a common expectation that students will have repeated experiences producing in-depth products of their explorations of topics of personal interest. Our observations of these projects, especially at the secondary level, is that they have tended to be conducted by individual students rather than collaborative groups, and evaluated by the teachers, but this may not be a universal experience.

From 1960 forward, the English and French literatures on inquiry in education took separate paths for nearly a half century, but the common roots can be readily sensed, including fostering and building upon student interest and curiosity, promoting question-asking and learner dialogue, enabling authentic and meaningful learning, actively engaging students from a wide range of backgrounds and abilities, and the influential but not exclusive role of science in initiating inquiry-based curricular change.

English Literature Branch

A major influence was the translation from Russian to English of Lev Vygotsky's book, *Mind in Society* (1978). Vygotsky was born in 1896, the same year as Piaget, but died in 1934 (Piaget in 1980). He was also a constructivist, but added an important dimension widely incorporated into curricular models. Vygotsky proposed that meaning is constructed by learners through dialogue, 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, etcetera), and not do at all. That middle zone is the now familiar "Zone of Proximal Development" (ZPD). Meaning is not constructed in individual isolation but in social interaction when the learner needs and can benefit from it. Teachers' professional judgment can be critical in helping learners recognize when they are in a ZPD. This extension of constructivism, known as social constructivism, as well as the idea of communities of learners, became the basis for group activities becoming central to inquiry pedagogy.

Keegan (1993) helped sharpen the language that defines this contrast between individual and collaborative work. He noted important differences among the types of teacher-student verbal interactions (see Table 1). Teacher-student roles, whose exchange is fundamental to inquiry, vary along a continuum of classroom discourse. From top to bottom in the table, students are more autonomous. They take more responsibility for generating and answering questions and learning about subject matter through dialogue or discourse, and the teacher moves from direct instruction to a less visible but critical role as the creator of learning situations. This provides an interesting lens through which to examine a learning situation. Keegan categorized discovery learning as most autonomous and distinguished it on the basis of how active the student is in exercising his or her imagination. Shore, Aulls, and Delcourt (2008) acknowledged that discovery learning may be *maximally* autonomous, but it places a large burden on the learner: From a social constructivist perspective, inquiry is *optimally* autonomous.

Table 1:
Keegan's Representation of Teacher-Student Interaction and Responsibility for Learning

INSTRUCTIONAL DISCOURSE PATTERN	WHO IS RESPONSIBLE FOR THE QUESTIONS?	WHO IS RESPONSIBLE FOR THE RESPONSES?	INSTRUCTIONAL EXAMPLE
Didactic	Teacher	Teacher	Lecture, text, film
Socratic	Teacher	Student	Recitation, discussion, oral quiz
Inquiry	Student	Student and Teacher	Library research, guided lab or project
Discovery	Student	Student	Lab, fieldwork, survey interview

Among the most influential documents in English are reports from United States associations in science, the social sciences, and mathematics. The introduction to the National Research Council's (1996) science-education standards listed historical precedents reaching back to the 1980s, and specifically cited the National Council of Teachers of Mathematics (1989) as the first to espouse the contemporary inquiry approach and to influence developments in other subject areas. Inquiry-based social sciences standards were the next to appear (National Council for the Social Studies, 1994). The formal compilation of the science standards appeared in 1996 and was followed by recommendations for research-based teaching in higher education (Boyer Commission, 1998) and *Inquiry and the National Science Education Standards: A Guide for Teaching and Learning* (National Research Council, 2000).

An early contributor was a 1984 working group convened by the National Research Council in which Jerome Bruner participated. The report was written by learning psychologist Lauren Resnick (1987). Although the word "inquiry" did not appear in the entire volume and the focus was totally on the individual learner, it anticipated documents to follow: "Various subject matters in the school program should be taught with an eye to developing the powerful thinking methods used by experts in those disciplines" (p. 48), and

> Effective reading, writing, and mathematics learning depend on elaboration, explication, and various forms of meaning construction. Reorienting basic instruction in these curricula to focus on intentional, self-managed learning and strategies for meaning construction, rather than on routinized performances, will result in more effective basic skill instruction while providing a strong base for higher order skills development in other disciplines. (p. 49)

Within inquiry instruction we now find these emphases on developing high-level intellectual skills and knowledge of experts (e.g., creating as well as absorbing knowledge), as well as cross-disciplinary abilities, and self-regulated learning. Added to these are collaboration and co-construction of curricular components by students with other students and teachers, arising from the convergence with social constructivism.

