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Using Brief Teacher Interviews to Assess the Extent of Inquiry in Classrooms

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Abstract

Inquiry-based instruction is common to nearly every model of gifted education. Six teachers of 14 secondary classes were briefly interviewed about their teaching and learning methods, use of inquiry-based strategies, classroom descriptions, a typical day, student expectations, and inquiry-instruction outcomes. A criterion-referenced checklist of 25 qualities of inquiry classrooms was used in a protocol analysis of the transcribed interviews. The classes were previously categorized as Most, Middle, and Least Inquiry with a modification of Llewellyn's simplified rubric for inquiry teaching complemented by teacher and student interviews and a teacher questionnaire. Extent of inquiry was well identified using only the teacher interviews and checklist. Teachers of Most Inquiry classrooms mentioned 21 or 25 of the 25 inquiry items. Middle Inquiry teachers mentioned 17 and 18 items. Least Inquiry teachers noted 6 and 9. Brief teacher interviews with a relatively straightforward coding system can assess the extent of classroom inquiry students experience.

Keywords

inquiry, inquiry-based teaching and learning, inquiry instruction, inquiry levels, inquiry quality, teachers, interviews

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The importance of inquiry-based education, whether or not that specific label is used, has been reflected internationally in contemporary general curricular reforms (e.g., European Commission [EC], Directorate-General for Research, Directorate L-Science, Economy and Society, 2007; National Council for the Social Studies [NCSS], 1994; National Council of Teachers of Mathematics [NCTM], 2000; National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010; National Research Council [NRC], 1996, 2000, 2012; Québec, Ministère de l'Éducation, 1999, 2001, 2004; UNESCO, 2008). Chichekian, Savard, and Shore (2011) summarized the historical growth of international commitment to inquiry-based instruction, from Dewey (1933) to Bruner (1960) and through the influence of several Nobel Laureates in physics, perhaps a partial explanation for the central and likely disproportionate role of science educators and scientists in promoting inquiry in education.

Robinson, Shore, and Enersen (2006) and Aulls and Shore (2008) noted that inquiry-based pedagogy has been present for many decades in almost all the curricular models in gifted education. Examples of these parallels include instructional emphases on engaging learners in problem finding as well as problem solving, building upon student interests within the curriculum, and enabling student–student dialog to create meaning. Inquiry-based learning is also especially well suited to gifted students' frequently encountered qualities of higher levels of metacognition or self-regulation that reveals itself in, for example, adapting solution strategies throughout the process rather than waiting for a wrong final answer to signal a need to try another approach, via gifted learners' analytic and critical abilities to evaluate the quality of evidence, and as evidenced in their relatively larger proportion of time devoted to planning before responding on complex tasks.

Learning and teaching environments can be described in terms of the presence or absence of inquiry, the amount or quantity of inquiry present, or the quality of the inquiry experience. General and gifted education teachers need tools to systematically and efficiently assess the presence, quantity, or quality of inquiry instruction in a classroom. As key background to the present research, we have included overviews of several major attempts to date to make such assessments. A common element of all these approaches is that they have identified different ways in which inquiry can be manifested in a classroom, and found that higher inquiry levels are distinguished by a greater number of the desired instructional qualities being present. Rarely is none present (e.g., even in a very traditional teacher-centered class, students might have a choice of topics for essays or reports), so the simple presence versus absence of inquiry has limited utility. The idea of presence or absence, however, is usefully applied to gauging whether or not one or more items on a list of characteristics or components of inquiry are present in a classroom. There has not yet been any study that addresses whether or not enacting a particular inquiry component more or less well makes a difference to learning. All studies of the impact of inquiry are, in effect, comparisons of situations in which more or fewer inquiry components, variously defined, are present. Quantity and quality are typically conflated, with more inquiry elements being regarded as indicative of a better inquiry-based learning experience. To some extent this seems to be an acceptable conceptual compromise for the moment, and it leads to a future question that will need to be answered, namely, how much inquiry or how much good inquiry is enough to make a difference? To be able to answer that question we need tools that can make the assessment at a sufficiently fine-grained level, so perhaps three issues can be addressed: How much of what kinds of inquiry experience is needed, what elements are most salient, and how well must such instruction be executed by the teacher? In this research, we have used the word "extent" to roughly encompass both the ideas of quantity and quality, even if this should be regarded as an interim step in the study of inquiry-based instruction, proposing a tool that could help make such assessments.

Having a model or framework for evaluating the extent of inquiry in instruction allows teachers and schools to scaffold the building of quality inquiry elements, helps educators and researchers monitor and evaluate individual and collective progress creating inquiry-based learning environments and outcomes, and provides teachers with vocabulary and skills to share their inquiry knowledge and skills with each other and their students.

Prior studies have used diverse data sources, often simultaneously, to assess the extent to which inquiry-based instruction was present in classrooms (e.g., Fayer, 2010; Henige, 2011; O'Steen, 2008; Pozuelos, González, & Cañale de León, 2010; Towers, 2010). Multiple sources of data to inform evaluation decisions are desirable in a large number of evaluation and research situations. Rubrics, student or teacher questionnaires and interviews, classroom observations, and others vary widely in their imposition on participants, complexity of scoring, and the likelihood that educators or researchers will adopt such instruments in their work. Many sources also require parent, student, administrator, or school-district permission.

Why Focus on Teacher Interviews?

Uniquely among sources of classroom data, teacher interviews do not disturb classes, consume instructional time, or burden students and parents. Although common among the data sources, teacher interviews have typically been moderately lengthy and analyzed by complex qualitative methods. Yet teacher interviews are arguably the easiest data to obtain. However, no study has specifically examined brief teacher interviews alone as the basis for assessing classroom inquiry.

Although interviews might introduce interviewer bias and cost, they can directly tap teachers' judgments. McMillan (2012) wrote,

> The interview allows for greater depth and richness of information. . . . presence of an interviewer tends to reduce the number of "no answers" or neutral responses, and the interviewer can press for more complete answers when necessary. Compared to questionnaires, interviews usually achieve higher return rates. (p. 167)

Interviews' flexibility and ability to amass detailed information are widely echoed in qualitative research design (Creswell, 2007; Fontana & Frey, 1994).

Research Questions

Can a small number of teacher-interview questions on their own effectively and efficiently provide data that reveal the extent of inquiry in a classroom for research, instructional, or professional-development purposes? And how could these interview responses be coded and interpreted?

