Multiple Complementary Methods for Understanding Self-Regulated Learning as Situated in Context

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Introduction and Overview

This conference paper is part of a symposium with the broad goal of stimulating in-depth discussion about strategies for understanding complex and dynamic learning processes as they play out in context. Researchers are increasingly sensitive to how learning is not only dynamic, but is also delimited by historically- and socioculturally-situated features of local learning environments (e.g., activities assigned; teacher-student discourse) (Butler & Cartier, 2004). As a result, educational researchers have been challenged both to understand how learning processes shift in interaction with evolving contexts and to develop methodological tools that capture learning processes in situ (Winne & Perry, 2000). In response to this challenge, this paper aims to contribute to theory, research, and practice by examining the links between contexts and learning, and by featuring research using and/or developing innovative methodologies.

More specifically, this paper focuses on strategies for assessing and understanding self-regulated learning (SRL). SRL is as an ideal example of a complex, dynamic and situated learning process (Butler & Winne, 1995). Consider, for example, that models of SRL are described as capturing the adaptation of individuals within environments (Zimmerman, 2000), and the interface between social and individual learning processes (Butler, in press; Butler, Novak Lauscher, Jarvis-Selinger, & Beckingham, 2004). Thus, as a more focused goal, this paper invites dialogue among those interested in finding ways of investigating SRL as a situated "event" (e.g., Winne & Perry, 2000).

Collectively, the papers included in our AERA symposium present a rich range of approaches to understanding SRL in classroom or e-learning environments (see also Aulls (2005), Hadwin, Nesbit, Winne, and Kumar (2005), and Perry and Winne (2005)). In our contribution, we begin by describing the model of "SRL in Context" on which our work is grounded. Building from that discussion, we articulate how SRL is a *complex*, *situated*, *dynamic* process involving *individuals learning in context*. This introduction lays the groundwork for us to evaluate different strategies for understanding SRL. We focus attention on an innovative self-report questionnaire and illustrate its potential contributions, but at the same time articulate and illustrate why it is important to use a suite of complementary tools to fully capture SRL.

Self-Regulated Learning in Context

Our model of SRL in context (see Figure 1) represents our attempt to summarize factors that have been associated with SRL in the research literature (e.g., Butler & Winne, 1995; Pintrich, 2000; Zimmerman & Schunk, 1994; Zimmerman & Schunk, 2001). Consistent with perspectives on SRL that have emerged through the 1990's and early 2000's (see Boekaerts & Corno, in press), we consider SRL to be a modifiable process shaped by individual

characteristics and learning histories in interaction with context (Brown, Collins & Duguid, 1989; Weinstein. Husman, & Dierking, 2000). In addition, consistent with expanding awareness of the multiplicity of factors associated with learning, we also consider interconnections among affect, motivation, cognition, and metacognition as they interact to shape an individual's situated engagement in tasks (APA, 1997; Wang, Haertel, & Walbert, 1993). In the rest of this section, we describe six central features of our model: (1) **layers of context**, (2) **what individuals bring to contexts**, (3) **mediating factors**, (4) **personal objectives**, (5) **SRL processes**, and (6) **cognitive strategies**.

First, consider how multiple nested and overlapping layers form the context (**layers of context**) within which any given learning episode tasks place. At a broad level, students' academic experiences are situated historically and geographically (e.g., nested layers from national to provincial / state, to country / municipality / district / neighbourhood). Socio-political perspectives and agendas interweave across these layers to impact what a student experiences within a given educational setting. School districts create structures that situate learning within schools (primary, elementary, intermediate, middle, or secondary schools including students of different ages and in different configurations). Schools within the same district are likely to be situated in neighborhoods with different levels of socio-economic advantages wherein families may have a variety of cultural experiences, expectations, and involvements related to the education of their children. Within schools, structures are created that situate learning in programs (e.g., French Immersion; a Visual and Fine Arts Academy) and different kinds of classroom configurations. Within classrooms, students' understandings about and ways of engaging in learning are influenced by how a teacher interprets and addresses the curriculum, by teachers' instructional approaches, evaluation practices, and feedback, and by interaction patterns between and among teachers and peers. Learning is also situated within particular activities (e.g., doing a research report) and within particular domains (science, mathematics) (Weinstein et al., 2000). Activities themselves comprise multiple tasks (e.g., researching, reading, writing, presenting) (Butler & Cartier, 2004). Understanding SRL requires recognizing the ways in which multiple interlocking contexts shape and constrain the quality of students' engagement in learning.

Second, what happens in a given learning episode is also influenced by **what individuals bring to contexts** (Cartier, 2002). For example, students bring a variety of strengths, challenges, interests and preferences to educational settings. Further, across time, based on their experiences within historically-, socially-, and culturally-situated classrooms and schools, students accumulate a learning history that shapes their development of knowledge and skills, self-perceptions, attitudes towards school, and conceptions about academic work (Butler & Cartier, 2004; Campione, Brown, & O'Connell, 1988; Schoenfeld, 1988). Thus, in our model of SRL, we try to account for how what individuals bring to learning contexts interacts with multiple layers of context to influence how a learner engages in SRL in a given learning episode.

Third, as is also depicted in Figure 1, when presented with academic work, students' SRL is mediated by (1) their **knowledge, perceptions, and conceptions**, including students' background knowledge about the topic under study, perceptions about the activity and component tasks (e.g., complexity, value), and self-perceptions about their competence and control over learning, and (2) the **emotions** they experience, before, during, and after completing

a task. For example, students who do not believe they can be successful at an activity (low self-perceptions of competence and control), do not perceive a task to be important or interesting (low perceptions of task value), and/or feel stressed while learning (negative emotions) may seek to avoid a task rather than to invest effort in self-directing learning. Note that students' knowledge, perceptions, conceptions, and emotions are not only shaped by what individuals bring to a context (e.g., prior learning histories), but they are also influenced by the contexts in which students are learning (e.g., interaction patterns; evaluation practices).

Fourth, the heart of our model is our description of key dynamic and recursive self-regulating processes. We depict how, when confronted with academic work, students draw on information available in the environment, and on knowledge, conceptions, and perceptions derived from prior learning histories, to interpret the demands of a task (**task interpretation**) (Butler, 1995; 1998; Butler & Cartier, 2004). Elsewhere we have defined task interpretation as a critical first step in SRL, because student's interpretation of task demands is a key determinant of the goals they set while learning, the strategies they select to achieve those goals, and the **criteria** they use to self-assess and self-evaluate outcomes (Butler & Cartier, 2004; Butler & Winne, 1995). Thus, students self-regulate learning activities, at least in part, based on their perceptions of task requirements.

But students also set **personal objectives** (not necessarily consciously) that impact their direction for (non)engaging in learning. Thus, personal objectives are included as a fifth feature within our model. These objectives may include achieving task expectations (e.g., learning, doing well), but may also reflect competing priorities. For example, students may direct their attention to achieving emotional well-being rather than focusing on academic objectives (Boekaerts & Corno, in press). Personal objectives are influenced by context, by what individuals bring to contexts, by the mediating variables outlined in our model (e.g., perceptions of task complexity or task value), and by students' interpretation of expectations.

In light of their interpretation of task requirements and their personal objectives, self-regulated learners manage their engagement in academic work by using a variety of **self-regulating strategies** (back to feature 4 in our model). These students make plans on how to use available resources (e.g., time, materials) and select strategies for task completion (**planning**), they self-monitor progress (**monitoring**) and adjust goals, plans, or strategies based on self-perceptions of progress or feedback (**adjusting approaches to learning**), and, they self-evaluate performance (**self-evaluating**). As noted earlier, the criteria (**criteria**) against which students judge progress and outcomes are linked to their interpretation of task demands (**task interpretation**), and can be affected by students' interpretation of feedback they are given (Butler & Winne, 1995). But students might also self-monitor outcomes in relation to competing objectives (**personal objectives**). Successful students may use **self-regulating strategies** to control the impact of negative emotions and redirect learning towards mastery goals (**managing motivation and emotions**) (Corno, 1994).

The last feature of our model is students' use of **cognitive strategies** for accomplishing tasks. Students' use of cognitive strategies is situated within cycles of self-regulated learning (Butler & Winne, 1995). That is, students' identification of appropriate strategies is predicated on their definition of task requirements and on the extent to which they successfully match

cognitive strategies to task demands. Further, to be maximally successful, learners must monitor the success of their efforts (and strategy use) while working through a task and make adjustments to strategies if not progressing as desired. Note that the best strategy for a student to use in a given situation is a joint function of the demands of a task (e.g., reading a novel vs. reading informational text) and what an individual brings to a context (e.g., areas of strength or challenge, preferences). In addition, multiple routes (i.e., strategies) are often available for achieving the same objective (e.g., finding links between ideas when learning by creating a drawing or making an outline). Thus, judging what is an effective profile of self-regulation for a given individual depends on interpreting strategy use in context.

It is our perspective that students self-regulate learning whenever they approach an academic activity, albeit more or less successfully (from a teacher's perspective). The most academically successful learners are often more consciously aware of managing their learning activities and take control of self-directing their efforts. For example, these learners may take the time to deliberately interpret tasks and make plans, think about strategy alternatives, interpret feedback they are given to derive directions for further learning, or self-monitor and manage emotions. But self-regulation is not necessarily consciously-mediated (Butler, 1998-a). Students may direct their engagement in tasks based on implicit conceptions about academic work (derived through their learning histories) (Cartier, 2000), or use strategies that they have used in the past without considering their effectiveness (Cartier, 1997). Even students who seek to avoid task demands are engaging in goal directed behaviour (although with a competing **personal objective**) (Boekaerts & Corno, in press). Our suggestion is that a model of self-regulated learning in context provides a framework for understanding what learners do when they confront academic work, self-consciously or less "mindfully" (Salomon & Perkins, 1989). Thus, assessing SRL in context provides a window into understanding complex learning processes whether or not students take more deliberate control over learning.

Assessing SRL as a Complex, Situated, and Dynamic Process

To aid in our description of essential qualities of assessment tools, Table 1 presents a summary that highlights how SRL is (1) *complex*, (2) *situated*, (3) a *dynamic process*, and (4) describes *individuals in context* along with implications for assessment. We build from this summary to analyze how different types of assessment strategies, including our questionnaires, provide information necessary for understanding SRL. An underlying theme in this presentation is that there is no single method that provides the best strategy for assessing SRL. We argue instead that assessment strategies have complementary strengths and weaknesses, and that it is their use in combination that has the greatest potential.

First, SRL is complex in that, within a given learning episode, SRL in context encompasses a dynamic and recursive cycle of cognitive and self-regulating processes that is impacted by multiple factors, including what individuals bring to contexts (e.g., learning history, strengths, challenges, preferences, interests), and individuals' knowledge, perceptions, conceptions, and emotions. It follows that, to understand SRL, it is necessary to construct multi-componential profiles of students' engagement in tasks, and to capture the interrelationships between SRL processes and multiple related factors.

Second, as described in some detail above, SRL is situated in multiple layers of context. It follows that understanding SRL requires collecting information about the contexts in which SRL occurs (at multiple levels) and that interpreting results requires sensitivity to the contexts in which the data were gathered. Further, we suggest that the meaning of any given aspect of SRL in context (e.g., use of a given strategy, an emotion experienced) only takes meaning in the context. For example, whether "asking for help" is an indicator of strategic help-seeking or dependence on others can best be understood by considering how and why help-seeking is used by an individual in context (Butler, 1998). It follows that assessments must be structured to construct profiles of SRL that illuminate meaning. Further, building from a common description in the qualitative literature, aggregating data across individuals may be maximally informative when the general is found in the particular (Merriam, 1998), and when generalized understandings are abstracted from analyses of individuals acting in context.

Third, SRL is a dynamic process that plays out as an event over time, in cycles of activity, and includes processes that may or may not be deliberately chosen and/or consciously accessible to learners. It follows that assessment strategies must capture overt and covert processes in tandem with descriptions of students' intentions for enacting certain processes. Further, SRL is dynamic because key features evolve, not only across sequential learning experiences, but also within the context of a single task. That is, an individual's knowledge, perceptions, conceptions, emotions, and strategies (cognitive and self-regulating) are influenced and shift during cycles of self-regulation. Thus, assessment strategies must capture how SRL components shift within and across learning episodes (Winne & Perry, 2000).

Finally, models of SRL are designed to capture individual learning in context. But characterizing the interactions of individuals and contexts is itself a complex task, with multiple dimensions. For example, how an individual self-regulates learning is mediated by what that individual brings to the context (e.g., based on learning histories, strengths and challenges), while at the same time, the way in which individual characteristics impact SRL depends on how those characteristics fit and interact with features of contexts (e.g., expectations, task demands, support structures). Thus, it also follows that assessing SRL requires attention to how what individuals bring to context interacts with environmental features to shape individuals' engagement in learning.

Another example of the complexity of individual-context relationships is evident if we consider how SRL is shaped and constrained by opportunities afforded by contexts (e.g., exposure to learning topics; availability of resources) and by the language and tools available for learners to make sense of experience (Stone, 1998). Thus historical and current learning experiences delimit students' understanding about and engagement in academic work. But at the same time, environmental features (e.g., instruction, feedback) cannot directly impact on student learning. Rather, the impact on learning of contextual features depends on how individuals focus on and interpret information in their environments (Butler et al., in press). For example, it is not so much what a teacher intends in her instructions as what a student perceives that shapes the student's interpretation of a task (Winne & Marx, 1982), which is in turn shaped by students' conceptions about academic work (Campione et al., 1988; Schoenfeld, 1988). Thus, understanding individuals' learning in context requires sensitivity to affordances of environments but also to the sense learners make of the contexts in which they are learning.

