An Exploration of Elementary Students' Task Understanding: How do Young Students Understand the School Activities they are Assigned?

by

Stephanie Catherine Helm

B.A., University of British Columbia, 2005

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Supervisory Committee

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Abstract

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This study employed a cross case analysis research design to explore young elementary students' task understanding and its relationship to learning. Participants included 13 grade two students. Research was incorporated into the regular activities of a second grade class. Students learned about animal lifecycles and completed an associated activity (task) about the frog lifecycle during five hour-long sessions. The Task Understanding Questionnaire (TUQ), targeting students' perceptions of explicit (e.g., task requirements) and implicit (e.g., course concepts, task purpose) task features, was administered at the end of each session. Findings indicate young students' task understanding accuracy varied. Students demonstrated strong, improved, and weak task perceptions. Task understanding was also associated with learning outcomes. For students with limited prior knowledge, accurate task understanding was related to successful learning.

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Chapter 1

Introduction

Throughout the school day, students spend the majority of their time working on tasks or activities assigned by the teacher, such as completing worksheets, assignments, or exams (Doyle, 1983). Although teachers assign these tasks with the intent that students will learn important instructional concepts, developing an accurate understanding of task instructions can be a cognitively complex enterprise with which many students struggle (Butler & Cartier, 2004; Doyle, 1983; Hadwin, 2006; Miller, 2009).

Task understanding refers to how a student perceives an academic task, and is emerging in the literature as an important component of self-regulated learning (SRL) and academic success (Butler & Cartier, 2004; Hadwin, 2006; Miller, 2009; Oshige, 2009; Winne & Hadwin, 1998). Students who productively self-regulate their learning metacognitively monitor, evaluate, and adjust their behavior, cognition, and motivation in order to successfully complete an academic task (Winne & Hadwin, 1998; Zimmerman, 1990). Current theories of SRL emphasize task definition as the foundation for later stages in the self-regulated learning cycle, as having inaccurate task understanding can lead students to set poor goals and select inappropriate strategies (Butler & Cartier, 2004; Winne & Hadwin, 1998).

Task understanding research has consistently demonstrated students struggle to develop complete and accurate representations of academic tasks. This in turn has been associated with poor academic performance on the specific task as well as overall academic achievement (Miller, 2009; Oshige, 2009). On the other hand, students with an accurate understanding of the task are more likely to engage in successful strategies, allowing the final product (the assigned task) to be more aligned with instructor expectations (Hadwin, 2006; Winne & Hadwin, 1998).

Research on academic tasks and task understanding, however, has predominantly been investigated in high school or post-secondary populations of students. Little to no research has explored how younger elementary students understand the school activities they are assigned. Although these preliminary investigations have provided a background for task understanding, researchers in the field have recognized a need to examine how task understanding functions in students of differing ages and grades (e.g., elementary students; Jamieson-Noel, 2004).

As task understanding is pivotal for the successful regulation of learning, and often represents a challenging phase of the SRL cycle, it is imperative that research also targets how younger learners understand the academic tasks they are assigned in order to gain a fuller picture of task understanding across development and to see if younger students experience the same or different challenges when interpreting task instructions. The current study, therefore, aims to explore elementary students' task understanding. Incorporating research into a second grade class allowed for an investigation of young students' task understanding for an assigned school activity. Findings explore the accuracy of young students' task perceptions and the relationship between task understanding and learning.

Chapter 2

Literature Review

Research, in the field of Educational Psychology, has shifted to focus on the role of the student in his or her own learning process. It is this “recognition of the importance of the personal initiative in learning” (Zimmerman, 1990, p. 3) that has lead to recent interest in the construct self-regulated learning (SRL).

Students who productively self-regulate their learning distinguish themselves from their classmates by being actively engaged in studying, acquiring knowledge, and completing academic tasks (Winne & Hadwin, 1998; Zimmerman, 1990). They do not rely on instruction alone, but are aware of their strengths and weaknesses as a learner, and can select strategies to compensate or enhance their abilities while learning or completing tasks (Zimmerman, 1989, 1990).

As well as taking an initiative in their own learning, students who productively engage in SRL often show higher academic achievement (Camahalan, 2006; Dignath, Buettner, & Langfeldt, 2008; Zimmerman, 1989; Zimmerman & Martinez-Pons, 1986). In a seminal study, Zimmerman and Martinez-Pons (1986) found that high-achieving students reported using significantly more learning strategies (e.g., seeking teacher assistance, rehearsing and memorizing, keeping records and monitoring) than low achieving students. On the other hand, low achieving students tended to make more statements about learning that were either reactive (i.e., statements showing a lack of personal initiative in learning) or about will power (i.e., statements of resolve). This research illustrates the importance of self-regulated learning, and specifically strategy use, for academic success.

Although Zimmerman and Martinez-Pons (1986) specifically discuss learning strategies and their relationship to academic achievement, other researchers have noted that the inability to effectively self-regulate one's learning may result in defensive or self-handicapping approaches to learning (Perry 1998; Perry & VandeKamp, 2000; Zimmerman, 1990). In order to promote self-regulated learning and academic success, it has become important to examine specific SRL processes to identify where students struggle.

Many theorists have postulated how students regulate their learning. Increasingly, student perceptions or definitions of the learning task are becoming recognized as an important component of students' SRL. Understanding how students' definitions of the task either promotes or hinders regulation and learning is recognized by experts in the field as an important research avenue to explore (Jamieson-Noel, 2004; Winne & Hadwin, 1998).

Theoretical Frameworks

Before examining the relevant empirical literature on task understanding, two theoretical frameworks that have been used to guide research will be discussed. These models include Winne and Hadwin's (1998) model of self-regulated learning and Hadwin's (2006) model of task understanding. These models have been selected as they highlight the importance of task understanding in SRL and how it may function to influence student learning.

Winne and Hadwin's Model of Self-Regulated Learning. Winne and Hadwin's (1998) model of SRL allows researchers to clearly identify the different phases of SRL and where in that process students may struggle. Specifically, they outline a four-phase model of self-regulated learning, including: (a) task definition, (b) goal setting and planning, (c) enacting and (d) adaptation. Their model of SRL is a weakly sequenced and recursive cycle. As students study they generally move from phase 1 (task definition) through to phase 4 (adaptation).

In the first phase, task definition, students' use their previous experiences with similar tasks, related domain knowledge, and other environmental cues to construct an interpretation of the task. This definition of the task may include an understanding of instructions, potential resources and other personal attributes that may influence work or learning (Winne & Hadwin, 1998, 2008). The second phase, goal setting and planning, involves students setting goals and selecting strategies that will allow for the successful completion of the task. Students' standards for "success" are based on those outlined in task requirements and students own objectives for the task. Phase three (enacting) involves putting into place selected strategies or operations for goal attainment. Finally, in the fourth phase, adaptation, students evaluate the outcome of earlier stages in the SRL cycle to previously set standards for the task; adjustments are then made to phases 1 through 3. Students are also monitoring, evaluating, and adjusting as they progress throughout each phase of the SRL cycle (Winne & Hadwin, 1998, 2008).