Review of the Literature

Highlights of Inquiry-Based Teaching and Learning

Social constructivism at the core. Inquiry instruction is based on social-constructivist theory (Vygotsky, 1978). Learning occurs when students interact, pose questions, and construct new knowledge from everyday life and prior knowledge. Teachers and peers scaffold students to move beyond what they can learn on their own. Learning goals extend beyond acquisition of facts and skills to being a knowledge producer, making judgments about the quality of evidence, and planning and conducting investigations based on learners' curiosity or interest, or problems posed by others (Aulls & Shore, 2008). Inquiry education is

> a range of activities that have in common the student's central role as someone who actively takes charge of his or her learning, raising questions, challenging pre-packaged answers, seeking out necessary information, weighing different perspectives against one another, and making real choices about what to believe and what to do. An education founded on inquiry, then, is one that emphasizes learning processes rather than a set of answers. (Carstens & Howell, 2012, p. 53)

Inquiry "requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations" (NRC, 1996, p. 23). "The goal of traditional instruction is conventional knowledge largely acceptable as facts one can remember fleetingly . . . being an inquirer prepares one to be able to rely on oneself rather than someone else to learn new knowledge" (Aulls & Shore, 2008, p. 23).

Inquiry education affords teachers an equally important role, but that of a resource for students (Llewellyn, 2002; Manconi, Aulls, & Shore, 2008). The teacher becomes a facilitator, giving students more responsibility (Carstens & Howell, 2012); however, students and teachers share responsibility for creating the learning activities that address the questions posed. Teachers and students diversify roles during inquiry and add to and adopt each others' role repertoire (Aulls & Shore, 2008; Walker & Shore, 2014; Walker, Shore, & Tabatabai, 2013).

Other influences on inquiry enactment. Disciplines differ most obviously in the content, but also in how the content is organized, for example, hierarchically as in physics or through clusters of related ideas such as in sociology (Donald, 2002). They also differ in how inquiry is conducted (Shore, Pinker, & Bates, 1990). Literary analysis, experimental laboratories, clinical case studies, and archeological field studies include very different specific skill sets and they diverge widely in what constitutes evidence for advancing knowledge. Inquiry is also most frequently portrayed in the literature in science examples, evident even in the references cited in this study. Yet, there remain common processes across disciplines in inquiry, for example, asking new and important questions, collecting data that will help answer them, choosing criteria for the acceptability of evidence, selecting the desired degree of generalizability, and communicating the results to a critical community and the greater public. We are not suggesting that inquiry is uniquely appropriate to science learning.

Kindergartners ask different questions than secondary or doctoral students, but by secondary school, there are adolescents who have published or hold patents. Inquiry has been successfully conducted by students who have learning or developmental disabilities when simultaneously and extensively scaffolded with strategies and content (Mitchell, 2001).

Teaching both strategies and content at the same time is perhaps the greatest challenge for teachers in enacting inquiry-based instruction, regardless of who the students are. Depending on educational background and pedagogical education, teachers vary widely in their knowledge of content and how it is created in a discipline. Crawford (1999) and Windschitl (2004) observed that teachers who had personally engaged in research and experienced inquiry-based instruction as students were more likely to include inquiry in their teaching. Also, a recently completed study of 17 background variables of final-year student teachers in relation to the quality of their conceptualization of inquiry, measured as in this present study by the number of inquiry outcomes they include in their definitions of inquiry or descriptions of salient inquiry experiences, reported on two significant relations: Direct personal experience with research as a thesis or major research project was positively related to the quality of the definitions, and having completed a research-methods course was related to the quality of the descriptions (Aulls, Tabatabai, & Shore, 2015). Research experiences can be provided in preservice teacher education or in later professional development. To the best of our knowledge, except for the comparisons of preservice versus new or experienced teachers, there have not been studies of the impact of variation in years of teaching experience in general on teachers' ability to enact classroom inquiry.

To date, whatever the predictor, the focus in classroom studies of influences on teachers' enactment of inquiry instruction as a dependent variable has largely addressed its presence or absence. This is despite the presence of several instruments, described below, that would enable commentary not only on the presence or absence of inquiry but also on its quantity or quality. As we propose, the existing instruments might be good research tools, but they are cumbersome to administer, score, or both. This brings us, therefore, to our goal of finding a simpler and less intrusive approach.

Conceptualizing Levels or the Extent of Inquiry in Classrooms

Banchi and Bell (2008) described a continuum across four levels of inquiry: confirmation, structured, guided, and open. In confirmation inquiry, students confirm facts presented by their teacher, receive questions and procedures to follow with known end results, and practice specific inquiry subskills. In structured inquiry, students are expected to produce their own explanations to questions and procedures provided by the teacher. Confirmation and structured inquiry are considered lower levels. Guided inquiry is at a middle level of inquiry; students receive questions to analyze but must devise their own procedures and explanations. Although more involved in their own learning, the teacher remains a resource. Student-centered open inquiry is the highest level. Students are encouraged to formulate their own questions for investigation, procedures, explanations, and communicating results. The Banchi and Bell model focused on student question asking. Student involvement in questioning is pivotal to cultivating high levels of inquiry in classrooms because learners then have a personal connection to learning and enjoy it more (Smith, Barnatt, Friedman, & Pine, 2009). Preservice teachers taught within a high-level inquiry framework enjoyed the subject more, and were more likely to employ similar inquiry methods in their own classrooms (Bulunuz, Jarrett, & Martin-Hansen, 2012).

Manconi et al. (2008) used Aulls and Shore's (2008) four inquiry-instruction properties (content, process, strategy, context) as a template to study the extent of inquiry in teaching descriptions from 3-hr-long interviews over an academic year with eight experienced teachers who varied in their use of inquiry and related inquiry use to inquiry knowledge. High Inquiry teachers more deeply understood inquiry across all four properties. Key elements from the inquiry literature were evident in their instructional strategies.

Measuring Inquiry-Based Teaching and Learning

Inquiry in a classroom can be measured with several tools, including observation scales, rubrics, questionnaires, student interviews, and teacher interviews. These typically highlighted properties of inquiry that should exist in inquiry classrooms. Measuring inquiry quantity and quality, however, can be complicated, especially with multiple data sources. Following are examples of criterion-referenced or standardized tools that measure classroom inquiry with different degrees of granularity and from different perspectives.

The first widely recognized tool was probably Llewellyn's (2004) simplified *Rubric for Becoming an Inquiry-Based Teacher*, a 12-item rubric (2004) that described high- and low-inquiry teaching in 2 columns for each point. The original rubric (2002) was a comprehensive six-page, 41-row (inquiry qualities) by 4-column (Traditional, Exploring Inquiry, Transitioning to Inquiry, Practicing Inquiry), with 164 cells that provided a superb framework for conceptualizing professional development for inquiry instruction, but did not constitute a measurement tool on its own. Neither rubric included scoring procedures, but the number of High Inquiry actions observed in the classroom or derived from interviews could be counted, and the 12 items in the abbreviated version were among inquiry qualities well represented in the literature. The items were an excellent thematic outline for professional development. Our concerns with this rubric were that, even in our short summary, and certainly in Llewellyn's full rubric, there are many more than 12 important qualities of inquiry instruction. For example, the rubric does not include changes or diversification in student and teacher roles that are consistently reported (Aulls & Shore, 2008).