Complementary Methods for Assessing SRL

Previous research has shown that understanding complex and dynamic learning processes such as SRL is enhanced by using complementary assessment strategies. For example, Butler (1995; 1998) employed a combination of questionnaires, interviews, think alouds, observations, and traces to link shifts in learning engagement with features of an intervention program. Cartier (2000, Cartier, Beaudry, & Hébert, 2002) has used a combination of log-books, interviews and questionnaires to capture students' cognitive strategies while learning through reading. Building from this past research, our current goal is to develop a coordinated suite of measures designed to assess SRL.

In this paper, we focus attention most closely on the first of the tools that we have developed, namely a new set of questionnaires. In our past research, we had both depended on intensive, in-depth assessment approaches and we both had developed questionnaires, albeit with limitations (e.g., that did not fully address SRL in context) (Butler, 1995; 1998; Cartier, 2000; Cartier et al. 2002). As a result, three years ago we pooled our efforts to develop a self-report tool that could be used in larger scale studies that remained consonant with our underlying theoretical framework. To describe the contribution of our new questionnaires, while at the same time maintaining a focus on the importance of using multiple complementary assessment strategies, in this section we (1) introduce our questionnaires, (2) identify the contributions of our questionnaires and other complementary assessment strategies to understanding SRL as a *complex, situated,* and *dynamic process* that describes *individuals in context,* and (3) provide concrete examples to illustrate how using our questionnaires has the potential to enhance understanding about SRL.

The Reading to Learn and Inquiry Learning Questionnaires

Given our contextualized view of SRL (see Figure 1), it is our perspective that understanding SRL requires examining how individuals engage with a particular task within a given domain and as presented in a particular classroom. Examples of tasks might include reading one or more texts in order to learn about particular topic in science, writing a free verse poem about a personal experience, or solving math problems based on an understanding of an underlying concept. Our model of SRL as situated in context focuses on how students engage with these kinds of academic tasks.

To date, we have developed two versions of our questionnaire, for two key academic tasks: *learning through reading* and *inquiry learning*. *Learning through reading* can be defined as "a process and a learning situation in which the reader/learner aims to learn more about a subject by reading text, while at the same time managing his/her learning environment and completion of the task" (Cartier, 2000, p. 93). Within this activity, students must not only understand what they are reading (e.g., a textbook, a newspaper article, a website), but they must also construct knowledge about a topic that they can apply to a situation or problem. To be successful, students need to find or access appropriate texts, manage time and resources, select information, derive meaning through reading, and build connections across sources of information and be motivated to do so.

Inquiry learning is a task that requires students to construct and enact a research or inquiry project to generate new understandings about a topic or issue. *Inquiry learning* subsumes *learning through reading*, because conducting good research typically requires learning about a problem or topic by reading across sources of information. Additional expectations, however, are that students learn about research processes, and then participate in those processes to derive knowledge within a field of study. When participating in this type of task, students have the potential to appreciate how theories or "facts" within a domain are generated (and provisional), rather than thinking of themselves as recipients of given or fixed domain-specific knowledge. They are invited into the "progressive discourse" that exists within a research community (Bereiter, 1994).

Our questionnaires were inspired by the work of others who have developed related assessment tools (e.g., Cartier, Chouinard, Théorêt, Van Grunderbeeck & Garon, 2001; Pintrich & Garcia, 1994; Weinstein & Palmer, 1990; Zimmerman & Martinez-Pons, 1986) and have the following essential features:

- Each questionnaire evaluates linkages among the key features included within our model of SRL in Context (see Figure 1), including students' knowledge, experiences, perceptions, emotions, task interpretation, personal objectives, cognitive strategies, and self-regulating strategies.

- Each questionnaire is contextualized, referring to a specific type of task (e.g., *reading to learn*, *inquiry learning*) within a particular domain (*reading to learn* in history or in science) and a specific topic (e.g., why volcanoes erupt). To contextualize students' responses to the questionnaires, students are asked to refer to an example task while they respond to the questions. The task is framed as an "assignment" they will (or might be asked to) complete and is provided on a separate sheet of paper. For *learning through reading* tasks, students are presented with a topic about which to learn more, along with concrete copies or representations of the texts to be read. For *inquiry learning* tasks, students are presented with a brief rationale for a problem to be studied, along with minimal background information.

- When responding to questions, students can think about a referenced activity at one of three different levels. Students can: (a) actually do the activity, (b) think about doing a specific activity, or (c) think about doing the *type* of activity represented in a specific example. Interpretations need to be made depending on how a referenced activity was presented.

- In each questionnaire, we ask students to self-report on what they think and do during a learning episode, at the beginning, during, and at the end of a given task. The questionnaire is divided into three sections corresponding to these three phases in task completion. In the first section, we ask students to report on what they think and do when first presented a task, focusing on students' knowledge (e.g., about a topic), perceptions (e.g., task value, self-competence and control over learning), emotions before starting, task interpretation (as a launch to self-regulation but also as an indicator of students' conceptions about academic work), personal objectives, and self-regulated strategies for planning. In the second section we ask students to report on what they think and do while working through the task, focusing here on students' emotions while completing the task and their use of cognitive and self-regulating strategies (here monitoring, fix-up, and emotion control strategies). The final

section asks students to report on what they think and do at the end of a task, with a focus on criteria for self-evaluation and emotions experienced when finished.

- Students can complete the questionnaire in one sitting or in three separate chunks. If actually doing a referenced task, they can fill out the questionnaire before, during, or after finishing their work. Alternatively, students can complete the questionnaire in sections interspersed with actually doing the task. Again, interpretations would need to be made depending on how students completed the questionnaire in relationship to doing a task. It would also be important to document how a task was presented to students and whether and how support was given during task completion within a given classroom environment.
- Parallel French- and English-language versions of the *Reading to Learn* questionnaire have been developed to facilitate within- and cross-provincial research in Canada where our two official languages are English and French.

In each questionnaire, students think about the example task, and then rate on a scale from one to four the *frequency* with which an item reflects their engagement in that kind of task (from "almost never" to "almost always"). A few other items (e.g., assessing knowledge) are also judged on a four point scale, but on a dimension appropriate to the question (e.g., students might judge how much knowledge they have about a topic, from "very little" to "a lot"). The time required to complete questionnaire versions ranges from 30 to 50 minutes depending on students' age and the context. The complete version of the *Reading to Learn* questionnaire is designed for students in grades 7 and above, but we have also developed an abbreviated version of the tool for students in grades 4 to 6. Questions can be read aloud to individuals or groups as students answer the questions. The current *Inquiry Learning* questionnaire was designed for students at the University level.

Contributions of Different Kinds of Assessments to Understanding SRL

Much discussion has taken place about the relative merits of different assessment approaches for capturing SRL (e.g., Boekaerts & Corno, in press; Winne & Perry, 2000). For example, Boekaerts and Corno (in press) provide an historical overview of assessment strategies, along with a useful typology for describing different approaches. They differentiate between self-report questionnaires, observations of overt behaviours, interviews, think alouds, traces of learning processes (e.g., through computer tracking, in work samples), situational manipulations (i.e., experiments), and diaries. In this section, we outline the ways in which our questionnaires, along with other types of assessment strategies such as these, have the potential to contribute to understanding SRL as a *complex, situated, dynamic process* that captures *individual learning in context* (see Table 1).

We acknowledge at the outset that self-report measures are not the best indicators of actual behaviour. However, research has shown how students' knowledge, perceptions, conceptions, and interpretations shape their engagement in academic work and interactions within learning environments. Thus, the strength of our self-report questionnaires is that they assess students' self-awareness and knowledge about important learning processes. Other assessment strategies, such as observations and traces, provide better measures of overt behaviour. But self-report tools can complement such measures by infusing behaviour with meaning, from an individual's

perspective, and by tracking knowledge, perceptions, conceptions, emotions, interpretations, and self-awareness of processes that can be associated with students' engagement in learning.

We also acknowledge that students may use strategies without awareness (and so not self-report their use). However, we suggest that questionnaires such as ours can capture what students *think they are doing*, also important information. We also acknowledge that students might report what they think they *should* do, rather than what they recognize about their actual behaviour (the social desirability problem). However, we have found that students report using strategies on our questionnaires that are less than socially-desirable (e.g., just turning their work in without checking it; giving up when they encounter a problem). We have also documented self-reported profiles of strategy use that are not particularly positive for many groups of students (see below for some examples). Thus, it appears to us that students have been being relatively straightforward in self-reporting behaviour on our questionnaires (i.e., what they think they do vs. what they think they should do). But even in the worst case scenario, if social desirability did have an effect, our findings might be even more interesting. It would be frightening if students were reporting the "best" of what they knew they should do in our studies, given the less than ideal SRL profiles we have uncovered for many groups of students.

As a final point in our preliminary discussion about the relative merits of self-report tools, we suggest that it is of interest to directly investigate the links between students' self-reports and actual behaviour. For example, it would be of considerable interest to study how individuals' self-awareness of SRL in context relates to their engagement in learning (e.g., how do individuals' interpretations of tasks or perceptions about their strategies interact with guidance provided by procedural facilitators to shape how students engage in learning?). Similarly, finding gaps between self-reported strategy use and actual behaviour can establish interesting directions for intervention. For example, assisting students to recognize strategies they use, but about which they are not self-consciously aware, may support their development of metacognitive knowledge about learning processes, positive self-perceptions of competence, and deliberate control over learning (Butler, 1995; 1998). Similarly, alerting students to gaps between what they report doing and what they actually do may support them to realize how better to implement powerful strategies. Our point here is that what is needed are a suite of complementary assessment strategies that can capture not only overt or covert behaviour, but also students' perspectives about academic work and learning processes.

Given this discussion, and as we summarize in Table 1, we suggest that our self-report questionnaires provide important information about SRL as a complex, situated, dynamic process that describes individuals learning in context. Our questionnaires assess the *complexity* of SRL in two important respects. First, our questionnaires focus attention on the key features of SRL in context, as reflected in our model. Specifically, our tools assess students' knowledge and perceptions, self-awareness of emotions, task interpretation (and conceptions of academic work), and personal goals for learning. These are subjective influences on SRL that are hard to observe directly. Our questionnaires also capture students' self-awareness of cognitive and self-regulating learning processes. We note that interviews have the potential to collect self-reports in a more open-ended and dynamic format, and think alouds or stimulated recall have the added advantage of linking observed behaviour to student perspectives. However, the practical advantage of our questionnaires is that they are easy to administer to groups of students while

still offering enough response options to allow for constructing multidimensional profiles of student perspectives.

The second way our questionnaires contribute to understanding the complexity of SRL is that the data collected allow for comparison of interconnections and interactions among key features of SRL in context (e.g., emotions, motivation, cognitive strategies, self-regulation). For example, we are able to construct profiles of responses to classes of items for individuals or groups of students (e.g., multidimensional portraits of self-reported cognitive strategy use or task interpretation). We can also identify "dimensions" comprising clusters of items (through factor or cluster analysis), and construct case profiles (for individuals) that relate dimensions to one another. Correlation, multiple regression, structural equation modeling, and hierarchical linear modeling are additional tools available for examining rich patterns across layers of context for aggregated data. Thus, while our tool cannot on its own track relationships between perceptions and behaviour, we are able to look for interrelationships between key features within our model. Further, pairing use of our questionnaires with other assessment strategies (such as traces, observations, or think alouds), would create opportunities to systematically link self-reports to behaviours for individuals or groups of students.

Our questionnaires are also designed to capture SRL as *situated* in context. For example, no matter how large the administration (e.g., up to 42,000 students in one project in Quebec; see Cartier, Janosz, Butler, Archambault, & Touchette, 2004), students' responses are situated in a specific task, domain, and topic (e.g., reading to learn about the respiratory system in a science classroom). Thus, interpretation of results can be situated in at least these layers of context. Further, to the extent possible in various projects, we collect information simultaneously about larger layers of context in which the questionnaires are administered. Complementary sources of data here might include classroom observations, interviews or questionnaires completed with teachers, or collection of documents (e.g., of provincial curricula, school district priorities and policies, demographic information about neighborhoods, lesson plans). Our questionnaires also situate assessment of SRL by supporting interpretation of individual responses in context. For example, as we illustrate in the section to follow, we can construct SRL profiles for individuals or groups to generate hypotheses about the meaning of findings (e.g., self-reports of help-seeking). Pairing our questionnaire with interviews or think alouds would further allow for checking on the meaning of individuals' responses.

Questionnaires do not provide an ideal strategy for assessing SRL as a *dynamic process*, especially for processes that are automatized or not under the conscious control of students. It is here that the advantages of other assessment strategies (e.g., traces, observations, think alouds) come to the fore. Nonetheless, our questionnaires are useful for surfacing students' self-awareness related to their use of cognitive and self-regulated strategies. We also contribute by linking students' self-reported strategy use to other key features in our model, such as self-perceptions about competence and control, perceptions of task value, emotions, task interpretation, and personal goals. Thus, our questionnaires provide a window into how students *think about* important types of academic work. Note also that, because our questionnaires reference a very specific task, opportunities exist for students to actually work through the task in tandem with completing the questionnaire. Pairing use of the questionnaire with complementary strategies (observations, think alouds, performance-based assessments) has the potential to link

students' perspectives about SRL in context to assessments of what they actually do. Further, if subsections of the questionnaire (e.g., self-perceptions of competence, task interpretation) were re-administered at intervals as students completed a task, the questionnaire could be used to track changes within and across learning episodes.