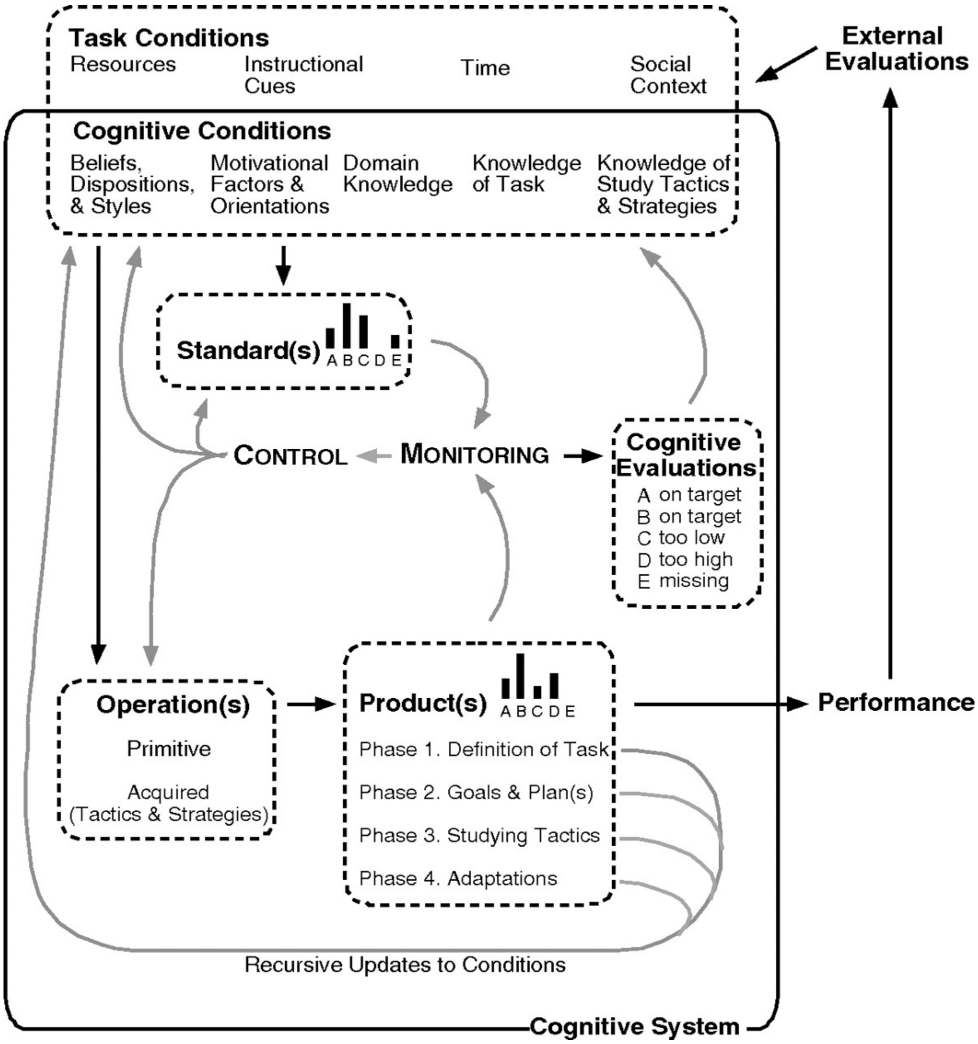

Figure 1. Winne & Hadwin's model of self-regulated learning (1998). From Winne, P.H., & Hadwin A.F. (1998) "Studying as Self-Regulated Learner." In D.J. Hacker, J. Dunlosky, & A.C. Graesser (Eds.), *Metacognition in educational theory and practice*. Hillsdale, NJ: Lawrence Erlbaum Associates. Reproduced with permission from Taylor & Francis Group LLC via Copyright Clearance Centre, Inc.

Winne and Hadwin (1998) argue five factors (conditions, operations, products, evaluations, and standards; COPES) work together to create a "cognitive architecture" within each phase. Conditions refer to the factors both internal (e.g., cognitive conditions- domain knowledge, motivational factors, goal orientations) and external (e.g., task conditions- resources, instructional cues, the social context of the task) to students that they draw on within each phase. Operations describe the cognitive actions a student takes within each phase of SRL in order to understand the task, set goals, carryout plans or monitor and adapt their learning (Winne & Hadwin, 1998). Products are the result of the operations taken by the student. They can include how a student actually understands a set of task instructions or the goals or standards that they set. Products of one phase often become the conditions for other phases. Evaluations include students' appraisals of the products that they create, while standards include the criteria against which products are evaluated. If a student identifies a mismatch between a product and standard, they may adapt their studying process in order to meet desired outcomes.

Winne and Hadwin's (1998) model is unique in its emphasis on task definition or task understanding as the basis for later phases in the SRL cycle. Unlike other SRL models (e.g., Zimmerman or Pintrich's SRL models) that conceptualize task definition and planning as a single phenomenon, Winne and Hadwin separate these processes into distinct phases in the SRL cycle (Greene & Azevedo, 2007). They argue that it is from the definition of the task that students select appropriate goals and strategies for completing the task. Similarly, accurate task understanding allows students to metacognitively monitor their progress. Task understanding enables students to develop accurate representations of what is expected and then monitor whether or not they are meeting those expectations (Hadwin, 2006).

It is important to note that Winne and Hadwin argue, "…individual differences between students and intraindividual differences within a student over time practically ensure that there will be variance in perceptions about what a 'given' study task is" (1998, p. 283). As perception of academic tasks are subjective and variable, and as task understanding lays the foundation for later stages in the SRL cycle, it is in this first stage that problems regulating learning are often rooted (Butler & Cartier, 2004; Hadwin, 2006).

Task Understanding

Definition of Academic Tasks. Academic tasks have been defined in multiple ways (Butler & Cartier, 2004). In his seminal discussion of academic work, Doyle (1983) conceptualized students' work as being comprised of three components: (a) the products students are required to create (e.g., essays, answers to a set of questions), (b) the operations students use to generate these answers (e.g., memorizing words, analyzing text), and (c) the resources students use to create the final product. Others have expanded on this definition (Michenbaum & Biemiller, 1992; Winne and Marx, 1989). For example, Michenbaum and Biemiller (1992) add an affective component along with the already identified cognitive components of task features. In their opinion, definitions of academic tasks should also take into account task affect or the student's feelings about the task or his/her ability to complete the task.