Saunders-Stewart (2008; Saunders-Stewart, Gyles, Shore, & Bracewell, 2015) reduced Llewellyn's rubric to 11 items and described a middle level of classroom inquiry for each (Table 1). The dropped item highlighted classroom displays that are problematic when students or teachers change classrooms. The three levels of classroom inquiry—low, middle, and high—still had imprecise boundaries. High Inquiry classrooms exhibit all or most of the items, traditional classrooms few or none, and Middle Inquiry classes some. Like Llewellyn's original short form, this adaptation can be applied to observations or interviews. It generates a relatively global rating of the extent of inquiry on 11 classroom practices and is brief enough to be usable by teachers.

In Campbell, Abd-Hamid, and Chapman's (2009) Principles of Scientific Inquiry (PSI-T, PSI-S) 5-point Likert-type scale self-report surveys for teachers and students, teachers and students rate the frequency of having experienced principles of scientific inquiry, including asking and framing questions, designing investigations, conducting investigations, collecting data, and drawing conclusions. A reportable score emerges. The PSI-T/S is also useful for planning teachers' professional-development activities and for research on student-learning processes. Limitations include possibly socially desirable answers (McMillan, 2012). Another constraint is its exclusive focus on science.

The Electronic Quality of Inquiry Protocol (EQUIP) assesses the quantity and quality of inquiry instruction in K-to-12 science and mathematics classrooms (Marshall, Smart, & Horton, 2010). Descriptive rubrics for 19 indicators measure instruction, curriculum, interaction, and assessment. EQUIP can also inform educational practice and research. It is, however, complex in structure and to administer, requires training to interpret, and is also limited to science and mathematics.

The McGill Strategic Demands of Inquiry Questionnaire (MSDIQ; Shore, Chichekian, Syer, Aulls, & Frederiksen, 2012) uses an 11-point Likert-type scale in a 79-item criterion-referenced questionnaire generating a total and three inquiry phase subscores—planning, enactment, and reflection—at a relatively fine level of granularity of specific tasks that students and teachers undertake when engaged in inquiry, but across disciplines. Respondents rate the importance of each item to inquiry instruction. There are parallel versions for students, parents, and teachers, and adaptations have been developed to assess self-efficacy to use inquiry as a learner or teacher (e.g., Chichekian & Shore, 2014; Ibrahim, 2014). The MSDIQ discriminated between newly enrolled and senior preservice teachers' understanding of inquiry (Shore et al., 2012), and between preservice teachers' and honors psychology students' ability to understand versus do inquiry (Syer, Chichekian, Shore, & Aulls, 2013). Nevertheless, it imposes work in respondents' "free" time, it is long, and subscales need to be tallied.

Table 1. Three-Level Rubric for Assessing Inquiry-Based Classroom Teaching (Based on Llewellyn).

Item	Low Inquiry	Middle Inquiry	High Inquiry
1.	Student knowledge is solely based on mastery of facts and trivial information.	Student knowledge is based on mastery of facts and discipline-relevant process skills.	Student understanding consistently revolves around "big ideas" or underlying concepts.
2.	Curriculum is teacher centered and based on prescribed activities with anticipated results.	Curriculum is teacher centered, however, it allows for some flexibility for investigations according to student interests.	Curriculum is student centered and provides flexibility for students to design and carry out their own investigations.
3.	Curriculum is based on a single textbook.	Curriculum uses multiple textbooks and resources.	Curriculum uses multiple textbooks, Internet, software, and primary resources.
4.	Teacher frequently uses worksheets to assess learning; students record data on teacher-designed sheets.	Teacher uses demonstrations and attempts open-ended activities; teacher attempts to have students record data on student-designed sheets.	Teacher seldom uses worksheets to assess learning; students successfully record information on student-designed sheets or journals (or both).
5.	Teacher mostly uses objective-type testing.	Teacher uses objective testing and attempts to implement authentic assessment.	Teacher consistently and effectively uses assessment to include objective testing, portfolios, rubrics, and authentic assessments.
6.	Assessment is solely based on mastery of facts and trivial information.	Assessment is based on mastery of facts and discipline-relevant process skills.	Assessment consistently revolves around "big ideas" or underlying concepts.
7.	Teacher frequently lectures, uses demonstrations and activities.	Teacher usually lectures and does demonstrations and activities to explain information.	Teacher uses all stages of inquiry and consistently provides time for student-initiated inquiries.
8.	Teacher rarely allows students to share information with each other through small-group discussions and dialog.	Teacher occasionally allows students to share information with each other through small-group discussions and dialog.	Teacher consistently expects students to share information with each other through small-group discussions and dialog.

(continued)

Table 1. (continued)

Item	Low Inquiry	Middle Inquiry	High Inquiry
9.	Teacher speaks mainly from the front of the room and communicates by standing above students.	Teacher usually speaks from the front of the room and occasionally moves about.	Teacher effectively moves about the room and consistently communicates to students by sitting to make level-eye contact.
10.	Students are mostly passive but teacher uses some hands-on activities.	Students are occasionally active; teacher uses hands-on activities but attempts open-ended investigations.	Students are consistently active; teacher uses hands-on and minds-on activities that encourage open-ended, student-initiated investigations and explorations.
11.	Teacher uses questions to impart knowledge and solicit a desired response from students.	Teacher uses questioning skills to initiate discussion.	Teacher uses questioning skills to assess prior knowledge, facilitate discussions, and construct knowledge.

Note. Llewellyn (2004) offered 12 categories of Low- and High Inquiry classrooms. Saunders-Stewart, Gyles, Shore, and Bracewell (2015) adapted the rubric; the Middle Inquiry column was synthesized from textual content of Saunders-Stewart (2008) and Saunders-Stewart et al. (2015).