Finally, our questionnaires have some usefulness in terms of understanding *individual learning in context*. For example, because our questionnaires are situated in particular contexts, we have the potential to relate students' knowledge, perceptions, emotions, personal objectives, and task interpretation to the contexts, tasks, domains, and topics in which our assessment is situated. We could thus create research studies wherein we systematically examine how students' answers to questions are responsive to shifts in context (e.g., changes from elementary to secondary school; shifts in classroom environments; shifts in the complexity of tasks). Our questionnaire also does an excellent job of assessing how students interpret the demands of academic work (i.e., task interpretation). Clearly, however, complementary assessment strategies are also needed to enrich our understanding of individual learning in context. For example, documents would provide information, not only about the contexts in which individuals learn, but also about an individual's strengths, challenges, and learning history. Verbal report measures paired with observations (as in think alouds or cued recall interviews) could be used to relate individuals' self-reports to actual behaviour.

Examples of Data from our Questionnaires

In this section, we present sample results drawn from three different projects, with a focus not on project by project reports, but rather on illustrating the kinds of data our questionnaires generate that are useful for better understanding SRL. We present just a few examples of how data from our questionnaire can be analyzed and interpreted to capture SRL as a complex, situated, dynamic process that describes individual learning in context. These data also illustrate that our questionnaire is indeed sensitive enough to capture differences in responses generated in different types of context by individuals who bring to learning different types of background and experiences.

Item Profiles for Individuals Working Within Different Contexts

Within our questionnaires, we ask multiple questions related to SRL in context, focusing on students' knowledge, perceptions, emotions (before, during, and after a task), task interpretation, personal objectives, self-regulating strategies, and cognitive strategies. Rather than asking just enough questions to construct reliable "dimensions" in each of these areas, we constructed our questionnaires to allow for creation of "item profiles," being as inclusive as possible in the definition of alternative answers based on previous research.

Although it is possible to construct item profiles for individual students, in each of our projects we have also examined patterns of item responses for groups of students who answered the questionnaire within similar contexts (e.g., referencing the same task). At the same time, we are consistently careful to take note of the multiple layers of context within which the questionnaires are administered. To create item profiles, we have calculated the percentage of students in groups who selected the top two responses for any given item (e.g., "often" or

"almost always," "pretty much" or "a lot," etc.). We have drawn on those frequency data to construct graphical or tabular representations. We have used chi-square analyses to detect statistically reliable differences, across items for students in a single group, or between groups of students.[1] In this section we illustrate how constructing item profiles in this way has been useful for advancing understanding about SRL as a complex, dynamic, and situated event.

To illustrate the benefits of item profiles for capturing the complexity of SRL, two examples of item profiles are presented in Figures 2-a and 2-b (see also Table 2). These examples compare profiles of responses for two groups of grade 8 students from a project conducted in an urban center in Western Canada. Both groups of students were in the same school, were enrolled in "humanities" classes, and provided responses to the *Reading to Learn* questionnaire. One group was studying within a French Immersion program (for native speakers of English pursuing studies in the 2nd official language in Canada as a means for becoming bilingual), the other group pursued their studies in the school's English program. While completing questionnaires, both groups were asked to consider a task focused on reading to learn from their Social Studies textbooks. They then actually completed the reading tasks. Students in the French Immersion program read a text on the impact of Christianity, Islam, and Judaism as forces for societal change and responded to a French Language version of our questionnaire. Students in the English program read a text on the Vikings and responded to our English language questionnaire version.

Figures 2-a and 2-b compare, respectively, the percentage of students from each group who selected "often" or "almost always" as responses to questions related to self-perceptions of competence and control (e.g., "*When I am asked to read in order to learn, I think I can do a good job of following any instructions*," "*When I am asked to read in order to learn, I think that I can succeed"*) or to cognitive strategy use (e.g., "*While I am reading to learn, I think about what I already know about the subject*"). Items where differences were statistically reliable are indicated with asterisks in the Figures. Note that these are the types of figures we have been able to provide back to teachers at various levels of aggregation (classroom level, program level, grade level, school level) to characterize the SRL profiles of groups of students in their schools (see Butler & Cartier, 2004; Cartier, Janosz, Butler, & al., 2004).

What these figures illustrate is one strategy for analyzing and representing our data that captures the complexity of SRL. Rather than creating just a summary score for a given dimension (e.g., positive self-perceptions of competence; positive strategy use for building meaning from text), these profiles depict more nuanced differences in students' engagement in learning. For example, Figure 2-a shows that the majority of students in each group were relatively confident in their ability to succeed at the task that they were given, and anticipated being able to do a good job of following instructions. However, fewer students in both groups were confident in their ability to remember what they read (a reasonable metacognitive insight). Similarly, Figure 2-b provides a rich profile of self-reported cognitive strategy use for the two groups of students. These figures show dramatic differences in the frequency with which students reported using different kinds of strategies. For example, the most frequently used

[1] Note that we have also constructed item profiles using mean item responses, and analyses of variance or t-tests to compare responses to items or across groups. Results have been substantially the same using these two different methods.

strategies for both groups included looking at titles, paying attention to underlined or bold words, and paying attention to important ideas. Much fewer students reported using what have been shown to be excellent strategies for building meaning from text, such as summarizing in their own words, thinking of examples, applying what they are reading, regrouping information by subject, or finding links between information. Of course, whether or not a given strategy profile is optimal depends on the demands of a particular task. In this case, given that students were asked to learn more about a subject through reading, it is telling that not as many students self-reported using meaning building strategies.

Table 2 provides a more complete picture of differences between these two groups of students. We present these more complete data to illustrate how students' self-reported SRL in context varies as a function both of what individuals bring to settings and the contexts in which they work. Table 2 shows, first, that the pattern of responses differed substantially for the two groups (French Immersion or English program) across most of the constructs our questionnaires measure. Specifically we found that a higher percentage of students in French Immersion reported positive self-perceptions of competence, productive attributional patterns, positive perceptions of task value, positive emotions when given the task, productive criteria for self-evaluation, and frequent use of productive cognitive and self-regulating strategies. Interpreting the meaning of these differences, however, requires sensitivity to the characteristics of the students within each program and to the contexts in which the data were collected. For example, it is highly likely that systematic differences exist between students who enroll in the two different kinds of programs. It is less likely that the difference in topics addressed by the readings influenced students' responses, because we found no group differences in students' self-reported knowledge about the topics, interest in the task, or perceptions of task complexity. But it is possible that differences in instructional contexts affected the patterns we observed. It is also possible that our French and English language versions of the questionnaire are not exactly parallel, in spite of the considerable efforts we have expended to make them as similar as possible (further investigations of their comparability are planned). Note that our questionnaire alone is insufficient to tease apart these various explanations for our findings. However, the tool could be used within multiple research designs (e.g., case studies, intervention studies, causal-comparative studies) that provide strategies for identifying contextual and individual influences on the patterns we are observing.

Tables 3 and 4 present two additional examples of the ways in which our questionnaires capture SRL in context. For example, Table 3 presents another example from the same school above, from which the French Immersion and English program comparison was drawn. This table contrasts findings from students in grade 8 Humanities overall (French Immersion and English combined) with grade 9/10 students in Drafting. Students in both settings responded to the *Reading to Learn* questionnaire. However, layers of context that differed in this instance included grade level (grade 8 vs. grade 9 or 10), domain (Social Studies vs. Drafting), and topic (different Social Studies topics vs. Information Technology), and type of text included in the reading assignment (textbook excerpt vs. informative text about project desktops). And again, it is likely that individuals brought different strengths, challenges, interests, and preferences to the two contexts. For example, Drafting 9/10 is often chosen by students who are struggling in more academically-oriented classes, and who seek a more hands-on, applied curriculum. Note that the content in this course focuses heavily on the uses of computers and information technology (in

fact, the course name will change to Information Technology next year). As can be seen in Table 4, the comparison of SRL profiles between groups reveals a large number of statistically reliable differences across every key feature within our model of SRL in context. Students in Drafting 9/10 clearly have less positive SRL profiles when reading to learn than do their grade 8 peers.

Table 4 provides another example of how layers of context might interact to influence Grade 7 students' self-reported engagement in learning (this time including only English language versions of our questionnaires). These data were collected within another school located within the same urban school district as was the school from the last example. In this relatively new school, layers of contexts included the program within which students were enrolled (here a Science Academy or a Visual and Fine Arts Academy), the domain of study (here science), the task (reading to learn), and the topic under study. On this latter point, students within the Science Academy were presented with a 2-page narrative passage that provided information about the respiratory system, while the students within the Fine Arts Academy were presented with a 1-page narrative passage that provided information about the chemical and physical qualities of bubblegum. Findings were that a larger percentage of students in the Science Academy were confident and strategic in their self-regulated approaches to learning in Science (similar differences were found for the majority of items on the questionnaire, although due to the small sample size only very large differences were statistically reliable). As in the last examples, multiple individual and contextual factors might be associated with the group differences observed in this case. For example, it is likely that students whose families choose one or the other academy bring different strengths, challenges, and backgrounds to the learning environment. Further, differences between the tasks within the two programs might have influenced students' responding. Finally, although unlikely to have an effect so early in students' first year at the school (the questionnaire was done in October), the differences in instructional approach within the two academies might also have had an impact. Although we do not have data that allow us to decide between these possible explanations, it is interesting to note how the interaction between a program (Science Academy) and the domain under study (Science) might have impacted students' self-reports about learning processes.

Table 5 presents a final example of the way in which item profiles can enrich understanding of SRL, this time drawn from a study conducted in Eastern Canada. This example shows how our questionnaires can capture changes over time for a single set of students as related to changes in context. The study from which these results were drawn was designed to examine the differences between the evaluation practices of teachers at the elementary and secondary levels and to relate evaluation practices at each level to students' motivation, social adjustment, and self-regulated learning. The study employed a longitudinal design, and data were gathered from the same group of students at the end of their last year in elementary school (at 12 years old) and again at the end of their first year at the secondary level (at 13 years old). Participants were drawn from 56 schools from neighbourhoods with varying socio-economic characteristics and included 10 public, francophone secondary schools from the greater Montreal area (urban, suburban, and regional schools) and their 46 associated primary schools. As part of this project, 985 students responded to an abbreviated version of the French-language *Reading to Learn* questionnaire in both years of the project. This shortened version included just the questions on task interpretation, personal objectives, cognitive strategies, self-regulating strategies, and evaluation criteria. What we found were statistically-reliable differences between

students' responses across the two time periods for every item except one (with more positive responses being in favour of students when at the elementary level). However, given the large n for this study, we chose to present here only those differences that were practically significant, reflecting a difference of 5 percentage points or more.

Examples of item profiles presented in this paper were drawn from studies using the *Reading to Learn* questionnaire (in BC and in Quebec). Note, however, that we have conducted similar analyses in our project that used the *Inquiry Learning* version. Across projects, our findings suggest that (1) our questionnaires are sensitive enough to capture differences in students' self-reported engagement in learning across contexts and across time, and thus might serve as valuable tools for understanding SRL, (2) differences in patterns of SRL might be affected by interactions between what individuals bring to contexts and the layers of context in which they are working, and (3) analyzing our data to create item profiles captures the complexity and situatedness of SRL by providing a rich description of SRL in context. Note that the data we have presented so far also suggests how emotions (before, during, and after a task), motivation (i.e., self-perceptions of competence and control, perceptions of task value, personal objectives), cognition (i.e., cognitive strategy use), and self-regulation (i.e., task interpretation, planning, monitoring, self-evaluation, criteria, fix-up strategies, emotion control strategies) are linked and interconnected. In each of the examples that we have presented, aggregated profiles have revealed coherent relationships between and among classes of items that might have been anticipated based on prior theory and research. For example, groups with relatively positive self-perceptions of competence have also reported positive emotional reactions and greater use of cognitive and self-regulated learning strategies. Conversely, as is tellingly indicated in the example of the grade 9/10 Drafting students, groups with lower self-perceptions of competence also report lower engagement in strategic processes, increased worry, and a greater likelihood of giving up in the face of difficulty. An obvious caveat is that our aggregated patterns might not apply to individuals within contexts. But we suggest that data gathered using our questionnaire could also be very informative should we focus attention on in-depth analysis of item profiles for individuals.

Dimensions and Clusters

In addition to item by item analyses, there are clearly more sophisticated approaches to analyzing the data from our questionnaires that can be employed to capture relationships between and among the main features of our model. In this final section, we present results from the *Inquiry Learning* questionnaire as used in a collaborative project conducted at the University of British Columbia (UBC). Our goals in this presentation are to illustrate how creating dimensions across our questionnaire items, combined with cluster analyses, has also understanding about SRL in context.

The data presented in this paper come from a study that was designed to investigate the benefits of a lab-based biology course (Biology 140) on students' self-regulated engagement in learning. Participants were 249 first-year Biology students, some of whom were taking Biology 140 and some of whom who were not, who completed the *Inquiry Learning* questionnaire in large lecture-based Biology courses. When completing the questionnaire, students were asked to

consider a sample inquiry project that involved designing a study to investigate the relationships among competing squirrel populations in a local setting.