Butler and Cartier (2004) provide a more current summary of task features commonly identified in definitions of academic work. These features include: (a) task purpose (e.g., why the task is being completed), (b) task structure (e.g., criteria for the task, how similar tasks are normally completed) and (c) task components (e.g., requirements for completing the task).

Definition of Task Understanding. Although academic tasks have been defined from multiple perspectives, the concept of task understanding is still in its infancy. How a student perceives academic work, task interpretation, or task understanding are all terms or phrases that have been used to describe a students' internal representation of an externally assigned task (Hadwin, Oshige, Miller & Wild, 2009). Definitions of task understanding often include such elements as students perceptions of (a) the purpose of the task, (b) the components of the task, (c) the structure of the task (d) strategies required to complete the task, (e) and beliefs about learning that may influence the task (Butlier & Cartier, 2004; Hadwin, 2006).

Hadwin's Model of Task Understanding. Hadwin's (2006) model of task understanding is one of the few that explains students' perceptions of academic tasks. Hadwin identifies three important features of task understanding; she argues explicit, implicit, and socio-contextual elements of the task are embedded within teacher instructions.

The explicit elements of a task are those task components directly stated in task instructions, such as task requirements, grading criteria, and terminology (Hadwin, 2006; Hadwin, Oshige, Miller, Fior, Tupper, 2008; Hadwin et al., 2009). Implicit elements, on the other hand, are those task features that are not explicitly stated in task instructions. Implicit task features are those components of the task that the student needs to infer from the task like the instructors' purpose for assigning the task, necessary course concepts, as well as the types of thinking and knowledge required for the assignment. Finally, the socio-contextual elements of a task refer to the larger disciplinary and instructional context in which the task is embedded. Socio-contextual task features include instructor's beliefs about knowledge and learning as well as disciplinary beliefs that subtly guide salient types of thinking and problem solving, writing genre, and argumentation styles.

Hadwin's model of task understanding emphasizes the dynamic nature of academic tasks as student and instructor perceptions frequently change over time (Hadwin, 2006; Hadwin et al., 2008). Emerging evidence validates Hadwin's (2006) model of task understanding and emphasizes the importance of task definition (stage 1 of Winne & Hadwin's model of SRL) for self-regulated learning and academic success. For example, in a study assessing Hadwin's model of task understanding, third year university students' socio-contextual task understanding related to successful academic performance in the course (Hadwin et al., 2009).

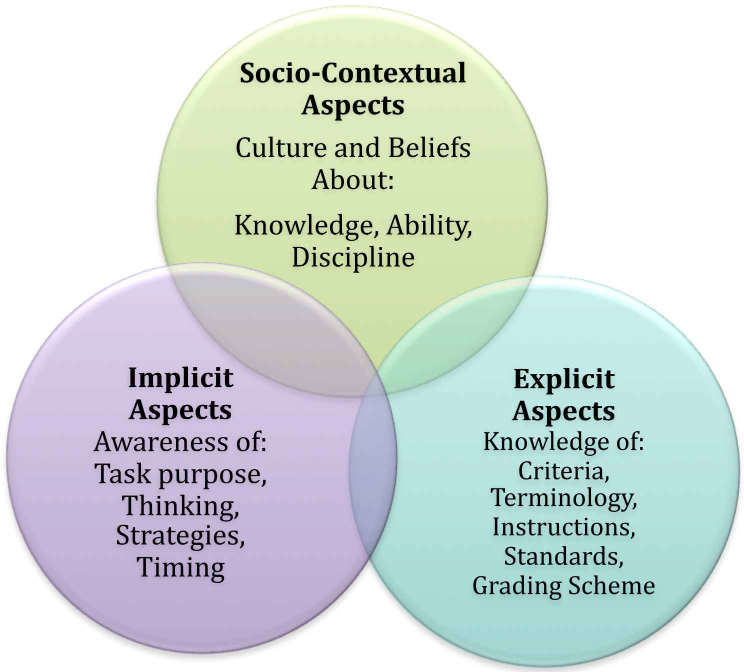

Figure 2. Hadwin's model of task understanding (Hadwin, et al., 2008).

Review of Relevant Literature

The Influences of Task Structure on Learning

Task Structure Promotes Task Engagement and SRL. The learning environment has been identified as a contributing factor influencing learning outcomes and processes. Academic tasks have been one specific element within the learning environment identified as influencing student learning (Perry, 1998). Tasks are specifically designed by instructors to influence students' cognitive engagement and learning of the instructional content (Lodewyk & Winne, 2005).

Support for these assertions comes from research conducted by Perry (1998) in which it was evidenced that certain classroom environments/ tasks were more likely to promote self-regulated learning behaviors in grade two and three students. Perry's work was conducted in three phases. In the first phase, Perry examined 19 second and third grade classrooms. Classroom activities were examined to establish whether or not assigned tasks promoted or hindered SRL behaviors in students. Based on results from phase 1, five classrooms (3 high SRL and 2 low SRL) were selected. Students were surveyed about their perceptions of classroom activities (e.g., whether they promoted supportive environments, opportunities for control, etc.). A smaller subsample of 10 students (5 high achieving and 5 low achieving) were selected for phase 3. In the final phase of the project student participants were interviewed and observed for differences in SRL behaviors.

Classrooms characterized as providing environments that promoted SRL included activities that were complex and meaningful (Perry, 1998). Students were also given opportunities to control the degree of challenge in an activity and were presented with non-threatening evaluation criteria. Qualitative differences were found in students' behaviors in the high SRL as opposed to low SRL classrooms. Specifically, students in the high SRL classrooms were more likely to use writing strategies (e.g., drafting), monitor and evaluate their progress and, when needed, seek help from their peers and/ or the teacher. Perry argues these behaviors are evidence of young students' abilities to act as self-regulated writers and learners and indicates that environments and activities selected can affect even young students.

Another task feature that influences student engagement in learning is the amount of structural architecture that students are provided within assignment instructions. For example, tasks can be classified as either well-structured (WST) or ill-structured (IST; Lodewyk & Winne, 2005; Lodewyk, Winne, Jamieson-Noel, 2009). Well-structured tasks include assignments like worksheets, question sets, or other coursework with specific guidelines for completing the task. WST are often straightforward assignments with linear procedures and explicit task requirements. Resources and grading criteria for completing the task may be provided and answers are often easily identifiable as correct or incorrect (Lodewyk et al., 2009). Ill-structured tasks, on the other hand, are usually more complex, and have been argued to more accurately reflect tasks experienced in real-world or work-related contexts (Lodewyk & Winne, 2005). These tasks may be more ambiguous with learners having to navigate selecting appropriate resources and methods/ strategies for completing the task. The process for completing ISTs is often not linear, but can be approached from multiple avenues (Lodewyk, et al., 2009).