A Three-Part Multimeasure Study of Inquiry Outcomes—Prelude to the Present Study

Inventory of inquiry outcomes. Much research on inquiry in classrooms addresses the process of inquiry engagement, content taught through or about inquiry, teaching and learning practices, and facilitators and barriers to inquiry instruction. These are primarily inputs into inquiry-based education. Scattered in the literature are reports of the learner outcomes resulting from inquiry instruction. Reviewing theoretical and empirical research, in this journal, Saunders-Stewart, Gyles, and Shore (2012) cataloged 23 criterion-referenced categories of student inquiry outcomes—McGill Inventory of Student Inquiry Outcomes (MISIO)—some of which are common to all education. Outcomes that were especially inquiry-oriented included learning the process or "how to," understanding the nature of the content area, emulating professionals—creating authentic products, and change in the range of teacher and student roles—increased student ownership. Examples of outcomes shared with general education included acquisition of facts or knowledge, achievement, and problem-solving skills. This list partially overlapped the Llewellyn-based rubric, but added outcomes to the inputs and observable practices. This remained but a set of elements to be developed into measurement tools.

Learners' perceptions of inquiry outcomes. Saunders-Stewart et al. (2015) adapted the 23 outcomes categories into a 31-item (including some subitems in this count) student questionnaire (MISIO-S) about the types and amounts of inquiry that students experienced in their classrooms. Six teachers were recruited locally and from graduates of an instructional leadership doctoral program to ensure varying inquiry backgrounds, and their 181 students in 14 grades, 9 through 12 classes, including mathematics, physical science, English, biology, and applied research, participated in the study. Students completed the MISIO-S. Principal components analysis generated four factors from their responses: Learning Competencies (e.g., content knowledge, learning-process skills), Personal Motivation (e.g., creativity, enjoyment, motivation), Student Role (e.g., autonomy, sense of responsibility), and Teacher Role (loading negatively—for example, encouraging factual recall). Factor scores were computed for each of the 14 classes.

A short teacher interview containing just three core questions plus prompts, the McGill Inquiry Teacher Short Interview (MITSI), was used to interview teachers for 15 to 45 min in their classroom or staff room. They were asked the following:

1. What methods of teaching and learning are used most often in your classroom?

- Please describe these methods in more detail (e.g., What does it mean when you say you use inquiry-based teaching strategies? What does this involve?).

2. Please describe what your classroom looks like on a typical day.
3. What are the most important outcomes that you hope your students will achieve in your class?

- What sorts of things should students learn about or learn how to do in your class?
- What do you consider to be the important outcomes of inquiry-based teaching and learning?

Interviews were recorded and transcribed verbatim; transcripts were relatively short, typically five or fewer pages. A subset of student interviews also provided corroborating data.

Using these three sources, each classroom was designated Least, Middle, or Most Inquiry, based on the adapted Llewellyn framework in Table 1. Students in the Most Inquiry classrooms reported Most Inquiry outcomes associated with Learning Competencies, Personal Motivation, and Student Role outcomes; students from Least Inquiry classes reported the most traditional Teacher Role outcomes.

Teachers' perceptions of student outcomes. Gyles (2011) reworded the MISIO-S for teachers (MISIO-T) and added two items on the extent of inquiry use and inviting comments. "You" became "the students" and most questions were prefaced with "In your judgment." Examples of questions included, "To what extent has this class helped the students learn how to plan and carry out your own investigations?" "In this class, how likely are the students to relate new information or experiences to something you knew before?" "When the students are working on an assignment in this class, to what extent are they expected to be the most important or responsible persons for their learning?" "To what extent does the teacher emphasize the importance of teamwork and cooperation in this class?" Seventy-four teachers responded on a 7-point scale from *not at all* to *completely* regarding their students or classes achieving or reflecting the inquiry outcomes noted above.

A MANOVA was conducted using the same four factor scores as derived from the MISIO-S. Teachers' high self-assessments of inquiry use (the first of the two added items) were directly related to their judgments about learner outcomes in Learning Competencies and Personal Motivation. Teachers in the Middle Inquiry–use group recognized changes in Student Roles before changes in their own roles—perhaps students even in moderate inquiry contexts increased peer interactions, but a deeper engagement by teachers is needed before they recognize their own role diversification. Teachers in High Inquiry–use contexts also described students as acquiring and demonstrating more basic information; it was not clear if this was on the students' own initiative, but it reinforces that inquiry instruction does not abandon but adds to factual learning.

Transition to the Present Study

Interviews in all these studies reflected teachers' use of inquiry; however, how to make use of the resulting data was either underspecified or the analysis was methodologically complex. These are not insurmountable limitations in some major research or evaluation studies—indeed they are methodologically desirable—but could a simpler data source such as the shorter teacher interviews alone from Saunders-Stewart et al. (2015) and a more direct scoring process provide data that offer comparable insight into the extent of classroom inquiry?

Method

Sample and Data Source

The present qualitative study re-examined the original full-text transcriptions from teachers' short interviews mentioned earlier (Saunders-Stewart, 2008; Saunders-Stewart et al., 2015) and recoded teachers' responses using a new template based directly on an expanded repertoire of what should happen in inquiry classrooms. Six secondary teachers from eastern Canada and the northeast United States had been interviewed about 14 different classes they taught in English, mathematics, and science (see Table 3 for a selection of these sample details).

Data-Analysis Procedures

An updated checklist of inquiry-indicative items was created drawing upon the theoretical and empirical literature, starting with the 23 MISIO items listed earlier. First, we conducted new literature searches of inquiry-indicative statements, goals, outcomes, advantages, and benefits to generate a criterion-referenced checklist of 25 inquiry categories (Table 2) respecting Wolcott's analysis strategy that Creswell (2007) described as "relating categories to analytic framework in literature" (p. 149). We then applied the checklist to the transcribed interval protocols using open coding through whole sentences (Strauss & Corbin, 1998): "This approach to coding can be used at any time but is especially useful when the research already has several categories and wants to code specifically in relation to them" (p. 120).

The first author examined interview sentences phrase-by-phrase and identified the inquiry items from the criterion-referenced checklist that were present (these 25 items were named the McGill Classroom Level of Inquiry Checklist, MCLIC) by highlighting the statements that referred to each inquiry item. The themes were already identified in the new checklist and we could quickly see if these themes were visible in the protocols (Creswell, 2007, 2008). The second author then went through each coding sheet; the ready applicability of the 25 categories to the short transcripts led to complete agreement about the codes assigned. As shown in Table 3, there were natural breaks in the frequencies of reference to different numbers of the 25 inquiry outcome-related elements: Two teachers referred to 21 or 25 of the 25, two referred to 17 or 18, and two mentioned 6 or 9. We labeled each classroom Most, Middle, or Least Inquiry based on these divisions. We compared these assessments with Saunders-Stewart et al.'s (2015) placements using multiple data-collection tools and the Llewellyn-derived rubric. Extracts from the interviews were selected and are provided below to illustrate the quantitative differences.