A subgoal of the UBC study was also to validate our *Inquiry Learning* questionnaire. Thus, some of the results we present here are preliminary, and will assist us in fine tuning our questionnaire (e.g., adding or deleting items to create maximally robust dimensions). For example, the first analysis we present here come from a series of exploratory factor analyses conducted on the full set of items (see Figures 3-a and 3-b). We present our findings in two ways (simultaneously) to best represent what we found. First, in each figure, we present a set of categories that represent the main features of our model (e.g., in Figure 3-a, these categories are Task Perception, Competence and Control, Emotions Before, During, and After). Then, within each of these broad categories, we present unique dimensions that emerged during our series of factor analyses. We name each dimension based on the items included (e.g., "done before", "know topic", "complexity", etc.), and list the exact questionnaire items included in this dimension. Finally, the numbers in italics represent an estimate of internal reliability for the dimensions we constructed Cronbach's alpha), where applicable.

Our first way of presenting our findings here includes all unique dimensions under each category, no matter how many questionnaire items (i.e., actual questions) are included. We wanted to maintain this representation to preserve the "time frame" referenced within our questionnaire, where we ask students to self-report on their engagement in learning before, during, and after a task. But note that our factor analyses revealed some stable dimensions that cut across our "categories" or across "time" (these are marked with an asterisk in each figure). For example, we found a very stable "stress/worry" dimension that included questions related to students' self-reported emotional reactions before, during, and after task completion. Although we clearly need to make some modifications to our questionnaire based on these findings (e.g., adding additional items to flesh out some dimensions), we were encouraged to find that items largely converged as expected within dimensions well matched to our theoretical framework.

Of particular interest to us was the break down of dimensions depicted in Figure 3-b. This figure shows stability in dimensions we found across different categories. For example, we found that task interpretation items clustered into three categories: (1) inquiry items focused on creating methods for generating new knowledge about the topic, (2) learning items focused on learning from reading, and (3) one memory item focused on remembering what was learned. These distinct categories were stable in that they re-emerged as unique dimensions for monitoring/fix-up strategies and as subtypes of self-evaluation criteria. Similarly, items related to planning broke down into three categories: (1) inquiry items as above, (2) task management items, focused on managing material, time, and resources, and (3) asking for help. These latter two dimensions appear again in later categories (e.g., monitoring/fix-up, emotion control, criteria). As was the case with Figure 3-a, several types of items hung together in stable "cross-category" dimensions (an external focus on obtaining good marks or pleasing/impressing others, memory strategies, and asking for help). These findings are consistent with our characterization of *Inquiry Learning* as subsuming but going beyond *Reading to Learn.* And as noted above, the breakdown of dimensions was generally very robust and consonant with our theoretical perspectives.

Another finding of particular interest was that "memory" stood out as a unique dimension for university students responding to the *Inquiry Learning* questionnaire. In similar factor analyses of our *Reading to Learn* questionnaire versions, we have found that a focus on memory is highly related to a focus on learning, at least for younger students (see Tables 2 to 5 for examples of this connection). However, at least in this context at the postsecondary level, we found meaningful distinctions between different learning foci (inquiry, learning through reading, memory foci). This finding suggests that questionnaire items might relate to each other differently depending on the age of respondents and on the contexts in which our data are collected.

Because our dimensions appeared to provide a good, initial representation of key features of SRL in context, we did some additional analyses to explore whether we could find unique SRL "profiles" for students that cut across our different dimensions. To examine this question, we conducted a cluster analysis, identifying groups of students who had responded similarly to the questionnaire. As an input into the cluster analysis, we included individuals' scores on the 47 dimensions we identified using our factor analyses (see Figures 3-a and 3-b). This cluster analysis yielded two possible solutions, with four and eight clusters, respectively. In the rest of this section, we describe the different SRL profiles we found, for the four and eight cluster solutions in turn. We present these findings to illustrate how: (1) creating SRL profiles has the potential to show the interconnections among all the features in our SRL in context model, and (2) how creating SRL profiles has the potential to illuminate the meaning of responses in context.

We focus attention first on the four cluster solution, and present data to show how the four SRL profiles we found differed across the four clusters of students. To describe differences between the groups (i.e., clusters), we compared mean scores for each group on each of the 47 dimensions we had identified (see Figures 3-a and 3-b) using one-way ANOVAs and Bonferroni post-hoc analyses. Figure 4 visually represents the findings that emerged. Interpretation of this Figure is easiest if you assemble the three pages into one long continuous Figure. What you'll see, graphically represented, are (1) the dimensions on which a given group was higher than all others (e.g., Cluster 1 was higher than groups 2, 3, and 4 on Criteria: Task Management while Cluster 3 was higher than all others on stress experienced during learning), (2) dimensions on which a given group was lower than all others (e.g., Cluster 3 was lower than groups 1, 2, and 4 on Attributions to effort or methods), (3) dimensions on which two groups were roughly equivalent (i.e., Clusters 1 and 2 were similar in Personal Goals for Learning, but both were higher than Clusters 3 and 4). Note how this Figure depicts the high positive SRL of students in Cluster 1 (whose mean scores were higher than those of students in Clusters 2, 3, and 4 on 13 different dimensions), and the negative SRL profile of students in Cluster 3 (whose mean scores were lower that all three other clusters on 17 different dimensions).

To assist in interpreting the patterns evident in Figure, 4, the bottom row provides a broad characterization of the four groups of students formed in our four-solution cluster analysis. To summarize, Cluster 1 students (n = 10) appeared to have the most positive SRL profile, as might be defined in prior theory and research. These students not only reported using productive cognitive and self-regulating strategies, but they were also excited and challenged by what they perceived as a relatively complex learning task. Students in Cluster 2 (n = 68) appeared to have a moderately positive SRL profile but to experience a bit more stress. Cluster 3 (n = 85) included

the students who reported the lowest use of cognitive and self-regulating strategies, experienced the greatest amount of stress, were least likely to recognize the task as something they had done before, and had the lowest self-perceptions of competence and of task value. These students were clearly at-risk for disengaging in learning. Finally, students in Cluster 4 might be best described as indifferent. These students reported moderate to low use of cognitive and self-regulating strategies, and were generally relaxed and/or neutral while participating in learning. Overall, these findings were consonant with what one might expect given prior research and theory (providing good empirical support for our questionnaire validation). Note also how constructing SRL profiles reveals how emotions, motivation, cognition, and self-regulation are intertwined in students' reactions to and engagement in academic work.

In our next set of analyses, in preparation for examining in our 8 cluster solution, we decided to find a simpler way of examining differences across clusters. So, we conducted another "cluster analysis," but this one on our set of 47 dimensions (*not* on individual cases). This analysis was designed to collapse the set of 47 dimensions into larger categories, and looked at how responses to different dimensions were related. This different kind of cluster analysis yielded 13 unique *mega-dimensions* (see Table 6). This analysis was interesting in and of itself, because it provided another perspective on how our 47 dimensions were related to one another (findings where are consistent with patterns of relationships observed in correlations). For example, two "positive SRL" profiles were observed that linked motivation, personal goals, task interpretation, cognitive strategies, self-regulating strategies, and criteria together. Note, however, that emotions formed their own unique mega-dimensions.

But we also constructed these mega-dimensions to provide broader, more global categories on which to contrast our eight cluster solution (i.e., where we found 8 unique SRL profiles). We had found it difficult to represent and synthesize patterns in the 8 group cluster solution across all 47 initial dimensions. But when we looked for group differences across individuals in our 8 cluster solution in light of just these 13 new clusters, some more nuanced differences in SRL profiles emerged. Table 7 describes 8 unique SRL profiles that emerged from our cluster analysis on cases (in fact the best solution, statistically speaking). This table compares mean scores across groups on our new *mega-dimensions*. Columns list for each cluster: (1) any mega-dimension scores that were the highest among all 8 clusters (e.g., Cluster 1 students were highest on the two positive SRL mega-dimensions), (2) scores that were the next highest (e.g., Cluster 1 students had the second highest scores on perceptions of task complexity), (3) scores that were the very lowest across all 8 clusters (e.g., Cluster 1 students were lowest on negative motivation/give up), (4) scores that were the next lowest (e.g., Cluster 1 students had the second lowest scores on being stressed), and (5) anything in between (e.g., Cluster 1 students' scores were in the middle of the pack on 6 mega-dimensions, including getting help and focusing on memory). This representational strategy allows for observing patterns across clusters (by virtue of their relative standing on the 13 mega-dimensions). As we did in Figure 4, the bottom of this Table presents our snapshot overview of what the patterns in each column might mean.

We present this final example of a data analysis strategy to show, again, how the various features of SRL in context are interrelated (e.g., SRL connected to perceptions about tasks connected to emotions, etc.). However, this analysis also reveals how the meaning of any given response is best interpreted within the context of an SRL profile. Consider, for example, that

students in Cluster 1 perceived the Inquiry Learning task given to be quite complex. But these students were also very excited, confident in their abilities, and reported using productive cognitive and self-regulating strategies. In contrast, the students in Cluster 3 also perceived the task to be very complex. However, these students were the most highly stressed, only moderately high in SRL, and more likely to ask for help. It is possible to hypothesize from these patterns that how students responded to the complexity of a task varied, and that the meaning of high ratings of complexity was different for students with varying SRL profiles.

Implications and Conclusions

We have made the case in this paper that self-reports have an important role to play in understanding SRL in context. While not the best indicators of actual behaviour, self-reports provide important information about how students think about their engagement in learning. At the same time, we have emphasized throughout this paper that understanding SRL requires use of a combination of complementary tools (in the same study, ideally). We have given examples of how supplementing self-report tools with other assessment strategies has the potential to give a richer picture of SRL.

Throughout this paper we have also underlined the importance of documenting and analyzing the contexts in which data are gathered for understanding SRL. The data we have presented here show how sensitive students' responses are to the contexts in which they find themselves, at multiple levels. Thus, our approach has been to collect data that is situated in context, and to be sensitive to multiple layers of context when aggregating data. This approach supports our finding the "general" in the particular (Merriam, 1998), with sensitivity to the multiple variables that impact SRL. At the same time, our questionnaires also allow us to look at the SRL profiles of individuals. Thus, we have the opportunity to use these tools to do some fine grained analysis of students' perspectives as they vary across contexts (e.g., whether students shift their self-reports of strategy use in tandem with changes in features of classroom environments, task complexity or type, domains, etc.).

Based on the results that we have gathered to date, across projects in BC and Quebec, it appears to us that our questionnaires have great potential both for research and for practice. For example, we are finding that our questionnaires are sensitive enough to capture differences in self-reports across contexts and time (e.g., students studying science in a Science or Fine Arts Academy; changes in perspectives of the same set of students between elementary and secondary school). Thus we can imagine using our questionnaires in research seeking to track shifts in SRL (e.g., research on relationships between features of context and SRL profiles, or on the effects of intervention on SRL). But we are also finding that results from our questionnaires are very informative for teachers. We have established a strategy for presenting findings in aggregated form to participating teachers (in frequency charts such as those in Figures 2-a and 2-b). Feedback from teachers suggests that they find the results very meaningful and interpretable within the contexts in which they are working. Thus, in addition to using the tool in future research, we also hope to develop supports that will allow teachers to use versions of the questionnaires to create individual or class profiles and interpret implications for practice.

In our future research, our plan is to incorporate our questionnaires into our methodological tool bag while at the same time employing a variety of assessment approaches to better understand SRL in context. We can continue to conduct large-scale studies within which our questionnaires have proven to be both informative and practical. However, we also hope to conduct smaller, more in-depth studies (i.e., separate studies or subsamples within larger-scale projects) in which we explore SRL using complementary assessment tools. We have constructed our questionnaires to be flexible enough to be done in multiple formats, such as all at once in a whole class or in sections as students work through tasks. This latter option is ideal for collecting multiple forms of data to link self-reports, behaviour, and performance. We can also collaborate with other researchers (e.g., Winne, Hadwin, Nesbit, Kumar, & Beaudoin, 2004; Hadwin et al., 2005) to trace SRL on-line in combination with doing our self-report questionnaire. A Differential Item Functioning (DIF) analysis of an on-line versus paper administration of our *Inquiry Learning* questionnaire showed no differences in responding (Gagnon & Butler, 2005). This is a promising finding should we wish to couple on-line traces of student learning with self-reports obtained using an on-line version of our questionnaires.

In sum, our goal in this paper has been to enhance understanding about how to assess SRL as a complex, situated, and dynamic process describing individual learning in context. Methodologically speaking, what is essential is that assessment tools build from theoretical perspectives well matched with the constructs under study. SRL has posed a challenge in that respect, given the complexity of the process. Our hope is that this and other related research, like that presented in the AERA symposium of which this paper was a part, will provide strategies and tools for not only better assessing SRL, but for further advancing understanding regarding this fundamental learning process.

References

American Psychological Association (1997). Learner-Centered Psychological Principles : A framework for School Redesign and Reform.

Aulls, M. (2005, April). Qualitative approaches to understanding dynamic learning processes as situated in context. Paper presented at the annual meetings of the American Educational Research Assocation. Montreal, QC.

Bereiter, C. (1994). Implications of postmodernism for science, or, science as progressive discourse. *Educational Psychologist, 29(1),* 3-12.

Boekaerts, M., & Corno, L. (in press). Self-regulation in the classroom: A perspective on assessment and intervention. International Journal of Applied Psychology.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18, 1,* 32-42.

Butler, D. L. (1995). Promoting strategic learning by post secondary students with learning disabilities. *Journal of Learning Disabilities, 28*, 170-190.