French Literature Branch

Decisions regarding the reform of science education were initiated by scientists. During a visit to the United States in the mid-1990s, Georges Charpak (1992 Nobel Laureate in physics) was inspired by the *Hands On* approach developed in Chicago by Leon Max Lederman (also co-winner of the Nobel prize in physics, in 1988). Lederman completed his PhD at Columbia University in 1951, and credited Isadore Isaac Rabi, mentioned earlier, as a key mentor (Hoddeson, Kolb, & Westfall, 2008). Lederman remained a Columbia physics professor for 30 years, envisioned and then became the director of the Fermi National Accelerator Laboratory in Illinois, and later a professor at the University of Chicago; this is why the meeting with Charpak took place in Chicago. The *Hands On* approach was originally tailored to address active learning needs of students from lower socioeconomic backgrounds. It was designed to engage students in clearly defined experimental steps and direct experience to develop scientific understanding of physical phenomena. The broader appeal to all students was rapidly recognized.

Motivated by *Hands On*, Georges Charpak, Pierre Léna, and Yves Quéré proposed the development of *La Main à la pâte* (2010) (LAMAP; literally "hands in the dough," equivalent to "hands-on" or, idiomatically, "do it on your own"). The French Academy of Sciences supported this proposal and in 1996 implemented LAMAP in several primary schools. By 2002, primary schools in Switzerland implemented *Penser*

avec les mains ("Thinking with the hands") (n.d.), a project adapted from LAMAP. This instructional approach eventually spread to other countries, such as China, Brazil, and Quebec in Canada in 2003. Although the initial curricular emphasis was in science, the approach spread to mathematics and other subjects. It is known as the *approche* or *démarche d'investigation raisonnée* (literally "approach by reasoned or thoughtful investigation") that is usually expressed in English as "inquiry-based instruction" or just "inquiry."

More recently, Europe-based agencies have also published reports in multiple languages proposing inquiry-based pedagogy (e.g., European Commission, 2007). UNESCO (2008), based in Paris, captured the essence of inquiry-based schools:

> Skills such as problem solving, communication, collaboration, experimentation, critical thinking, and creative expression become curricular goals in themselves and these are the objects of new assessment methods. Perhaps the most significant goal is for students to be able to determine their own learning goals and plans—the ability to establish what they already know, assess their strengths and weaknesses, design a learning plan, stay on task, track their own progress, and build on successes and adjust to failures; skills that can be used throughout a lifetime to participate in a learning society. (p. 8)

These reports do not, however, appear yet to have experienced wide professional recognition. There is also less direct emphasis in *La main à la pâte* on collaborative learning. In the Quebec Education Program, however, the North American emphasis on learning to work in groups is explicit as Competency 8—To Cooperate With Others:

> All the programs of study lend themselves to the creation of learning situations in which students are required to work together. Such situations give them an opportunity to learn to plan and carry out an activity with others, to participate in group discussion and to work with others to achieve a common goal, adapting to the situation, recognizing the contributions of others, developing a sense of organization and sharing. (Ministère de l'Éducation, du Loisir et du Sport, 2001, p. 34)

Shared Foliage: English-French Lexicon of Inquiry Terminology in Education

As our bilingual research team explored the French and English inquiry literatures, we found many different words used to express similar ideas. There is rarely a direct one-to-one correspondence. We therefore used the research team of some 20 professors and students (including many teachers and teacher-educators) as an expert panel to generate a list of key terminology, starting with a list of inquiry competencies (Shore, Birlean, Walker, Ritchie, LaBanca, & Aulls, 2009). We narrowed these to 10 key terms. They represent the beginning steps to guide educators who have the advantage of access to both the French and English inquiry traditions to translate ideas and curriculum consistently. For readers who are so far familiar with just one of these literatures, we hope it will open new opportunities to use the language and ideas of inquiry in their classrooms. If this first attempt at a lexicon proves useful, we can foresee adding more terminology and additional languages.

Table 2:
English-French Lexicon of Inquiry in Education—10 Key Concepts

ENGLISH	WHAT THE TERM IMPLIES IN EDUCATION	FRENCH
Inquiry [*or* inquiry instruction]	Learning and teaching in which students individually or in groups develop initiative, disciplinary and cross-disciplinary expertise, intellectual and creative skills, through thoughtful investigations of authentic questions on topics of student interest. Teachers collaboratively create inquiry experiences with students and help them develop autonomy. Students plan, generate, and evaluate evidence for their investigations, and construct meaning through hands-on activities and sharing and comparing ideas and plans through dialogue. [The English term might be too open and excessively focused on the question-asking part of inquiry; the French term is less vague but risks seeming tied uniquely to science.]	Approche [*or* Démarche] par investigation raisonnée *or* Démarche d'investigation