Results

Overview

In their interviews, Most Inquiry classroom teachers mentioned 21 or 25 of the 25 criterion-referenced inquiry items in Table 2 (respectively, 84% and 100% of the properties). Middle Inquiry teachers noted 17 or 18 items each (68% and 72%). In the Least Inquiry classrooms, 6 and 9 items were mentioned (25% and 36%). Table 3 presents the details. The wide range of tallies (from 6 to 25) with natural breaks was a welcome result, and offered considerably more potential to plot progress than High versus Low (even with the addition of Middle), or the use of 11 or 12. Nonetheless, a ceiling effect was found in that for one science and two English classes the teachers mentioned all 25 (100%) inquiry classes. Although the extent of classroom inquiry and groupings matched those previously reported using the 11-item three-level scale, Saunders-Stewart et al. (2015) had reported that both High Inquiry teachers mentioned all 11 High Inquiry indicators—a more serious ceiling effect. They reported that two Middle Inquiry teachers mentioned 6 and 2—a similar result to ours, and that the two Least Inquiry teachers each identified zero—a floor effect that may well have underestimated their inquiry knowledge or use and the potential for a range of inquiry within each group. Scales with too many floor and ceiling effects are not useful for plotting

Table 2. Criterion-Referenced Checklist for Identifying Data About Inquiry Instruction in Teacher-Interview Responses (McGill Classroom Level of Inquiry Checklist—MCLIC).

Inquiry item	Classroom events	Reference sources
1. Dialog occurs (student–student and student–teacher)	Small group discussion and dialog among students Social nature of learning Sharing of ideas Communicating work with others Collaborating Sharing emotions, feelings, ideas, and opinions Students talk to each other about strategies and results Communication through discussion and discourse	Aulls and Shore (2008); Cole (1989); Driver (1983); EC, Directorate-General for Research, Directorate L-Science, Economy and Society (2007); Germann (1991); Gyles (2011); Llewellyn (2002); Manconi, Aulls, and Shore (2008); National Governors Association Center for Best Practices, Council of Chief State School Officers (2010); NCSS (2010); NCTM (2000); NRC (1996); Shore et al. (2009); Shore, Chichekian, Syer, Aulls, and Frederiksen (2012); UNESCO, 2008; Walker and Shore (2014)
2. Student-centered curriculum and role diversification	Student-centered curriculum Change in teacher and student roles Increased student ownership Ability for students and teachers to interchange their roles Increased student autonomy Exchanges occurring in classroom roles between teachers and learners Students encouraged to learn on their own, come up with own ideas, teacher is student centered	Aulls and Shore (2008); Carstens and Howell (2012); Crawford (2000); EC, Directorate-General for Research, Directorate L-Science, Economy and Society (2007); Gyles (2011); Kuhn (2005); Llewellyn (2002); Manconi et al. (2008); National Governors Association Center for Best Practices, Council of Chief State School Officers (2010); NCSS (2010); NCTM (2000); NRC (1996); Shore et al. (2009); Shore et al. (2012); UNESCO (2008); Walker and Shore (2014)
3. Multiple resources used	Multiple means of resources (textbooks, Internet, other software, and primary resources) Evaluate necessity and sufficiency of resources	Driver (1983); Germann (1991); Llewellyn (2002); Manconi et al. (2008); NCSS (2010); NRC (1996); Shore et al. (2009); Shore et al. (2012)
4. Varied assessment	Assessment included objective testing, portfolios, rubrics, authentic assessment Multiple forms of assessment such as group projects, portfolios, and writing questions	Llewellyn (2002); Manconi et al. (2008); NCTM (2000); Shore et al. (2012)

(continued)

Table 2. (continued)

Inquiry item	Classroom events	Reference sources
	Evaluation based on strengths and weaknesses Teacher gives sensitive feedback, positive reinforcements, praise for persistence	
5. Focus on the relationships among concepts	Student understanding and assessment revolves around big ideas or concepts Understanding concepts (vs. memorizing facts) Ability to see concepts as related Specialized or deep understanding of concepts	Aulls and Shore (2008); Gyles (2011); Llewellyn (2002); NRC (1996); Shore et al. (2009); Wade (1995)
6. Active learning	Active learning, hands-on and minds-on activities are used to encourage open-ended, student-initiated investigations and explorations	EC, Directorate-General for Research, Directorate L-Science, Economy and Society (2007); Llewellyn (2002); Manconi et al. (2008); NCTM (2000); NRC (1996); UNESCO (2008); Walker and Shore (2014)
7. Asking questions	Develop questioning skills to assess prior knowledge, facilitate discussions, and construct knowledge Generation of questions and curiosity Co-ownership of questions (student and teacher) Asking relevant questions	Aulls and Shore (2008); Cole (1989); Driver (1983); EC, Directorate-General for Research, Directorate L-Science, Economy and Society (2007); Gyles (2011); Kuhn (2005); Llewellyn (2002); Manconi et al. (2008); National Governors Association Center for Best Practices, Council of Chief State School Officers (2010); NCSS (2010); NCTM (2000); NRC (1996); Shore et al. (2009); Shore et al. (2012); UNESCO (2008); Walker and Shore (2014); Wills (1995)
8. Extend inquiry beyond the classroom	Motivation to be informed citizens, increased social awareness and action Learn how to learn or lifelong learning New knowledge to future experiences	Aulls and Shore (2008); Brown (1990); Driver (1983); Gyles (2011); Jansen (1995); Kuhn (2005); Llewellyn (2002); Massialas and Cox (1966); NCSS (2010); NCTM (2000); Newmann (1988); Osborne and Seymour (1988); Shore et al. (2012); UNESCO (2008); Walker and Shore (2014)

(continued)

Table 2. (continued)