Butler, D. L. (1998). The Strategic Content Learning approach to promoting self-regulated learning: A summary of three studies. *Journal of Educational Psychology, 90*, 682-697.

Butler, D. L. (2002). Individualizing instruction in self-regulated learning. *Theory into Practice, 41*, 81-92.

Butler, D. L., & Cartier, S. C. (2004). *Results from the Reading to Learn Questionnaire*. Technical report submitted to 3 different Secondary School in an urban school district in Western Canada.

Butler, D. L., & Cartier, S. (2004). Promoting students' active and productive interpretation of academic work: A Key to successful teaching and learning. *Teachers College Record*, *106,* 1729-1758.

Butler, D. L., & Winne, P. H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research, 65*, 245-281.

Butler, D. L., Novak Lauscher, H. J., Jarvis-Selinger, S., & Beckingham, B. (2004). Collaboration and Self-Regulation in Teachers' Professional Development. *Teaching and Teacher Education, 20,* 435-455.

Campione, J. C., Brown, A. L., & Connell, M. L. (1988). Metacognition: On the importance of understanding what you are doing. In R. I. Charles & E. A. Silver (Eds.), *The teaching and assessing of mathematical problem solving*, Vol. 3 (pp. 93-114). Hillsdale, NJ: Erlbaum.

Cartier, S. (1997). *Lire pour apprendre: Description des stratégies utilisées par des étudiants en médecine dans un curriculum d'apprentissage par problèmes.* Unpublished doctoral dissertation. Montréal : Université de Montréal.

Cartier, S. (2000). La lecture pour apprendre à l'ordre universitaire : proposition d'un cadre de référence. *Res academica, 18*(1 and 2), 91-104.

Cartier, S. (2002). Étude de l'apprentissage par la lecture d'étudiants en contexte d'apprentissage par la lecture. *Revue canadienne de l'enseignement supérieur, 32*(1), 1-29.

Cartier, S. C., Janosz, M., Butler, D. L., Archambault, I. & Touchette, D. (2004). *« Lire pour apprendre » Résultats au questionnaire d'enquête*, 72 separate reports submitted to francophone schools in Quebec from a major project sponsored by the Ministry of Education in Quebec.

Cartier, S., Beaudry, D., & Hébert, C. (2002). *Lire pour apprendre : stratégies d'élèves ayant des difficultés d'apprentissage.* Rapport de recherche interne, Université de Montréal.

Cartier, S., Chouinard, R., Théorêt, M., Van Grunderbeeck, N. & Garon, R. (2001, May). *Les difficultés éprouvées par les élèves de milieux populaires lorsqu'ils lisent pour apprendre :*

pistes pour les sciences humaines. Congrès de l'Association canadienne française pour l'avancement de la science (ACFAS). Sherbrooke, QC.

Corno, L. (1994). Student volition and education: Outcomes, influences, and practices. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulation of learning and performance: Issues and educational applications* (pp. 229-251). Hillsdale, NJ: Erlbaum.

Gagnon, F., & Butler, D. L. (2005, April). Comparability of Online and Paper-based Assessments: Differential Cognitive Processing in Varying Contexts. Paper presented at the annual meetings of the American Educational Research Association. Montreal, QC.

Hadwin, A. F., Nesbit, J. C., Winne, P. H., Kumar, V. (2005, April). Tracing self-regulated learning in an e-learning environment. Paper presented at the Annual Meeting of the American Educational Research Association. Montreal, QC.

Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education.* San Francisco: Jossey-Bass.

Perry, N. E., & Winne, P. H. (2005, April). Tasks that Extend Opportunities for Self-Regulated Learning: A Lifecycles Learning Kit for Grade 1 Students. Paper presented at the Annual Meetings of the American Educational Research Association. Montreal, QC.

Pintrich, P.R., & Garcia, T. (1994). Self-regulated learning in college students: Knowledge, strategies, and motivation. In P.R. Pintrich, D.R. Brown & C.E. Weinstein (Eds.), *Student motivation, cognition, and learning* (pp.113-133). Hillsdale, NJ: Erlbaum

Salomon, G., & Perkins, D. E. (1989). Rocky roads to transfer: Rethinking mechanisms of a neglected phenomenon. *Educational Psychologist, 24*, 113-142.

Schoenfeld, A. H. (1988). Problem solving in context(s). In R. I. Charles & E. A. Silver (Eds.), *The teaching and assessing of mathematical problem solving*, Vol. 3 (pp. 82-92). Hillsdale, NJ: Erlbaum.

Stone, C. A. (1998). The metaphor of scaffolding: Its utility for the field of LD. *Journal of Learning Disabilities*, *31*, 344-364.

Wang, M., Haertel, G., & Walberg, H. (1993). Toward a knowledge base for school learning. *Review of Educational Research, 63*, 249-294.

Weinstein, C. E., & Palmer, D. R. (1990). *Learning and Study Strategies Inventory – High School Version (LASSI-HS).* Clearwater (FL): H & H Publishing Company, Inc.

Weinstein, C. E., Husman, J., & Dierking, D. R. (2000). Self-regulation interventions with a focus on learning strategies. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), Handbook of Self-Regulation. (pp. 727-747). San Diego, CA: Academic Press.

Weinstein, C.E. (1988). Assessment and training of student learning strategies. In R.R. Schmeck (Ed.) *Learning strategies and learning styles* (pp. 291-316). New York: Plenum Press.

Winne, P. H., & Marx, R. W. (1982). Students' and teachers' views of thinking processes for classroom learning. *Elementary School Journal*, *82*, 493-518.

Winne, P. H., & Perry, N. E. (2000). Measuring self-regulated learning. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (531-566). Orlando, FL: Academic Press.

Winne, P. H., Hadwin, A. F., Nesbit, J. C., Kumar, V., & Beaudoin, L. (2004). *gSTUDY: A toolkit for developing computer-supported tutorials and researching learning strategies and instruction* (version 1.0). Simon Fraser University, Burnaby, BC.

Zimmerman, B. J. (1990). Self-regulating and academic achievement: An overview. *Educational Psychologist*, *25*, 3-17.

Zimmerman, B. J. (1994). Dimensions of academic self-regulation: A conceptual framework for education. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulation of learning and performance: Issues and educational applications* (pp. 3-21). Hillsdale, NJ: Erlbaum.

Zimmerman, B. J. (2000). Attaining self-regulation: a social cognitive perspective. In M. Boekaerts and P. R. Pintrich (Eds.). Handbook of self-regulation (pp. 13-39). New York: Academic Press.

Zimmerman, B. J., & Martinez-Pons, M. (1986). Development of a Structured Interview for Assessing Student Use of Self-Regulated Learning Strategies. *American Educational Research Journal, 23*(4), 614-628.

Zimmerman, B. J., & Schunk, D. H. (2001) (Eds.). *Self-regulated learning and academic achievement: Theoretical perspectives* (2nd Ed.). Hillsdale, NJ: Erlbaum.

Figure 1. Self-Regulated Learning in Context

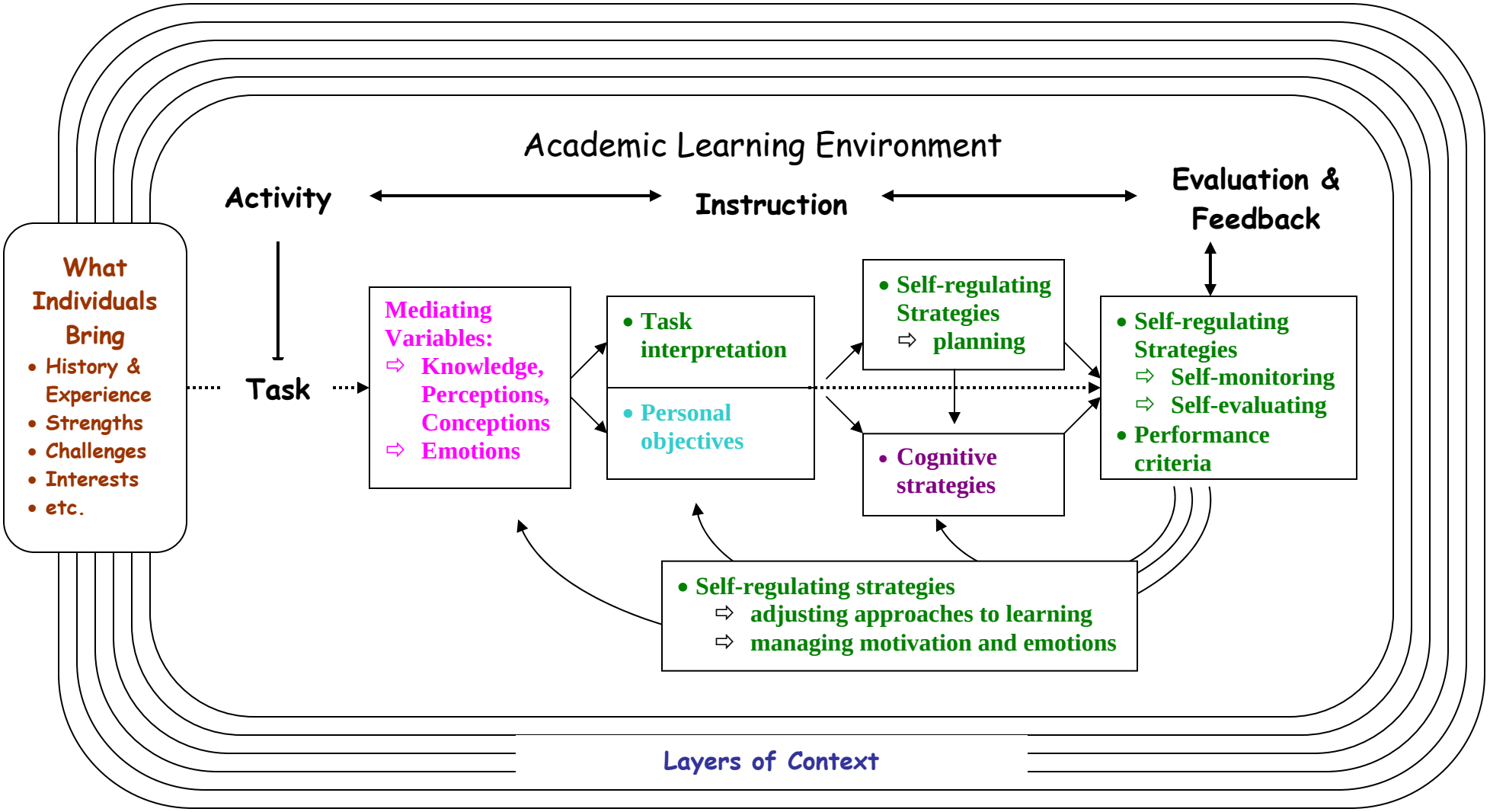
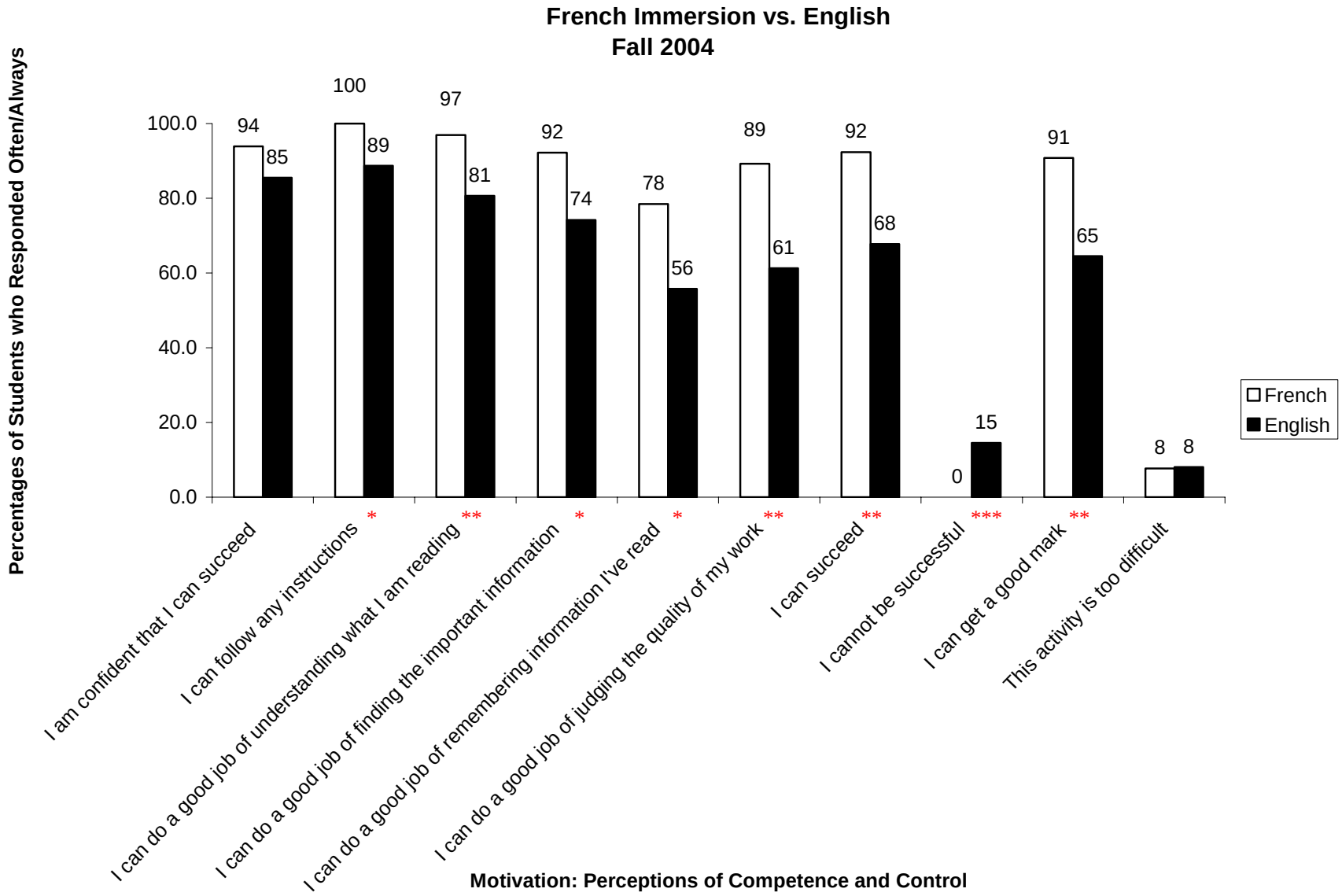


Table 1. SRL as a complex, situated, dynamic process capturing individual learning in context.