Although it may be easier for students to succeed academically on a WST as the resources and procedures for completing the task are made readily available, it is argued that these tasks may limit opportunities for deeper cognitive processing. The complex nature of ISTs requires students to decipher and create their own sub-goals for completing the project. This requires more self-regulatory behavior as learners set task goals, select and enact strategies, and monitor their progress for completing the task (Lodewyck et al., 2009).

Research on tasks that are either well-structured or ill-structured, has found distinctions in the way that students commonly approach each type of task (Lodewyk & Winne, 2005; Lodewyk et al., 2009). For example, 94 students from four 10th grade classrooms participated in research examining distinctions between WST and IST in relation to student (a) motivation, (b) strategy use, (c) achievement, (d) calibration, and (e) task perception (Lodewyck et al., 2009). Student participants completed a WST and an IST as a part of requirements for a year-long science class. Data collected also included students' responses to a Self and Task Perception Questionnaire targeting how students perceived the task as well as how they conceptualized their own engagement in the task (e.g., some questions assessed what elements of the task students found easy/ challenging while other questions asked students to indicate their level of interest in the learning material or whether or not they were understanding the material). The Motivated Strategies for Learning Questionnaire was another measure used and assessed students' motivation orientation and use of learning strategies. Finally, a Post-Task Questionnaire asked students to reflect on which task (WST or IST) they found more interesting and challenging (Lodewyck et al., 2009).

When compared to the IST, student participants tended to report higher levels of task value, interest, and motivation on WST. Similarly, students also demonstrated higher levels of academic achievement and reported less difficulty completing the WST as opposed to the IST (Lodewyck et al., 2009). However, students were more likely, on the IST, to use more cognitive and meta-cognitive strategies. A comparison of high and low achievers demonstrated differences in student perception and engagement with the tasks. In particular, high achievers were more interested and self-efficacious on the ill-structured task, while on the well-structured task they reported more boredom. Low achieving students evidenced less task value on ill-structured tasks and lower levels of calibration accuracy (i.e., the students ability to predict their final task grade). Evidence from the research discussed here clearly demonstrates that factors in the task structure itself influence how a student may engage with and employ SRL behaviors to complete the task.

Relationship Between Task Structure and Task Understanding

In addition to influencing self-regulatory behaviors, task structure can also more specifically influence how students understand the tasks they are assigned. As a part of a larger research project, Oshige (2009) was interested in the types of tasks with which university students struggled as well as the structural characteristics of those tasks. Data were collected from 98 post-secondary students enrolled in a first year undergraduate course geared towards promoting self-regulated learning at a university level. As a part of regular course activities, students were required to complete a Task Analysis Assignment. The Task Analysis Assignment instructions asked students to (a) select a "challenging" academic task from one of their university courses and describe their understanding of the explicit, implicit, and socio-contextual features of the task, (b) interview the instructor for the task in order to get his/her perceptions of these task features, and finally (c) self-evaluate their task understanding by comparing their initial understanding of the task to that of the professor's understanding (Oshige, 2009).

Data analyzed as a part of this project included (a) the types of tasks that students found challenging, (b) the discipline areas related to challenging tasks, and (c) the structures related to challenging tasks (Oshige, 2009). The types of challenging tasks and the related discipline areas varied. For example, task types commonly identified by students included exams, research essays, analysis papers, individual projects, and chapter questions. Similarly, the disciplines of challenging tasks ranged from the humanities and sciences to business. This indicates university students struggle to understand a range of tasks from a range of disciplines. In an examination of task structure, results paralleled those from Lodewyck et al. (2009) in that the tasks selected as more challenging more often met the criteria for ill-structured as opposed to well-structured tasks. Oshige (2009) interpreted these findings as evidence that tasks that are less prescribed may be perceived as more challenging by students and may prove more difficult for students to accurately understand.

What do Students Understand About the Tasks They are Assigned?

Students Struggle to Develop Accurate Task Perceptions. Although understanding an academic task has been theoretically identified as important for self-regulation, research on students' task understanding has consistently demonstrated that developing a thorough and accurate understanding of the task can be challenging for students (Butler & Cartier, 2004; Doyle, 1983; Hadwin, 2006; Oshige, 2009; Miller, 2009; Winne & Hadwin, 1998).

In a preliminary attempt to explore students' task understanding, Jameson-Noel (2004) examined 58 undergraduate students' perceptions of two assignments embedded in an upper level Instructional Psychology course. Immediately after receiving task instructions, students were asked to reflect on their initial task understanding. Examples of questions students were prompted to answer included (a) what are your perceptions of the activity? (b) how do you plan to accomplish the task? and (c) how do the instructions frame your thinking of the task?

Students' task understanding could be coded along two dimensions, their depth and breadth of response (Jamieson-Noel, 2004). Students who expressed their task understanding with more breadth made a larger number of references to the main components or details of the task. Students with more depth to their understanding of the task often created their own representation of the assignment by searching, selecting and assembling important instructions and translating them into their own task interpretation (Jamieson-Noel 2004). Students who lacked depth in their responses often reiterated task language to express their understanding of elements of the task.

Students' initial task understanding more frequently reflected surface level descriptions with limited to moderate detail. Although students had an understanding of some of the key task components, their descriptions often neglected finer task details and may have missed the purpose or implicit cues embedded in task instructions. Few students demonstrated a real depth and breadth of understanding in their descriptions of the task (Jamieson-Noel, 2004). While admittedly these particular results reflect students' first impressions and interpretations of two course assignments, they nonetheless demonstrate that students by no means have a thorough portrayal of an assigned task after receiving task instructions. Moreover, students may initially struggle to synthesize task instructions into a personal representation of the task. When interpreted in light of SRL theory, this demonstrates students may not always have the strategies required to interpret task requirements (Jamieson-Noel, 2004).

Results from Oshige's (2009) research on task understanding parallel findings from Jamieson-Noel's work (2004). Along with investigating task structures that may influence students' task understanding (results previously described above), Oshige was also interested in examining the thoroughness of students' task understanding. While reviewing students' Task Analysis Assignments (an activity in which students were expected to describe their explicit, implicit, and socio-contextual understanding for an assigned university level course), Oshige found student descriptions of their understanding of the task often lacked in comprehensiveness.

In particular, when students were required to describe their tasks they often did so in broad and vague terms, evidencing that although students had some idea of what they were expected to do, their understanding of the task may not have been complete enough to describe it in specific or concrete ways (Oshige, 2009). Students also tended to focus on the mechanical aspects of the task (e.g., number of pages, formatting, etc.) while struggling to make connections from this task to the larger instructional purpose of the assignment. Finally, Oshige found students struggled to understand socio-contextual task features and how the professor's perspective and intentions when assigning the task may influence task expectations. Students lacked a sense of ownership for the assignment, often describing the completion of tasks as for someone else rather than for the benefit of their own learning. These results are unique as students were reporting their task understanding from a range of tasks in a variety of disciplines, rather than for one specific assignment. The challenges or gaps identified here in terms of students' task understanding are pertinent in identifying where in the process of developing their perception of a task, students may particularly struggle.