ENGLISH	WHAT THE TERM IMPLIES IN EDUCATION	FRENCH
Inquirer	A person--student, teacher, or any other person--who values inquiry as a way to learn, is engaged acquiring competences of inquiry and the ability to communicate these, and who completes one or more inquiry projects; an inquirer has knowledge, skills, dispositions, and experience that support inquiry. [The term most commonly used in French is focused on the learner.]	Élève-chercheur
Role exchanges between and among teachers and students	In inquiry students undertake some roles formerly the exclusive purview of teachers, such as asking questions, choosing topics of study, specifying evidence or argument, and evaluating progress and final performance. Teachers undertake some roles sometimes reserved for learners, such as helping to figure out how to answer questions, and learning new content resulting from student inquiry. [The English term places extra emphasis on the role exchange versus the role differences.]	Rôle de l'élève et de l'enseignant
Interest- or curiosity-motivated learning	A learning situation whose objective, essential in inquiry, is built at least partly around students' interests or curiosity.	Apprentissage basé sur curiosité et engagement des élèves

ENGLISH	WHAT THE TERM IMPLIES IN EDUCATION	FRENCH
Dialogue	Dialogue is goal-directed and collaborative, as is inquiry. Participants go beyond making their own contributions as in discussion or conversation. [The French term usefully draws attention to the mindset or thought process that distinguishes dialogue.]	Pensée dialogique
Problem finding	Defining the problem to be solved by the individual or group, for example, the topic of the investigation conducted as part of inquiry. [The French term avoids the ambiguity of "finding"; problems are formulated generated, recognized, found, etcetera]	Problématiser
Questioning	Questioning is at the heart of inquiry, but, in class, it is more than asking questions. It refers to a questioning frame of mind or spirit, including shaping hypotheses, seeing issues or problems in different ways or from other people's perspectives. It includes developing students' responsibility and opportunities for originating and shaping questions, putting things into question (remise en question) or being skeptical--in relation to critical thinking, and extends far beyond teachers quizzing student knowledge.	Questionnement

ENGLISH	WHAT THE TERM IMPLIES IN EDUCATION	FRENCH
Be comfortable with ambiguity (ill-defined or open-ended problems)	An important inquiry disposition is to learn to feel at ease undertaking investigations of questions that may begin with questions that require making assumptions to fill gaps or that do not have known answers, or whose answers are incomplete and lead only to new questions. [In French these are also called *black boxes*.]	Être confortable avec des problèmes ouverts et complexes [on appelle aussi ce type de problème des *boîtes noires*]
Evaluating evidence	At the heart of inquiry is the systematic investigation of a question or topic leading to a decision. These decisions require consideration of the quality of evidence supporting or refuting different conclusions. [The English terminology stresses the quality of the external evidence; the French terminology stresses the critical thinking processes needed to evaluate evidence. Both emphases are essential in inquiry.]	Pensée critique
Co-constructing knowledge	Meaningful learning occurs most successfully when students and teachers create new understanding through dialogue, especially helping each other to do what they cannot do alone but can with each others' assistance. In inquiry, this includes sharing ideas for goals, procedures, evidence, and conclusions during the process, not only at the end.	Co-construction des connaissances

Conclusion

Since the early 1900s, educational reforms have sought to decrease the rates of attrition among science students (European Commission, 2007; National Council of Teachers of Mathematics, 2000; National Research Council, 1996) by increasing the quality of science education. Although inquiry has served as the primary means to learn to do science, its advocacy should not be limited to this domain. This paper provided reasons for including inquiry as a core goal in our teaching at all levels and although the nature of the subject matter does play an influential role, the inquiry process has already been successfully transferred in social studies and language arts. However, one can expect the steps involved in using a historical or linguistic method to differ from the cognitive actions of a scientific thought. Nevertheless, making historical inquiry a part of the social studies and history curriculum can add a unique element to the repertoire of inquiry skills, that of social criticism (Shore, Aulls, & Delcourt, 2008). In this context, human interaction, discussion and the proper use of literacy are required on the part of teachers and students.

Curricular realities in Quebec include the vast percentage of anglophone students receiving a substantial part of their education in a combination of French and English instruction, the newly proposed creation of intensive English experiences for francophone students, the existence of schools in which English and French programs share a building, administration, teaching personnel, or curricular resources, and the Quebec Education Program. Comparable situations exist in many parts of Canada and beyond. At the same time, the language of inquiry-based instruction has developed along partially different paths in the two languages and their national and international communities. Building bridges across these differences will provide greater unity of purpose and expression to the educational communities, facilitate opportunities for jointly participating in professional development experiences, and communicating with families about the goals of 21st-century education.

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