Inquiry item	Classroom events	Reference sources
	Engaging in learning activities on a local or global scale Improving the social, cultural, economic, and environmental development	
9. Creativity	Creative risk taking Enhanced creativity	Bredderman (1983); Germann (1991); Gyles (2011); Shore et al. (2009); Shore et al. (2012); Shymansky, Kyle, and Alport (1983); Walker and Shore (2014)
10. Imagination	Use of imagination	Driver (1983); Shore et al. (2009); Shore et al. (2012)
11. Knowledge acquisition and knowledge construction	Beginning with a small amount of formal education Look for patterns and links across knowledge Connect old and new knowledge Find patterns in data Acquisition of facts and knowledge Understanding about the nature of the content area Construction of knowledge Co-own knowledge Application of knowledge or information Using research to build knowledge Emphasis on knowledge building, deepening, and sharing through the use of technology	Anderson and Burns (1989); Aulls and Shore (2008); Basaga, Gebain, and Tekkaya (1994); Bredderman (1983); DeBoer (1991); Driver (1983); EC, Directorate-General for Research, Directorate L-Science, Economy and Society (2007); Gyles (2011); Kuhn (2005); Llewellyn (2002); Manconi et al. (2008); National Governors Association Center for Best Practices, Council of Chief State School Officers (2010); NCSS (2010); NCTM (2000); NRC (1996); Newmann (1988); Schön (1992); Shore et al. (2009); Shore et al. (2012); UNESCO (2008); Vygotsky (1978); Walker and Shore (2014); Zachos, Hick, Doane, and Sargent (2000)
12. Learn the process of inquiry	Learn the process (the how to) of inquiry Learn the language, symbols, and skills of inquiry Using language of inquiry properly Teacher models skills needed for inquiry process Teacher uses all stages of inquiry and consistently provides time for student-initiated inquiries.	Anderson and Burns (1989); Aulls and Shore (2008); Bredderman (1983); Germann (1991); Gyles (2011); Kuhn (2005); Llewellyn (2002); Manconi et al. (2008); NRC (1996); Robinson, Shore, and Enersen (2006); Schön (1992); Shore et al. (2009); Shore et al. (2012); Shymansky, Hedges, and Woodworth (1990); Shymansky et al. (1983); Walker and Shore (2014)

(continued)

Table 2. (continued)

Inquiry item	Classroom events	Reference sources
	Understanding of the nature and value of inquiry Understand the flexibility of the inquiry process and flexibility with time Goals made clear, learning "to do" and "about" inquiry	
13. Positive attitudes	Positive attitude toward subject or learning	Aulls and Shore (2008); Chang and Mao (1999); Ebenezer and Zoller (1993); EC, Directorate-General for Research, Directorate L-Science, Economy and Society (2007); Gyles (2011); Kyle, Bonnstetter, and Gadsden (1988); Lowery, Bowyer, and Padilla (1980); Martino-Brewster (1999); Massialas (1969); NCTM (2000); Ornstein (2006); Shymansky et al. (1990); Shymansky et al. (1983); Sunal, Sunal, Whitaker, Odell, and MacKinnon (2003)
14. Improved achievement	Improved achievement across subject areas	Chang and Mao (1999); Gyles (2011); Manconi et al. (2008); National Governors Association Center for Best Practices, Council of Chief State School Officers (2010); Scruggs, Mastropieri, Bakken, and Brigham (1993); Shymansky et al. (1990); Shymansky et al. (1983); UNESCO (2008); Von Secker (2002); Wise and Okey (1983)
15. Develop personal skills	Development of personal skills (e.g., planning and organization), habits of mind	Bredderman (1983); Costa and Kallick (2000); EC, Directorate-General for Research, Directorate L-Science, Economy and Society (2007); Gyles (2011); Manconi et al. (2008); National Governors Association Center for Best Practices, Council of Chief State School Officers (2010); NCSS (2010); NCTM (2000); NRC (1996); Renzulli and Reis (1985); Shore et al. (2009); UNESCO (2008)

(continued)

Table 2. (continued)

Inquiry item	Classroom events	Reference sources
	Locate, document, and organize relevant information, data, and evidence for interpretation	
16. Increase motivation	Increase motivation and task commitment	Germann (1991); Gyles (2011); Hmelo-Silver (2004); Manconi et al. (2008); NCTM (2000); Renzulli and Reis (1985); Shore et al. (2012)
17. Student interests incorporated	Take student's and teacher's interest and strengths into account Address student's and teacher's needs Incorporates student's opinion and preferences	Chiappetta (1997); Manconi et al. (2008); National Governors Association Center for Best Practices, Council of Chief State School Officers (2010); NCSS (2010); NCTM (2000); NRC (1996); Shore et al. (2009); Shore et al. (2012); UNESCO (2008); Walker and Shore (2014)
18. Student choice	Encourage choice among students	Manconi et al. (2008); Walker and Shore (2014)
19. Critical thinking	Development of intellectual or thinking skills, critical thinking Develop problem-solving skills Honest criticism of ideas	Anderson and Burns (1989); Aulls and Shore (2008); Bredderman (1983); Brown (1990); Delcourt (1993); Duggan and Gott (1995); EC, Directorate-General for Research, Directorate L-Science, Economy and Society (2007); Garnett, Garnett, and Hackling (1995); Gyles (2011); Hall and McCurdy (1990); Kuhn (2005); Lampert (2006); Llewellyn (2002); Magnussen, Ishida, and Itano (2000); Manconi et al. (2008); Massialas and Cox (1966); National Governors Association Center for Best Practices, Council of Chief State School Officers (2010); NCSS (2010); NCTM (2000); NRC (1996); Shore et al. (2009); Shore et al. (2012); Shymansky et al. (1990); Starko (1988); Thacker, Kim, and Trefz (1994); Walker and Shore (2014)

(continued)

Table 2. (continued)

Inquiry item	Classroom events	Reference sources
20. Self-esteem and self-confidence	Increase self-esteem and self-confidence Development of personal identities	Aulls and Shore (2008); Bredderman (1983); Gyles (2011); EC, Directorate-General for Research, Directorate L-Science, Economy and Society (2007); Martino-Brewster (1999); NCSS (2010); NCTM (2000); Renzulli and Reis (1985)
21. Development of student expertise	Emulate professionals and create authentic products	Aulls and Shore (2008); Bruner (1960); Gyles (2011); Kuhn (2005); National Governors Association Center for Best Practices, Council of Chief State School Officers (2010); Renzulli and Reis (1985); Tomlinson et al. (2002); UNESCO (2008)
22. Developing metacognition	Monitor and evaluate progress toward solutions, adjust plans as needed Students explain, develop, and are aware of their thought processes	Manconi et al. (2008); Shore et al. (2009)
23. Sharing results	Positively value sharing the results of inquiry Explanation of the results	Driver (1983); Manconi et al. (2008); National Governors Association Center for Best Practices, Council of Chief State School Officers (2010); NRC (1996); Shore et al. (2009); Shore et al. (2012)
24. Scaffolding learning	Scaffolding from teacher or more knowledgeable student Using adult or peer mentors effectively Teacher provides mentor	Germann (1991); Manconi et al. (2008); Shore et al. (2009); Shore et al. (2012); UNESCO (2008); Vygotsky (1978); Walker and Shore (2014)
25. Reflection	Reflect upon results Question findings Reflect upon inquiry experience and evaluate the inquiry experience Follow up results with new questions	Cole (1989); Driver (1983); Manconi et al. (2008); NCSS (2010); NCTM (2000); NRC (1996); Shore et al. (2012); Short and Burke (1996)

Note. EC = European Commission; NCSS = National Council for the Social Studies; NCTM = National Council of Teachers of Mathematics; NRC = National Research Council.