Along with investigating students' thoroughness in interpreting task instructions, research has also examined the accuracy of students' task understanding. Miller's (2009) research for example sought to examine the relationship between students' task understanding, self-efficacy for performance, and actual performance on a university assignment. In examining students' task understanding, Miller measured students' task understanding accuracy.

Participants in research included 38 undergraduate students enrolled in a first year elective course intended to develop self-regulated learning and strategy use in university students (Miller, 2009). Data collected as a part of research were embedded in students course work and included (a) the Task Analyzer— a 43 item forced choice questionnaire targeting explicit and implicit features for an assigned task in the course, (b) an adapted version of the Epistemic Beliefs Questionnaire— a measure reflecting students' understanding of socio-contextual task features, (c) the Self-Efficacy for Performance Scale— a measure targeting students efficacy for the explicit, implicit, and socio-contextual task features, and (d) the strategy library assignment— course assignment students were required to complete as a part of the course and the task targeted to assess students task understanding.

In order to assess the accuracy of students' task understanding, student and instructor interpretations of the task should be compared, as instructors may hold differing expectations, even for the same task (Oshige, 2009). The Task Analyzer, used as a measure of task understanding that in this study, forced students to answer questions targeting explicit and implicit aspects of the assignment. Unlike other measures of task understanding, students' responses to the task analyzer could be scored as accurate/ inaccurate by comparing answers to assignment instructions, grading rubrics, etc. (Miller, 2009). Results indicated that students had difficulty constructing accurate representations of the assigned task (i.e., the strategy library assignment) when using a composite score of task understanding that included students' understanding of the explicit, implicit and socio-contextual features of the task. When students' task understanding was broken down into the specific task features students struggled to understand the implicit features of the task the most. Students understanding of the socio-contextual features of the task were the highest (Miller, 2009). In contrast, students often showed high self-efficacy for task performance. Results suggest there may be a misalignment between students' actual and perceived accuracy for interpreting task instructions.

Taken together the results from these studies demonstrate that although task understanding is a foundational component of SRL that guides future studying phases like goal setting and planning and strategy selection, students often struggle to develop a thorough and accurate understanding of the academic tasks they are assigned.

Students' Task Understanding Changes Over Time. The recursive nature of Winne and Hadwin's model of SRL (1998) implies students' task understanding should change over time as they engage in the task. As students metacognitively monitor their progress on the task, evaluations (a part of the COPES architecture) in subsequent phases of the SRL cycle may become new cognitive conditions re-informing students about task features, in turn causing students to adjust their understanding of the task (Winne & Hadwin, 1998). Studies exploring students' task understanding over time have documented the shifting nature of students' perceptions for academic assignments.

One study, for example, examined student and teacher perceptions of an academic assignment across three points in time. Participants included 54 undergraduate students enrolled in an upper-level engineering course. In order to examine student and instructor task understanding for the target assignment, participants were required to answer an open-ended version of Hadwin and colleagues Task Analyzer (Hadwin et al., 2009). Questions targeted explicit and implicit elements of the task. In order to assess socio-contextual task understanding students as well as the course instructor completed the Epistemological Beliefs Inventory. This questionnaire assesses key perspectives and beliefs about learning that may influence the context of the task. In order to get an indication of students' task understanding over time, data were collected over the course of the semester as students worked on the assignment. These points in time included (a) after the task was assigned, (b) after a preliminary report for the assignment was submitted, and (c) after the final product/ assignment was submitted.

Over time, task understanding changed for both students as well as the course instructor (Hadwin et al., 2009). Data exemplifying this change could be seen in participants' shifting understanding of explicit task features of the assignment. In assessing students' understanding of explicit task features, an open ended question in the Task Analyzer asked participants to list key elements that needed to be included in the assignment. From Time 1 to Time 3, the instructor identified fewer key aspects of the task. Students were able to most accurately identify the key points at Time 2 and were lowest at Time 3 even though there were fewer points with which to agree. Results were interpreted as demonstrating the dynamic nature of academic tasks, with students and instructors co-constructing task representations and expectations (Hadwin et al., 2009). Developing accurate task understanding requires students to adapt task perceptions throughout task engagement as they familiarize themselves with the task and communicate about the task with the instructor (Hadwin et al., 2009).

A secondary component to Jamieson-Noel's (2004) research was to explore how students revised initial perceptions of a target task. Findings corroborate those discussed in the previous study while simultaneously shedding new light on certain elements of task engagement that may cause students to shift their understanding of the task. When student participants were asked explicitly if their perceptions of the target task had changed, 96% agreed that their initial task understanding had changed (Jamieson-Noel, 2004). Reasons students attributed for this change included (a) discussing the assignments with peers, teaching assistants, and the professor, (b) developing a more defined focus, (c) defining a topic, (d) developing a deeper cognitive representation of the purpose for the assignment, (e) grappling with the proper formatting for the assignment, (f) the process of research, (g) motivational orientation, (h) task difficulty, and (i) making links to other assignments. Again, although these themes developed out of students work on one particular assignment, they may provide future avenues for research in terms of exploring how and why students' task understanding may shift over time as they engage in the process of completing academic work.

Task Understanding and Academic Achievement. As self-regulated learning is associated with better academic performance, theoretically, task understanding as the foundational phase of SRL should also be related to academic achievement (Butler & Cartier, 2004; Winne & Hadwin, 1998; Zimmerman & Martinez-pons, 1986). Emerging research on task understanding has indeed quickly been able to identify a relationship between task understanding and academic performance. Specifically, students with a more thorough and accurate understanding of the task are also more likely to evidence academic success (Hadwin et al., 2009; Miller, 2009; Oshige, 2009).

Oshige (2009) for example, looked at the relationship between students' ability to construct thorough and complete task understanding for a university level course and students' overall GPA. Verifying Oshige's hypotheses, Explicit, Implicit, and Total Task Analysis Quality were all significantly correlated to students overall GPA. Students with better task understanding also tended to have a higher grade point average.

In order to more thoroughly explore this relationship, Oshige (2009) conducted regression analyses to see if task understanding was a predictor of academic achievement, even when students' prior academic performance was controlled. Results indicate implicit task understanding (e.g., students who had a better understanding of the purpose of the assignment, course concepts, and types of thinking and knowledge required for the task) was a statistically significant predictor of students' overall GPA, even when prior grades were partialled out. Oshige (2009) suggests these results are important as they demonstrate that prior academic achievement may not be a determinant for academic success. Rather, a student's ability to infer the implicit features of an assignment may compensate for low or limited prior knowledge or ability when entering university.