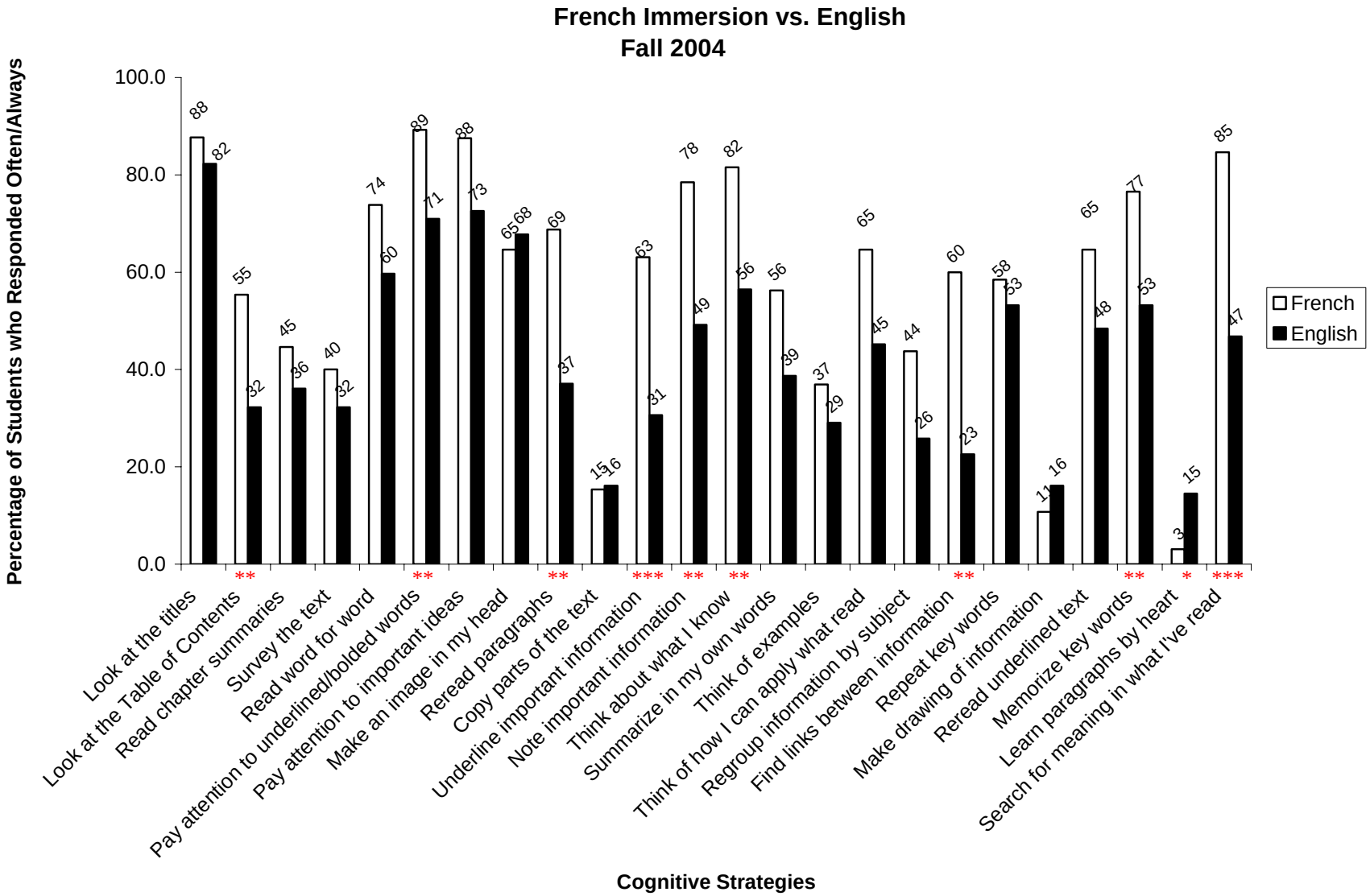
SRL Quality	How so?	Implications for Assessment	Contributions of our SRL Questionnaires	Contributions of Other Complementary Tools
Complex	• SRL encompasses dynamic cycles of cognitive and self-regulating activity • SRL is impacted by multiple factors, including individuals' knowledge, perceptions, conceptions, and emotions	• need multi-componential profiles of student learning to understand SRL • need to capture interrelationships among SRL activities and multiple related factors	• Capture students' knowledge, perceptions, conceptions, and self-awareness of emotions • Capture students' metacognitive self-awareness about SRL and cognitive processes	• Interviews assess prior knowledge, perceptions, conceptions, self-awareness of emotions and of SRL and cognitive processes • "Traces" and observations track observable behaviours • Think alouds or stimulated recall link perceptions with actions
Situated	• SRL is situated in multiple interacting layers of context • The meaning of SRL activities (e.g., help seeking) depends on an individual's contextualized learning profile	• need to understand impact of multiple layers of context • need to interpret findings in light of contexts • aggregated data should reveal the "general in the particular" • need to define meaning of components in context	• Responses are situated in specific domains, topics, and tasks • Interpretation of results is contextualized • Data can be aggregated in light of contexts in which they were gathered • Meaning of components can be interpreted within SRL profiles	• Documents (e.g., lesson plans) offer insight into contexts • Observations capture features of schools, programs, classrooms • Other questionnaires capture features of environments (e.g., evaluation practices)
Dynamic Process	• SRL plays out as an event over time, in cycles of activity • Processes are overt & covert • Processes are deliberate & automatic • SRL in context evolves over time and dynamically during learning	• need to assess overt & covert, automatic & deliberate processes • need to understand how learners consciously-mediate learning • need to understand how SRL evolves within and across learning episodes	• Assess self-awareness of SRL and cognitive processes before, during, and after a task • Assess linkages between components • Can be done in chunks in tandem with doing the tasks • Can be done to track changes within or across episodes	• "Traces" track tactics and strategies assembled into events • Observations record behaviour • Think alouds surface unobservable processes • Interviews capture students' self-awareness of SRL and cognitive processes
Individual in Context	• SRL is impacted by interactions between what individuals bring to learning and the contexts in which they learn • Contexts delimit opportunities and provide language and tools for making sense of experience • SRL is dependent on how individuals focus on and interpret features of contexts	• need to understand what learners bring to contexts and how those interact within context • need to understand what contexts do and do not afford • need to understand students' perceptions of environments	• Assess knowledge, perceptions, conceptions, emotions shaped by what individuals bring to context • Assess students' interpretation of tasks • Interpretation builds up from contextualized descriptions of individuals' SRL	• Documents offer insights into individual strengths/challenges • Interviews & stimulated recall link behaviour to perceptions, conceptions, intentions • Observations trace individual reactions in context • Performance-based assessments track how learners engage in particular tasks within context

Figure 2-a. Sample “item profiles” for perceptions of competence and control for students in Humanities 8, in French Immersion (N = 65) or in English (N = 37) programs.



* p < .05, ** p < .01, *** p. < .001

Figure 2-b. Sample “item profiles” for cognitive strategy use for students in Humanities 8, in French Immersion (N = 65) or in English (N = 37) programs.



* p < .05, ** p < .01, *** p. < .001

Table 2. Percentage of students who gave the top two responses: Humanities 8 French Immersion (n = 65) vs. English Language (n = 37).

Item	French Immersion	English	Chi-square (df = 1)	p value <
Self-Competence: I can follow instructions	100%	89%	5.430	.05
Self-Competence: I can understand what I read	97%	81%	7.355	.01
Self-Competence: I can find the important information	92%	74%	5.354	.05
Self-Competence: I can remember information read	78%	56%	4.586	.05
Self-Competence: I can judge the quality of my work	89%	61%	7.300	.01
Self-Competence: I cannot be successful	0%	15%	13.203	.001
Self-Competence: I can succeed	92%	68%	7.027	.01
Self-Competence: I can get a good mark	91%	65%	8.734	.01
Attributions: I will succeed if the activity is easy	15%	40%	9.635	.05
Attributions: I will succeed because I'm good at reading	71%	48%	4.936	.05
Attributions: I will succeed if I am lucky	12%	29%	4.722	.05
The task is important	80%	58%	7.645	.01
Emotions beginning: happy	52%	23%	10.935	.001
Emotions beginning: relaxed	56%	26%	8.073	.01
Personal Goals: Finish as quickly as possible	11%	29%	5.833	.05
Personal Goals: Read as little as possible	1.5%	16%	6.107	.05
Personal Goals: Please or impress other people	8%	23%	7.027	.01
Planning: Plan my time	31%	16%	5.22	.05
Planning: Choose a method	55%	32%	6.246	.05
Planning: Ask someone how to do the activity	17%	36%	4.346	.05
Strategies: Look at the table of contents	55%	32%	7.658	.01
Strategies: Pay attention to bold or underlined words	89%	71%	7.300	.01
Strategies: Reread paragraphs in the text	69%	37%	7.681	.01
Strategies: Underline important information	63%	31%	12.257	.001
Strategies: take notes on important ideas	78%	49%	8.671	.01
Strategies: Think about what I already know	82%	56%	8.753	.01
Strategies: Find links between information	60%	23%	8.645	.01
Strategies: Memorize key words, details, facts	77%	53%	6.774	.01
Strategies: Learn paragraphs by heart	3%	15%	5.632	.05
Strategies: Search for meaning of what I am reading	85%	47%	13.100	.001
Monitoring: Check to make sure I have completed all readings	89%	66%	8.88	.01
Monitoring: Identify what I do and don't understand	86%	55%	12.792	.001
Monitoring: Check if can describe main topics	72%	45%	6.717	.01
Monitoring: Check that I have found all important information	88%	60%	7.515	.01
Monitoring: Ask myself if I am concentrating well	66%	44%	9.163	.01
Fix-up: Read more slowly	85%	60%	5.266	.05
Fix-up: Try to memorize information	20%	39%	3.855	.05
Fix-up: Look back at introduction or summary	68%	48%	4.638	.05
Fix-up: Pay attention to words I don't know	82%	48%	13.873	.001
Fix-up: Look at titles, subtitles, etc.	91%	68%	7.134	.01

Item	French Immersion	English	Chi-square (df = 1)	p value <
Fix-up: Try to use my time better	75%	52%	3.80	.051
Fix-up: Try to use better methods	75%	44%	8.948	.01
Self-assessing: Assure myself I've done a good job	82%	53%	8.753	.01
Self-assessing: Compare with other students	29%	52%	3.846	.05
Criteria: Ask myself if I've learned everything	66%	27%	12.556	.001
Criteria: Think about how I could do better next time	62%	40%	6.585	.01
Criteria: Did my best	97%	82%	4.018	.05
Criteria: Found important ideas or themes	86%	58%	9.338	.01
Criteria: Concentrated well on my work	85%	73%	4.051	.05
Criteria: Read all the texts	86%	60%	10.425	.001
Criteria: Better understood the subject	92%	74%	7.107	.01
Criteria: Got a general idea about the subject	92%	72%	7.017	.01
Criteria: Understood what I read	92%	74%	6.845	.01
Criteria: Memorized information	16%	46%	6.608	.01
Criteria: Pleased or impressed someone	14%	47%	14.673	.001

Table 3. Percentage of students who gave the top two responses: Humanities 8 (n = 102) vs. Information Technology 9/10 (n = 25).