Table 3. Frequencies of Classroom-Inquiry Criteria Obtained From Teacher Interviews in Relation to Classroom-Inquiry Level Derived From a Slightly Modified Version of Llewellyn's (2004) Rubric.

Teacher	Classroom code and subject taught	Inquiry category	Frequency (*f*) of inquiry items (maximum = 25)	Percentage of inquiry items (*f*/25)
A	1. English literature and composition	Most	21	84
	2. English literature and composition	Most	21	84
	3. English	Most	21	84
	4. English	Most	21	84
B	5. Biology	Middle	18	72
	6. Biology	Middle	18	72
	7. Applied research	Most	25	100
C	10. English	Most	25	100
	11. English	Most	25	100
D	8. Physical science	Middle	17	68
	9. Physical science	Middle	17	68
E	12. Biology	Least	6	25
	13. Biology	Least	6	25
F	14. Mathematics	Least	9	36

progress and offer little leeway for minor discrepancies in coding or tallying. In the manner of Goldilocks's adventures, the 25-item list seemed just right. The responses are explored in more detail below for each group.

Table 4 identifies which criterion items were mentioned by the six teachers. Except for Teacher B, each was consistent in his or her extent of inquiry across classes. For Teacher B, it was appropriate "applied research" should be in the Most Inquiry group; Teacher B cited the official curriculum to explain the other two classes being Middle Inquiry. Data in Table 4 are therefore presented by teacher and not class, but Teacher B appears twice according to class level. Illustrative statements in the narrative descriptions that follow for each inquiry group are from references to specific classes (the interviews were conducted separately for each class).

Most Inquiry

The three Most Inquiry teachers (A, B, C) taught seven classes including applied research, English, and English literature and composition. They mentioned most or all of the 25 criterion items for these classes. Common Most Inquiry items were 1 to 8, 11 to 17, 19 to 23, and 25. All three teachers referred to helping students understand connections among concepts by learning from a conceptual framework or the "big-picture."

Table 4. Specific Inquiry Criteria Explicitly Mentioned (✓) or not (absence of ✓) in Teacher Interviews in Relation to the Inquiry Level of the Classes.

Inquiry property based on outcomes	Teacher	A	B	B	C	D	E	F
	Inquiry level	Most	Most	Middle	Most	Middle	Least	Least
1.	Dialog	✓	✓	✓	✓	✓		✓
2.	Student-centered curriculum and role diversification	✓	✓	✓	✓	✓		
3.	Multiple resources	✓	✓	✓	✓	✓	✓	
4.	Varied assessment	✓	✓	✓	✓	✓		
5.	Understanding relationships among concepts	✓	✓	✓	✓	✓		
6.	Active learning	✓	✓	✓	✓	✓	✓	✓
7.	Asking questions	✓	✓	✓	✓	✓		
8.	Inquiry beyond classroom	✓	✓	✓	✓	✓	✓	✓
9.	Creativity		✓	✓	✓	✓		✓
10.	Imagination		✓	✓	✓			
11.	Knowledge acquisition and knowledge construction	✓	✓	✓	✓	✓	✓	
12.	Learn the process, language, and skills of inquiry	✓	✓	✓	✓			
13.	Positive attitude	✓	✓		✓	✓		
14.	Improved achievement	✓	✓	✓	✓			
15.	Develop personal skills	✓	✓	✓	✓	✓	✓	✓
16.	Increased motivation	✓	✓	✓	✓	✓		
17.	Interests	✓	✓		✓	✓	✓	
18.	Choice		✓		✓			✓
19.	Critical thinking	✓	✓	✓	✓	✓		✓
20.	Self-esteem, self-confidence	✓	✓		✓			
21.	Expertise	✓	✓		✓	✓		✓
22.	Metacognition	✓	✓	✓	✓			
23.	Sharing results	✓	✓	✓	✓	✓		
24.	Scaffolding		✓		✓			✓
25.	Reflection	✓	✓		✓			
Total criteria (sum)		21	25	18	25	17	6	9
Percentage of criteria (sum/25)		84	100	72	100	68	24	36

Teacher A stated, "the whole [English] course is organized around the central premise that it's all conceptual. There's not going to be any memorization at all." The same view was reinforced by Teacher B and Teacher C in their classrooms:

> I'm very much into concepts; I'm very far from a factual, learn-the-facts-person . . . I always focus on [what] that big idea is and how you've got to make sure that the students

> know what the big idea is too, because then you're making connections in your learning, instead of these isolated facts which have no connection. (Teacher B)

> I'm realizing that the subject that we have is just the backdrop; it's the stuff that we need to be able to talk about—the big questions. (Teacher C)

Within the "big idea" is emphasis placed on learning and producing meaningful work that connects to students' lives. Teacher A stated,

> making personal connections becomes a major task of learning, applying meaning to the work. This ensures that knowledge acquisition does not consist of solely learning and memorizing. To the contrary, knowledge surpasses simple facts and becomes something to be constructed by students themselves using the social environment and their prior knowledge.

Teachers A and B labeled this teaching approach as "constructivist" and Teacher C called it "competency-based" and "differential" learning.

All three emphasized student-centered learning in which students are "independent learners" (B) and "feel ownership" (A, C). Teacher C described the need for role diversification between students and teachers as a shift "to valuing students as co-learners in a cogenerative environment where together, we're determining what are meaningful learning goals, and together we're finding a process, and together we're seeking solutions to shared problems." Students are encouraged to generate their own questions (A, B, C) and are taught how to ask "higher order thinking questions instead of . . . recall questions" (B), and "it also teaches them about how to ask questions and find answers" (C).

All three recognized students' interests and strengths, ensuring that students had positive attitudes and motivation to achieve spurred by authentic classroom activities that exceeded factual knowledge. In the two English classes and English literature and composition classes (A), assessment comprised class debates and discussions instead of written tests. Teacher A also used "test analyses" in which students voted on what they believed to be "correct" answers to conceptual questions by referring to evidence in the test, and they were welcome to disagree. In the applied research class (B), students' independent laboratory projects invoked scientific methodology. Abstracts were written, data collected and analyzed, and results presented at external science fairs. Teacher C's English classes solicited meaningful feedback from students and the teacher in discussion groups.

Dialog through group discussions was common for all three. Teacher A taught students to understand "what good discourse is and how to effectively do that," similar to Teacher C who had seminars in which students learned "how to talk in a group, and how to listen in a group, and what's good talk and what's bad talk." They all referred to inquiry elements such as critical thinking, metacognition, and reflection with their students. "The most important thing is critical thinking. The capacity and ability to look at things in an objective way, and interpret and do all those higher order thinking skills" (A) by engaging in "a reflexivity about process" (C) helps students become "logical, analytical, and creative" thinkers (B).