Unlike Oshige's (2009) work that looks at the relationship between students' task understanding and overall GPA, Miller's (2009) research specifically focused on students' task understanding accuracy and its ability to predict performance for the targeted course assignment. Paralleling Oshige's results, correlational analyses found a positive statistically significant relationship between explicit, implicit, and socio-contextual task understanding and task performance. In a regression analysis, task understanding was also found to be a statistically significant predictor of task performance (Miller, 2009).

Finally, Hadwin and colleagues (2009) examined the influence of a specific facet of task understanding (socio-contextual task understanding) on students' academic performance for the target task. Students' socio-contextual task understanding was assessed using the Epistemological Beliefs Inventory (EBI). Student responses were compared to instructor responses to get an indication of students' socio-contextual task understanding accuracy (accuracy for interpreting instructor's discipline values and beliefs about learning). Students with higher scores (indicating their socio-contextual task understanding was more in tune with instructor perceptions) also scored higher on the assignment and course overall (Hadwin et al., 2009).

Research to date clearly demonstrates the importance of task understanding for academic achievement, both in terms of performance on the particular task and a students' grades overall. Results also verify that Hadwin's model of task understanding may provide insight into what specific task features may be particularly important to academic performance. This holds practical implications for instructors hoping to improve students' task understanding, SRL, and/or academic performance.

Measuring Task Understanding

Measures or instruments used to assess students' task understanding are emerging along with task understanding research. Ways of measuring task understanding have varied from open-ended questions to more structured questionnaires (Miller, 2009). Earlier research on task understanding used open-ended questions and qualitative analyses as a way to explore students' perceptions of a task (Jamieson-Noel, 2004; Oshige, 2009; Miller, 2009). For example, Jamieson-Noel (2004) investigated students' task understanding by having them answer a set of questions about the task included in research. Examples of questions examined included "How do you perceive this task?", "What do you think this task is all about?", and "What steps are you going to use to complete the task?". Results from these open-ended questions allowed for an in-depth perspective of how students develop and alter their task perceptions.

Hadwin and colleagues have also been developing a measure of task understanding called the Task Analyzer. Similar to Jamieson-Noel's measure for assessing task understanding, earlier versions of the Task Analyzer included open-ended questions to get an indication of what students were understanding about their assigned tasks. For example, the Task Analyzer and Performance Evaluator (TAPE) was designed to measure students' task understanding and monitoring (Venkatesh, 2002). Task understanding was predominantly investigated by two open ended questions that asked students to think about whether or not their course work reflected course concepts and instructor perceptions of task requirements/ assessment criteria (Venkatesh, 2002).

Later versions of the Task Analyzer more systematically target students' understanding of specific explicit and implicit task features (Hadwin et al., 2009; Oshige, 2009). Again open-ended questions on this measure ask students to identify explicit aspects of a task (e.g., stated task requirements) and implicit aspects (e.g., types of knowledge, thinking required for the task, task purpose).

Although these versions of the Task Analyzer can provide information about the thoroughness of students' understanding of these task features, this type of open-ended responding may be limited in terms of getting a representation of the accuracy of students' task understanding. As instructors can hold different perspectives of a task, even for the same assignment, it is important to compare student and teacher responses to see if their understanding of the task is similar. Students' with an understanding of the task that is more in line with the instructor's conception of the task would be evidence of higher task understanding. When students and teachers are answering open-ended questions, the depth of response is dependent on the participant. Task understanding accuracy becomes difficult to interpret as some individuals may provide limited responses to questions that may not reflect what they actually understand about a task.

Miller (2009) adapted the Task Analyzer so that questions targeted the explicit and implicit task features for a particular assignment, but made questions forced choice, rather than open-ended. Correct responses were those that matched the instructor's perspective of the assignment and task instructions. In this way Miller measured accuracy of students' task understanding, rather than completeness of students' responses.

Although task understanding measures are continually developing, there are still ways that measures could be improved or altered. While research continually demonstrates that tasks and task understanding continually change over time, research and task understanding measures frequently only capture students' task perceptions at one point in time. They also neglect to capture the subtle shifts in students' task understanding while engaging in different components of the task. In addition, task understanding measures to date have been created for use with high-school or post-secondary students. The written open-ended questions/ questionnaires used with older students would be developmentally inappropriate to use with early elementary students. Developing measures to be used with younger students could help to expand our knowledge of task understanding in this population of students.

Task Understanding in Young Students

There is some empirical evidence to suggest that young students may struggle to understand the academic tasks they are assigned (Paris & Newman, 1990). Specifically, it has been argued that the unfamiliar nature of academic tasks makes it difficult for students younger than 10-12 years of age to accurately identify implicit task features (e.g., the task purpose). Paris and Newman (1990) note when a child begins school they may have only a limited understanding of what is involved in learning. For instance, for an academic task that involves literacy or reading, some children may not be sure “whether to read the pictures or the little squiggles on the page” (1990, p. 91). Although young students may struggle with some of the academic tasks they are assigned, researchers note students are not incapable of understanding all tasks (Doyle, 1983). For example, Doyle (1983) reviews research in which even four year-old children are able to adjust the language they use based on the requirements of different communication tasks.

Emerging research is beginning to illustrate that task understanding may be particularly important for young students’ SRL. One study, for example, sought to explore kindergarten students’ awareness of self-regulated learning and its relationship to their own problem solving ability (Hwang & Gorrell, 2001). Results indicated that students who were successfully able to solve a self-directed learning task were also able to identify SRL behaviors in another individual effectively modeling the same problem-solving task. Students’ understanding of the nature of the task was important for students to successfully problem solve and identify self-regulated learning behaviors in others (Hwang & Gorrell, 2001).

Although there is some research demonstrating that young students may be developing their ability to understand academic tasks, there is little empirical evidence exploring what specifically young students do/ do not understand about assigned school tasks. The majority of research in this field has been conducted with students at the intermediate, high school, and predominantly university level. As older students with better task understanding tend to show higher academic success rates, it seems important to also explore young students task understanding as well as how students with differing levels of task understanding compare in terms of their academic performance.

Research Purpose and Questions

Accordingly, the purpose of this study is to explore how young elementary students understand or perceive school tasks. As little research has investigated young students' task understanding, research will be more exploratory in nature. Specifically, three research questions will be examined:

(a) How accurate and complete are young students understanding of the explicit task features (e.g., task requirements)?

(b) How accurate and complete are young students' understanding of the implicit task features (e.g., course concepts, purpose for the task)?

(c) How does learning relate to task understanding in young students?

Chapter 3

Methods

Research Design

A cross case analysis research design was employed to explore young students' task understanding for an assigned activity over five consecutive lessons. Data assessing students' task understanding included short one-to-one interviews with participants before and after they completed the task as well as students' responses to a Task Understanding Questionnaire. Questions in the interview and Task Understanding Questionnaire targeted students' understanding of explicit and implicit features for the assigned task. The Task Understanding Questionnaire was used to gather a description of students' task understanding accuracy.