Item	Humanities Grade 8	Information Technology Grades 9/10	Chi-square (df = 1)	p value <
How complicated is this?	8%	24%	5.344	.05
Self-Competence: Do I know how to do this?	88%	68%	6.197	.05
Self-Competence: I can follow instructions	97%	84%	6.575	.01
Self-Competence: I can judge the quality of my work	81%	52%	9.388	.01
Self-Competence: I can succeed	85%	60%	8.125	.01
Self-Competence: I can get a good mark	82%	60%	5.837	.05
Emotions beginning: relaxed	46%	24%	3.838	.05
Task Interpretation: Find main ideas or themes	89%	72%	4.892	.05
Task Interpretation: Memorize information	34%	64%	7.363	.01
Personal Goal: Learn about the subject	93%	72%	9.146	.01
Personal Goal: Read as little as possible	6%	20%	5.058	.05
Planning: Think about the instructions	78%	52%	6.515	.05
Strategies: Pay attention to important ideas or themes	84%	64%	5.12	.05
Strategies: Reread paragraphs in the text	58%	32%	5.616	.05
Strategies: Regroup information by theme or subject	42%	8%	9.946	.01
Strategies: Find links between information	49%	12%	11.316	.001
Strategies: Search for meaning of what I am reading	73%	40%	9.499	.01
Monitoring: Check now and then to see if going well	78%	52%	6.515	.05
Monitoring: Check I have found the important information	79%	52%	7.845	.001
Monitoring: Ask myself if others are pleased or impressed	15%	40%	8.125	.01
Monitoring: Just think about when I'll be finished	44%	68%	4.791	.05
Monitoring: Check whether I can apply what I am reading	61%	28%	8.698	.01
Fix-up: Ask for help	78%	56%	5.253	.05
Fix-up: Stop working and give up	4%	16%	4.963	.05
Fix-up: Read more slowly	78%	52%	6.515	.05
Fix-up: Look at titles, subtitles, etc.	83%	64%	4.610	.05
Fix-up: Try to use my time better	69%	44%	5.272	.05
Fix-up: Try to use better methods for working	65%	40%	5.10	.05
Emotions during: worried	14%	36%	6.158	.05
Emotions during: relaxed	47%	20%	5.016	.05
Criteria: Ask myself if I've learning everything needed	53%	24%	6.748	.01
Criteria: Did my best	93%	76%	6.418	.05
Criteria: Memorized information	24%	56%	9.471	.05
Criteria: Found important ideas, themes	77%	56%	4.215	.05
Criteria: Did as little as possible	4%	16%	4.963	.05
Emotions after: proud	69%	40%	7.425	.01

Table 4. Percentage of students who gave the top two responses: Grade 7 Science in the Visual and Fine Arts Academy (n = 23) vs. the Science Academy (n = 20).

Item	Science Academy	Visual and Fine Arts Academy	Chi-square (df = 1)	p value <
Self-Competence: Find the important information	85%	52%	5.25	.05
Attributions: I will succeed because I'm good at reading	80%	48%	4.74	.05
Task Interpretation: Find information that interests me most	55%	9%	10.874	.001
Planning: Plan my time	65%	22%	8.226	.01
Planning: Choose a method for completing the activity	70%	26%	8.292	.01
Strategies: Look at the Table of Contents	60%	23%	6.041	.05
Strategies: Read chapter summary	79%	48%	4.273	.05
Strategies: Pay attention to underlined or bold words	95%	70%	4.570	.05
Monitoring: Just think about when I will be finished	74%	30%	7.785	.01
Fix-up: Reread information	100%	65%	7.779	.01
Emotions during: worried	0%	26%	5.195	.05
Emotion control: Take a deep breath to calm myself down	80%	39%	7.342	.01
Criteria: Asked myself if I've learned everything I needed to learn	74%	39%	5.015	.05
Criteria: Saw how everything fit together	74%	35%	6.313	.05
Criteria: Used good methods for working	90%	57%	5.536	.05

Notes: With the small n, differences had to be very large to be statistically reliable. Many trends were observed towards differences between these groups.

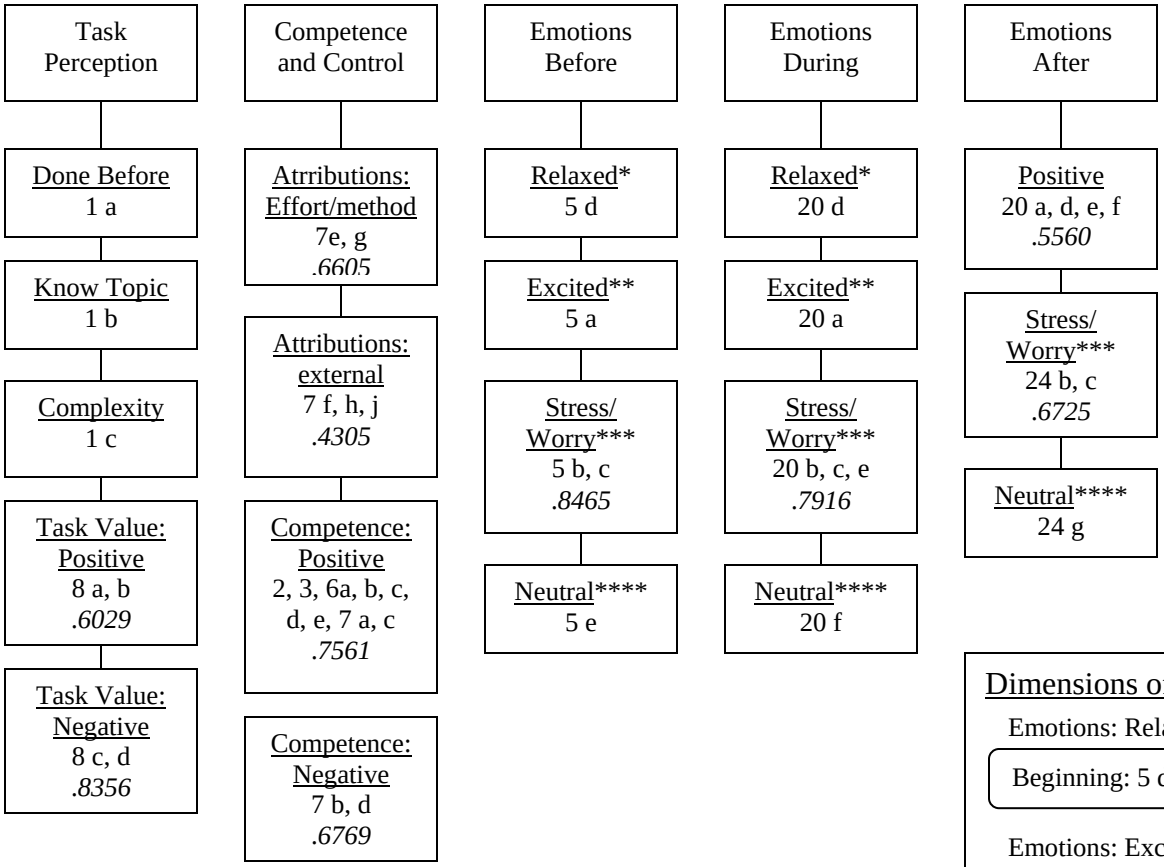
Table 5. SRL profiles of 985 students in Quebec between the end of primary school and the end of the first year of secondary school.

	Primary	Secondary	Difference[1]	Chi-square (df = 1)	p value <
	%	%			
Task Interpretation: just read the text	34	21	12.5	14.795	.01
Task Interpretation: remember important details & facts	66	59	7.5	20.638	.001
Task Interpretation: Find interesting information	31	22	8.8	31.48	.001
Task Interpretation: Apply what I read	47	40.2	6.8	20.144	.001
Task Interpretation: Memorize information	61.7	49.3	12.4	20.77	.001
Personal Goals: Finish as quickly as possible	14.9	20.4	5.5	37.565	.001
Personal Goals: Work with friends	50.3	64	13.7	53.242	.001
Personal Goals: Do a good job	82.2	77.2	5	22.776	.001
Personal Goals: Learn about the subject	73.8	57	16.8	42.219	.001
Personal Goals: Read as little as possible	11.7	19.6	7.9	50.695	.001
Personal Goals: Please or impress someone	14.4	8.4	6	26.657	.001
Planning: read the text	88.7	78.5	10.2	49.984	.001
Planning: think about the instructions	56.2	48.2	8	20.526	.001
Planning: Choose a method	39.7	31.5	8.2	32.121	.001
Planning: Make a plan	25	15.1	9.9	18.598	.001
Planning: Check the length of the readings	49.1	58.4	9.3	68	.001
Strategies: pay attention to information in the margins	60.7	54.8	5.9	24.349	.001
Strategies: reread paragraphs	46.8	37.8	9	113.298	.001
Strategies: take notes on important ideas	54	40.6	13.4	55.521	.001
Strategies: think about what I already know	54.9	47	7.9	46.718	.001
Strategies: take notes on important ideas	52.4	44.6	7.8	26.589	.001
Strategies: think of how I can apply information	54.5	45.9	8.6	19.77	.001
Strategies: regroup information by theme or subject	35.7	23.7	12	28.009	.001
Strategies: find links between information	49.8	37.8	12	22.04	.001
Strategies: repeat key words, details, facts	50.6	42	8.6	40.511	.001
Strategies: Reread underlined phrases	58.5	48.7	9.8	51.322	.001
Strategies: Memorize key words, details, facts	60.7	54.3	6.4	18.211	.001
Strategies: find key words or explanations of facts	56.4	46.3	10.1	37.433	.001
Monitoring: check to see if work is going well	54.5	46	8.5	31.349	.001
Monitoring: look back at the instructions	72.7	62.5	10.2	41.857	.001
Monitoring: identify what I do and don’t understand	64.5	56.1	8.4	33.145	.001
Monitoring: check if I can describe the main topic	54.3	48.8	5.5	51.011	.001

Monitoring: Check what I can remember	62	48.1	13.9	34.831	.001
Monitoring: Check that my learning is going well	60.5	46.7	13.8	32.307	.001
Monitoring: Check that I can apply what I am reading	51.4	41.6	9.8	61.995	.001
Fix-up: Reread information in the text	77.5	72	5.5	38.678	.001
Fix-up: Try to memorize information	57.4	43.7	13.7	56.996	.001
Fix-up: Pay attention to words I don't know	69.3	61.3	8	45.205	.001
Fix-up: Review the instructions	64.2	54.7	9.5	38.363	.001
Fix-up: Try to use my time better	53.4	46.6	6.8	53.85	.001
Fix-up: Try to use better methods	64.2	57.4	6.8	50.676	.001
Fix-up: Assure myself that I've done a good job	74.2	68.4	5.8	32.116	.001
Fix-up: Ask myself if I've learned everything	51.2	35.2	16	28.856	.001
Fix-up: Think about how I could improve my method	54.3	42.6	11.7	31.703	.001
Criteria: Succeeded in reading all the text	73.6	61.9	11.7	29.736	.001
Criteria: Remembered important details and facts	57.5	46.6	10.9	28.341	.001
Criteria: Understood the subject	76.1	67.6	8.5	18.578	.001
Criteria: Found information that was interesting	66.1	53.6	12.5	20.546	.001
Criteria: Saw how information fit together	49.5	41	8.5	22.997	.001
Criteria: Could apply what I've read	48.1	37.8	10.3	32.766	.001
Criteria: Memorized information	56.4	43.2	13.2	45.236	.001
Criteria: Used good methods	78.5	71.6	6.9	13.955	.01
Criteria: Pleased or impressed someone	25.2	19	6.2	48.274	.001
Criteria: Learned what I needed to	76.8	65	11.8	31.452	.001

[1] Most of the primary-secondary item by item comparisons were statistically reliable, given the large sample size. This table just reports those that appeared to be practically significant, where there was at least a 5 point percentage difference between scores at the two different levels.

Figure 3-a. Inquiry Learning Questionnaire Dimensions: Motivational Beliefs and Emotions.



Dimensions of items combined across categories

Emotions: Relaxed (*.6592*)*

Beginning: 5 d	Middle: 20 d

Emotions: Excited (*.8160*)**

Beginning: 5 a	Middle: 20 a

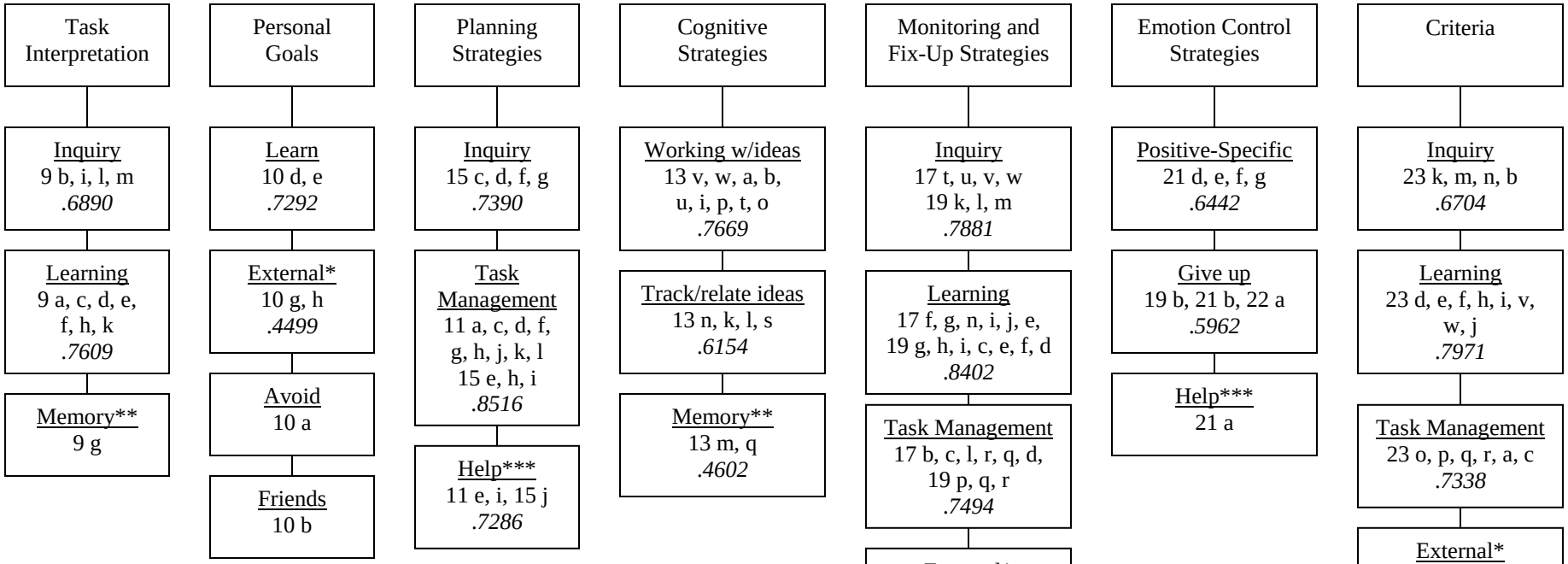
Emotions: Stress/Worry (*.8312*)***

Beginning: 5 b, c	Middle: 20 b, c, e	End: 24 b, c

Emotions: Neutral (*.7884*)***

Beginning: 5 e	Middle: 20 f	End: 24 g

Figure 3-b. Inquiry Learning Questionnaire Dimensions: Task Interpretation, Personal Goals, Strategies, and Criteria.