Middle Inquiry

The two Middle Inquiry teachers (B, D) taught two biology and two physical science classes. Common inquiry criteria they identified were items 1 to 9, 11, 15, 16, 19, and 23. Some of these were also cited by the Most Inquiry group, such as the importance of dialog, student-centered learning in which "students are responsible for some of their instruction" (B), understanding of the relationships between concepts or "big idea," active learning, and knowledge acquisition by learning how to "access information, and structure their own learning" (D). Although both stressed the importance of critical thinking by stating that inquiry learning "inspires kids to ask more questions, to be more curious" (D) and "You have to do lateral thinking, you have to be inductive and deductive" (B), Teacher B spoke differently about his biology classes compared with his Most Inquiry applied research class. Biology students had little choice in the material covered and were propelled by state curricular standards. Although teacher D tried to incorporate students' interests and inspire their curiosity, there was insufficient time to indulge in activities that were not predetermined or did not teach facts that her students would need for provincial examinations:

> There are times where it's like, we need to move on, and if you don't understand, now you have to see me after school for help, because I don't have more time . . . I don't have as much opportunity to teach the way I would like to, because I do personally feel it's the ideal, and I feel stifled . . . Theoretically, you could have a beautiful design, but in life you have to make it fit with scheduling and stuff. But I'd like to be able to, like, my goal as professional development would be to get more activities and infuse more of that in the lessons as opposed to always just "here's some information, let's work on it.

Least Inquiry

Teacher E taught one mathematics and Teacher F taught two biology classes. Their principals recommended them as good but traditional teachers. Although items 6, 8, and 15 were cited by both, most of their instructional statements were traditional. Teacher E identified her instruction as "lecture" and Teacher F described hers as "direct instruction." Students took notes in class, completed worksheets, and did practice examples. Teacher E regarded herself as a guide and role model, however, she emphasized, "I'm here to teach them the course. I have to follow the course outline and try to [give] them as much of the course as possible." When asked about student roles, Teacher E stated "Well, they have to learn." Students engaged in laboratories, however, the tasks were predetermined; questions to be analyzed and procedures were provided by the teacher (E) and projects were always given to students with specific criteria (F). Important to both was the need for students to learn work ethics, such as responsibility, respect, following instructions, and problem-solving skills.

Conclusion

An assessment of the extent of classroom inquiry can be directly ascertained from a fairly brief interview with teachers. This assessment is based on teachers' descriptions of their typical instruction, classroom descriptions, and anticipated student outcomes. This does not devalue other tools when classroom observations are possible, or questionnaires when student or teacher time is available. Interviews also indicate potential to tap differences in the amount and types of inquiry elements present between classes taught by the same teacher. The extent of inquiry is evident in a simple tally of the number of medium-grained criterion-referenced items about what happens as student outcomes in inquiry classes that are mentioned by respondents. This was accomplished with a criterion-referenced list of 25 items (MCLIC) that describes inquiry-based instruction in classrooms. Comparing the tallies of properties noted in the interviews with the inquiry levels based on the adapted version of Llewellyn's rubric, teachers who cited 20 or more of the 25 items can be described as teaching High Inquiry classes, and those who cite below 10 as low-inquiry classes. There was consistency in the subsets of items cited or not within each group.

The fact that the lowest number of inquiry-related elements revealed in the teacher interviews was six and not zero also supports our contention that it is important not to rely on assessments of merely the presence or absence of inquiry. It is important to address the extent of inquiry, and ultimately the quality of the inquiry experience.

Implications for Research

MITSI and MCLIC offer a relatively quick, criterion-referenced procedure for assessing the extent of inquiry in a classroom. Because these do not require elaborate inferences—either a teacher mentions creativity or student interests or not—protocol analysis (Ericsson & Simon, 1993) in an informal and easy-to-score procedure is possible, rather than engaging in more resource-intensive open coding (e.g., as guided by Creswell, 2007, 2008). MCLIC data could be useful predictor variables in studies of more fine-grained outcomes such as inquiry knowledge, self-efficacy, content or social learning, or facilitators and barriers to implementation.

Ultimately to address the quality of the inquiry experiences provided by teachers will require extending the research to classroom observations and cross-validating these data with inferences available from interviews, and probably linking such judgments to evaluations of the success of student learning.

Subject matter taught also remains worthy of further exploration. An interesting observation in Table 3 was that the science classes did not dominate the Most Inquiry group. Science teacher interviews revealed Most, Middle, and Least extents of inquiry. All the English classes were in the Most Inquiry classes, but four revealed 21 of the 25 criteria (84%). This supports the assertion that inquiry-based instruction is not the exclusive domain of science; common characteristics of inquiry occur across disciplines, but the number of detailed descriptions of how inquiry takes root in humanities and social sciences classes (e.g., Aulls, 2002; and examples in Aulls & Shore, 2008;

Shore, Aulls, & Delcourt, 2008) remains limited compared with the voluminous literature about inquiry in science teaching.

Methodologically, the present procedure is still depended on the transcription and coding of the interviews. This is feasible in research, and the interviews are short, but for purposes of teachers' action research and evaluation, it would be useful to attempt to validate scoring that uses voice recordings. Voice-recognition software may at this point make entirely useful automatic transcriptions (and even translations) of the live interviews that could be coded and tallied on paper.

With regard specifically to the education of gifted, talented, and creative learners, a brief teacher interview that is coded and scored in terms of the presence or not of 25 inquiry elements offers an additional tool to assure that teachers' descriptions of their overall instructional practices include pedagogical practices well suited to gifted students. This could be investigated as a useful tool in hiring, and as a basis for identifying needs for in-service professional development.

Implications for Professional Development

Teachers can use MCLIC as a personal checklist to monitor use of inquiry instruction and to chart changes. It can be a point of reference for charting student progress. Items not evident in practice within a school or department can be topics for professional development. Teachers can choose tools that address their practice at levels of granularity appropriate to their current needs. Llewellyn's (2002, 2004) 12-item rubric or the 11-item adaptation (Saunders-Stewart et al., 2015) addressed first steps in broadly understanding inquiry engagement. MITSI with MCLIC are probably more suitable for teachers embarking on inquiry as a teaching approach because they address specific classroom events in relatively familiar terms. Whether the context is general or gifted education, and creating learning environments that promote talent development in either, a short interview at regular intervals can help gauge progress toward a high level of inquiry-based instruction.

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