Additional data collected included (a) Knowledge Tests assessing students' understanding of the instructional concepts before and after completing the task, (b) students' task performance, (c) observational data, and (d) teacher interview data. These data sources were collected to help provide a context for interpreting student responses.

Participant Information

Sampling Strategy. Convenience sampling was used to recruit young students as participants for this study. As a part of the research, a class unit and associated activity on animal lifecycles was incorporated into the regular activities of a second grade classroom in Victoria, British Columbia. School principals and teachers in the community were informed of the research opportunity. The classroom teacher volunteered to incorporate the lifecycle activity and research into her classroom. Students in this class were then approached to participate in research.

Ethical Approvals and Consent. Ethical approval from the University of Victoria as well as permission from the school district, principal, and teacher were received to incorporate the activity and related research project into the classroom (see Appendix A for certificate of ethical approval).

Parents/ guardians of students in the class were informed their child would be completing the lifecycle unit and activity. They were also informed of the associated research including (a) purpose of research, (b) data to be collected, and (c) issues of confidentiality and anonymity related to the reporting of research. All parents/ guardians were given the opportunity to consent to have their child participate in research (see Appendix B for consent form). Although all students completed the class unit and activity, data were only examined for those students for whom consent had been granted.

Criteria for Inclusion. Nineteen out of twenty-two students in the class consented to participate in the research. Two students were excluded from research because the classroom teacher reported that they had learning disabilities likely to interfere with variables important for research, such as the ability to attend to the task or follow task instructions. Furthermore, these students received substantial assistance from teacher aids in the classroom.

The remainder of participants were included in research if they met the following inclusion criteria: (a) attended the first session (in order to hear full task instructions), (b) completed Knowledge Tests, and (c) attended 4 out of 5 days that the unit was incorporated into the classroom. These inclusion criteria were necessary to ensure students were sufficiently engaged with the unit to learn instructional content and so sufficient data was collected to examine change over time in students' task understanding. An additional 4 students did not meet the inclusion criteria of the study.

The final set of participants included 13 students (3 girls; 10 boys). The average age of participants was 7 years, 6 months with ages ranging from 7 years, 3 months to 8 years 2 months. As students' individual data is reported in the research findings, all participants have been given and are referred to by Pseudonyms.

Additional Demographic Information. A major component of the animal lifecycle activity included having students use computers to read about different animal lifecycles. Students' ability to use a computer was important for them to be able to successfully engage in/ complete the lifecycle activity, which may in turn influence task understanding. As such, it was important to gather additional demographic information about students' computer use to ensure that familiarity for working with computers was not a potential confound in research.

Parents/ guardians were asked to complete a short questionnaire reporting on their child's computer use in the home. Perry and colleagues' Computer Survey was distributed to parents (see Appendix C for full survey; Perry, Thauberger, & Hutchinson, 2010). Questions had parents report on whether or not their children had access to a computer in the home, how often they used the computer, as well as what types of activities students completed on the computer. Of the sample of students that met the inclusion criteria for research, 10 parents/ guardians also completed the Computer Survey.

All parents reported students had access to the use of a computer in the home. On average, students spent 171 minutes on the computer each week, with times ranging from 60-360 minutes per week. Again, all parents indicated that their child interacted with their home computer in multiple ways; most commonly children would play computer games (n=10), use educational software (n=6), or use the Internet (n=7). Students were less likely to use instant messaging (n=0) or word processing software (n=2).

The classroom teacher completed a similar teacher version of the Computer Survey (see Appendix C; Perry, Thauberger, & Hutchinson, 2010). All students in the classroom had access to a computer lab, which was used for 30 minutes once a week. The computers were used to interact with educational and word processing software. Based on results from Computer Surveys, it was assumed students included in research had the ability to successfully use the computers necessary for completing the instructional task.

Instructional Context

Research was conducted in the naturalistic setting of a class to explore students' task understanding within an authentic learning context. A unit on animal lifecycles was embedded in classroom activities as well as a related instructional activity. The activity was designed to meet the B.C. ministry of education's prescribed learning outcomes for science at a grade two level (2008). Research examined task perceptions as grade two students learned about and completed a task related to the human and frog lifecycle.

Instructional Material. Instructional material presented to students included Perry and colleagues Life Cycle Learning Kit specifically designed for students at a grade 1/ 2 level (Perry, Thauberger, MacAllister & Winne, 2005). The Life Cycle Learning Kit for the frog lifecycle is comprised of 5 web-based lessons. Each lesson includes text, photos, and interactive components such as links with additional information or self-testing questions. Instructional content in the kit includes a short introduction to the human lifecycle as well as individual lessons describing the development of frog eggs, tadpoles, and the needs and dangers that frogs face as they grow and change across the lifespan (Perry & Winne, 2006).

The web-based instructional material was presented to students in an online environment called nStudy (Winne & Hadwin, 2009). nStudy is a learning program designed to aid teachers and students in the instruction and learning process. nStudy provides an empty framework called a workspace where teachers are able to create or display instructional material (like the Life Cycle Learning Kit). Students are able to access and work with this instructional material in many ways (e.g., highlighting, creating notes, or concept maps). Providing students access to the instructional material in a web-based environment allowed students to view instructional material at their own pace. Although nStudy allows learners to engage in instructional material in a variety of ways, for the purposes of this unit, nStudy was only used as a means of presenting instructional material (see Figure 3).

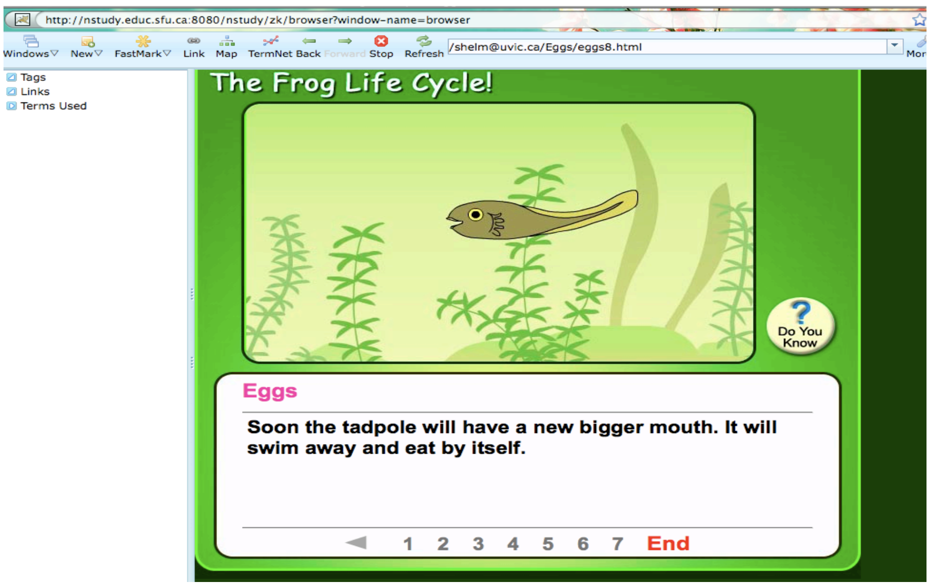

Figure 3. Example of a student view of the frog Life Cycle Learning Kits (instructional material) in nStudy.