Dimensions of items combined across categories

External* (*.6982*)

PG: 10 g, h	Mon: 17 m, o	Crit: 23 s, t

Memory** (*.7184*)

TI: 9 g	Strat: 13 m, q	Mon/FU : 17 h 19 j	Crit: 23 g

Help*** (*.7636*)

Plan: 11 e, i, 15 j	Mon/FU/EC: 17 s, 19 a, o, s, 21 a

Figure 4. Four Clusters of Cases based on *Dimensions* from the Inquiry Learning Questionnaire.

	Cluster 1 N = 10			Cluster 2 N = 68			Cluster 3 N = 85			Cluster 4 N = 86		
	Mean	Item	Compared	Mean	Item	Compared	Mean	Item	Compared	Mean	Item	Compared
Highest	3.77	Crit:TM	>2,3,4				3.05	Emotdurstr	>1,2,4			
	3.68	Plan:TM	>2,3,4				3.01	emotbegstr	>1,2,4			
	3.65	pos taskval	>2,3,4				2.03	neg comp	>1,2,4			
	3.64	Strat:w/ideas	>2,3,4									
	3.63	Crit:inquiry	>2,3,4									
	3.60	EC:help	>2,3,4									
	3.50	Mon:TM	>2,3,4									
	3.50	Emotbegexc	>2,3,4									
	3.43	Plan:inquiry	>2,3,4									
	3.40	Emotdurexc	>2,3,4									
	3.31	pos comp	>2,3,4									
	3.27	Mon:inquiry	>2,3,4									
	3.15	Strat:mem	>2,3,4									
	3.90	atts:eff/mth	>3,4				1.88	neg task val	>1,2			
	3.65	PG:learn	>3,4	3.56	PG:learn	>3,4						
	3.60	TI:learn	>3,4	3.39	TI:learn	>3,4						
	3.45	Mon:learn	>3,4	3.17	Mon:learn	>3,4						
	2.90	TI:mem	>3,4	2.54	TI:mem	>3,4						
	3.63	TI:inquiry	>3,4	3.30	TI:inquiry	>3						
	3.45	EC:pos-spec	>3,4	2.99	EC:pos-spec	>3						
	2.80	Mon:mem	>3,4									
	2.90	emotbegrel	>2,3							2.41	emotbegrel	>2,3
	2.50	Emotdurrel	>2,3							2.10	Emotdurrel	>2,3
	2.50	emotbegneu	>2,3							2.81	emotbegneu	>2,3
	2.20	Emotdurneu	>2							2.52	Emotdurneu	>2,3
	2.10	Emotendneu	>2							2.36	Emotendneu	>2,3
	3.36	Crit:learn	>3	3.10	Crit:learn	>3				3.03	Crit:learn	>3
	2.93	Strat:track		2.92	Strat:track	>3						
				3.43	atts: eff/mth	>3				3.34	atts:eff/mth	>3
				1.51	neg comp	<3				1.38	neg comp	<3
	2.70	Complexity	>4	2.43	complexity	>4	2.11	complexity				
	2.70	atts:ext					2.67	atts:ext	>2,4			
										1.62	neg task val	>2
										3.14	TI:inquiry	<1,>3

			3.09	Plan:TM	<1,>3,4						
			2.79	Emotdurexc	<1,>3,4						
			3.07	pos taskval	<1,>3,4						
			2.69	emotbegexc	<1,>3, 4						
			3.03	Crit:inquiry	<1,>3				2.93	Crit:inquiry	<1,>3
			3.10	Crit:TM	<1,>3				3.01	Crit:TM	<1
			2.85	pos comp	<1; >3				2.87	pos comp	>3
			2.76	Plan:inq	<1,>3				2.56	Plan:inq	<1,>3
			3.19	Strat:w/ideas	<1,>3				3.09	Strat w/ideas	<1,>3
			3.11	Mon:TM	<1,>3				2.95	Mon:TM	<1,>3
			2.81	Mon:inquiry	<1,>3				2.62	Mon:inquiry	<1,>3
			2.49	Strat:mem	<1	2.31	Strat:Mem	<1	2.45	Strat:mem	<1
			2.72	EC:help	<1	2.72	EC:help	<1	2.60	EC:Help	<1
			2.26	Mon:mem		2.14	Mon:mem	<1	2.12	Mon:mem	<1
			2.53	Emotdurstr	>1,4, <3						
			2.32	emotbegstr	>1,4; <3						
			1.91	emotbegrel	<1,4; >3						
			1.78	Emotdurrel	<1,4, >3						
									3.00	Mon:learn	<1,2,>3
									3.14	TI:learning	<1,2,>3
									3.00	PG:Learn	<1,2,>3
									2.89	Plan:TM	<1,2,>3
									2.59	pos task val	<1,2,>3
									2.02	Emotdurexc	<1,2,>3
2.77	plan:help		2.44	plan:help		2.64	plan:help	>4			
			2.02	Emotendstr	>4	2.09	Emotendstr	>4			
						2.13	PG:avoid	>2			
						2.63	Strat:track	<2	2.71	Strat:track	
						2.13	TI:mem	<1,2	2.00	TI:mem	<1,2
						2.72	EC:pos-spec	<1,2	2.75	EC:pos-spec	<1,2
						2.92	Crit:TM	<1,2			
						1.80	emotbegexc	<1,2	2.05	emotbegexc	<1,2
									1.88	complexity	<1,2
2.00	PG:avoid		1.74	PG:avoid	<3				1.80	PG:avoid	
			2.33	atts:ext	<3				2.41	atts:ext	<3
									2.28	Plan:help	<3
						1.87	Emotendneu	<4,>2			
			1.66	emotbegneu	<1,4	1.87	emotbegneu	<1,4			
			1.43	Emotdurneu	<1,4	1.69	Emotdurneu	<4			

Lowest	1.25 neg task val <3 1.15 neg comp <3 2.03 Emotdurstr <2,3 1.95 Emotendstr 1.75 emotbegstr <2,3	1.28 neg task val <3,4 1.35 Emotendneu <1,4,3	3.04 atts:eff/mth <1,2,4 2.94 TI:learning <1,2,4 2.80 Mon:TM <1,2,4 2.79 Strat:w/ideas <1,2,4 2.76 Mon:learn <1,2,4 2.76 PG:learn <1,2,4 2.73 Crit:learn <1,2,4 2.71 TI:inquiry <1,2,4 2.70 Crit:inquiry <1,2,4 2.65 Plan:TM <1,2,4 2.45 pos comp <1,2,4 2.33 Mon:inquiry <1,2,4 2.22 pos task val <1,2,4 2.19 Plan:inquiry <1,2,4 1.75 Emotdurexc <1,2,4 1.58 emotbegrel <1,2,4 1.35 Emotdurrel <1,2,4	2.24 Emotdurstr <2,3 1.66 Emotendstr <2,3 1.83 emotbegstr <2,3
<u>Sum</u>	• Highest SRL/Strategy Use • Highest Excited/Relaxed • Least Stress/Negative/Avoid • Highest Complex HIGH SRL MOST POSITIVE PROFILE	• Reasonably Strategic • Somewhat Excited/Lowest Neutral • Some Stress • Higher Complex MODERATE SRL: POSITIVE PROFILE	• Lowest SRL/Strategy Use • Lowest Excited/Relaxed • Lowest Done Before • Highest Stress • Lowest Positive Motivation • Highest Negative Motivation LOWEST SRL: NEGATIVE PROFILE	• Relatively relaxed/neutral • Low stress/excitement • Lower SRL, Lowest help • Lowest complex MODERATE-LOW SRL: INDIFFERENT PROFILE

Table 6. Thirteen *Mega-Dimensions* from the Inquiry Learning Questionnaire.

Cluster	Cluster Dimension Label	Original Component Dimensions		
		Before	During	After
1	Positive SRL 1	Self-competence: positive Attributions: effort/method Personal goals: learning Task interpretation: inquiry Task interpretation: learning Planning: task management	Strategies: working with ideas Monitoring: learning Monitoring: task management	Criteria: inquiry Criteria: learning Criteria: task management
2	Positive SRL 2	Task value: positive Planning: inquiry	Strategies: track ideas Monitoring: inquiry Emotion control: positive-specific	
3	External	Personal goals: external	Monitoring: external	Criteria: external
4	Stress	Emotions before: stress	Emotions during: stress	
5	Help/Social	Attributions: external Personal goals: friends Planning: help	Monitoring: help Emotion control: help	
6	Memory	Task interpretation: memory	Strategies: memory Monitoring: memory	Criteria: memory
7	Excited	Emotions before: excited	Emotions during: excited	
8	Relaxed	Emotions before: relaxed	Emotions during: relaxed	
9	Neutral	Emotions before: neutral	Emotions during: neutral	Emotions after: neutral
10	Avoid	Knowledge about topic Personal goals: avoid		Emotions after: stress
11	Negative motivation, give up	Self-competence: negative Task Value: negative	Emotion control: give up	Criteria: avoid
12	Done before	Done before		
13	Complex	Complicated		

Table 7. Eight Clusters of Cases Based on *Mega-Dimensions* from the Inquiry Learning Questionnaire.

	Cluster One N = 39		Cluster two N = 32		Cluster Three N = 29		Cluster Four N = 35		Cluster Five N = 41		Cluster 6 N =23		Cluster 7 N =19		Cluster 8 N =31	
	Mn.	Dim clust	Mn.	Dim clust	Mn.	Dim clust	Mn.	Dim clust	Mn.	Dim clust	Mn.	Dim clust	Mn.	Dim clust	Mn.	Dim clust
Most High	3.35 3.07 2.87	Pos SRL 1 Pos SRL 2 Excited	2.75	Memory	3.18 2.79	Stress Complex					3.19 3.19 2.97 2.27 1.87	External Stress Help Avoid Donebef	1.97	Neg/givup	3.30 2.95 2.55 1.87	Pos SRL 1 Neutral Relaxed Donebefor
Next Higher	2.62	Complex	3.11 2.72 2.48	Pos SRL 1 Help Excited	2.81	Help	2.43 2.17	Neutral Relaxed					2.93	Stress	2.96	Pos SRL 2
Middle	2.76 2.57 2.29 1.95 1.93 1.67	External Help Memory Relaxed Avoid Done bef.	2.94 2.82 2.47 2.03 1.97 1.83 1.81 1.74	External Pos SRL 2 Stress Neutral Avoid Relaxed Complex Neg/givup	2.96 2.94 2.62 2.12 2.06 1.75 1.71 1.61 1.48	Pos SRL 1 External Pos SRL 2 Excited Memory Avoid Neutral Neg/givup Donebefor	2.74 2.59 2.37 2.20 2.06 1.92 1.79 1.43	External Help Stress Memory Complex Avoid Neg/givup Donebefor	2.95 2.32 2.28 2.05 2.02 1.78 1.59	Pos SRL 1 Complex Excited Relaxed Neutral Avoid Donebefor	2.92 2.07 1.83 1.78	Pos SRL 1 Memory Neutral Neg/givup	2.75 2.20 2.04 2.00	External Memory Avoid Complex	2.97 2.63 2.36 2.13 1.78	External Help Memory Excited Avoid
Next Lower	2.26	Stress			1.41	Relaxed	2.74 2.46 1.87	Pos SRL 1 Pos SRL 2 Excited	2.50 2.11 1.36	Pos SRL 2 Stress Neg/givup	1.41 2.47	Relaxed Pos SRL 2	1.54 1.16	Neutral Donebefor	1.35 1.71	Neg/givup Complex
Lowest	1.35 1.23	Neutral Neg/givup	1.06	Donebefor					2.74 2.63 2.29	Memory External Help	1.72 1.48	Excited Complex	2.55 2.24 2.16 1.66 1.26	Pos SRL 1 Help Pos SRL 2 Excited Relaxed	1.89	Stress
Sum	Highest SRL Highest Inq/EC Complex/Excited Low Stress/Neg		High-Mid SRL Mem > SRL Higher help/excit Lowest done bef.		Mid SRL Highest Stress Complex/Stress Higher Help		Low SRL Low Inq/EC Higher neutral Higher relaxed		Mid-Low SRL Mid complex/exc Low help, mem, stress, external, Neg-Giveup		Mid-Low SRL Highest stress, ext, help, avoid, donebefore Lowest complex		Lowest SRL Ext/Mem > SRL Highest Neg/GU High Stress		High SRL Relaxed/neutral Done before Lowest Stress	