Instructional Task. As students accessed instructional material from the frog Life Cycle Learning Kit, they were also required to complete an associated paper-based task. Students received a series of worksheets that matched the instructional material. Students were expected to respond to worksheet questions as they read about the frog lifecycle in nStudy. Worksheets were intended to scaffold students' thinking about the human and frog lifecycle. For example, in the first worksheet, students answered questions about the different stages of the human lifecycle as well as how people grow and change across the lifespan. Students also drew a picture related to the human lifecycle.

Subsequent worksheets were completed for frog eggs, frog tadpoles, and frog needs and dangers. After learning about the human lifecycle and each stage of the frog lifecycle, students completed a final worksheet in which they created their own novel (imaginary) animal. Students were expected to illustrate how their imaginary animal changed across its lifecycle and write about what it needed to survive and how the lifecycle of their animal differed from that of the frog lifecycle. This final activity/ worksheet was included to assess transfer of learning; while there were not specific right or wrong answers for this particular worksheet it was expected that students would draw on what they had learned from studying the human and frog lifecycle (see Appendix D for full task and task instructions).

Although there were differences in the instructional course concepts featured in the worksheets, each was structured in a similar manner (i.e., students answered questions and drew pictures about different lifecycle stages). All worksheets were compiled into each students' own "Lifecycles Booklet". As one instructional course concept and associated worksheet were completed in each session, the "task" used in research can be conceptualized as *daily tasks* (each individual worksheet) or as an overarching *project task* (the Lifecycle Booklet as a whole).

Measures of Task Understanding

No research to date has explored task understanding in young students; therefore, measures were created specifically for this study. Two measures were created to assess young students' task understanding: (a) a Task Understanding Questionnaire (TUQ) and (b) a one-to-one interview with students. Implementing multiple measures of students' task understanding was done in order to triangulate data and get a more thorough representation of how young students understand the tasks they are assigned.

Task Understanding Questionnaire. The Task Understanding Questionnaire used in research was based on Hadwin and Colleagues' Task Analyzer (Hadwin et al., 2009; Miller, 2009; Oshige, 2009). The TUQ was specifically structured in a manner similar to Miller's (2009) version of the Task Analyzer, which used forced-choice as opposed to open-ended questions to assess students' task understanding accuracy for a particular course assignment.

Questions on the Task Understanding Questionnaire targeted students' understanding of the explicit and implicit task features for the Lifecycle Booklet (see Appendix E for full Task Understanding Questionnaire). The TUQ included five multi-item questions. For each question there was a list of possible answers (items). For each item, students were asked to indicate whether they thought the statement accurately or inaccurately answered the question. Items were designed to either match task instructions (target items) or to act as a distracter (seductive items). The first question had 8 items and targeted students understanding of the explicit features of the task (e.g., what they were required to do for the task). The remaining four questions targeted implicit task features including whether or not students could identify relevant course concepts (7 items), resources for the task (4 items), features that define a top quality assignment (8 items), and finally the purpose of the Lifecycle Booklet (6 items).

Students completed the TUQ at the end of each of the five lessons in the lifecycle unit. Having students answer the questionnaire multiple times was done to get an indication of students' task understanding over time. As other task understanding measures have yet to capture students' ability to alter task perceptions in relation to fluctuations in task expectations, two questions on the TUQ were structured to be sensitive to changes in the focus of the specific daily tasks. The TUQ questions assessing explicit task features as well as the implicit course concepts were created so that target and seductive items shifted over time; an item may be a target item for one daily task, and a seductive item for the next daily task. Students with an accurate understanding of the project task should recognize that while an instruction might be important for one daily task, it might not be relevant for a subsequent daily task. The remaining implicit task features assessed in the TUQ were stable across the project task; target and seductive items for these questions were consistent across time (see Table 1).

Scoring the Task Understanding Questionnaire. TUQ questions were developed to correspond to task instructions. Responses were scored as correct when they matched task instructions and the instructional designer's stated intent for the Lifecycle Booklet. They were scored as incorrect when they did not match. Research examined (a) accurate identification of target items, and (b) identification of non-target (seductive) items. Students with accurate task understanding should be able to identify target items, but should avoid selecting seductive items.

The primary researcher scored students' responses to the TUQ. For target items, students were given a score of 1 for each item they accurately identified. For each TUQ question, scores for target items were summed. As the number of items for each TUQ question varied, the summed scores were converted to proportions so all scores were on the same scale. A student with strong task understanding should be able to accurately identify target items; therefore, a high score for identifying target items on the TUQ would indicate accurate task understanding.

For seductive items, students were given a score of 1 for each seductive item they inaccurately identified as relevant. Again, for each TUQ question, scores for the seductive items were summed and converted to proportions. A student with strong task understanding should avoid identifying seductive items; therefore, a low score for not identifying seductive items as relevant on the TUQ would indicate accurate task understanding.

A student with a high score for identifying target items and a low score for identifying seductive items would reflect a student who is able to recognize what is relevant for the task but also what is irrelevant for the task.

Table 1

Target and Seductive Items for the TUQ for Each Day of Data Collection. Check Marks reflect target items while "X" reflects seductive items.

TUQ Questions and Items	Daily Task 1	Daily Task 2	Daily Task 3	Daily Task 4	Daily Task 5
Explicit Task Understanding: What did your teacher want you to do today when you were working on your Lifecycle Booklet?					
Read a book about animal lifecycles	✓	X	X	X	X
Practice using a computer	✓	X	X	X	X
Answer questions about the human lifecycle	✓	X	X	X	X
Draw pictures of animals at different stages of the lifecycle	✓	✓	✓	✓	✓
Answer questions about frog eggs	X	✓	X	X	X
Answer questions about how tadpoles grow and change into big frogs	X	X	✓	X	X
Answer questions about what frogs need to grow and change	X	X	X	✓	X
Create my own animal	X	X	X	X	✓
Number of Target Items	4	2	2	2	2
Number of Seductive Items	4	6	6	6	6
Implicit Task Understanding (Course Concepts): What do you think your teacher wants you to learn about today when you were working on your Lifecycle Booklet?					
Learn about the different stages of the human lifecycle	✓	X	X	X	X
Learn about using a computer	✓	X	X	X	X
Learn about frog eggs and how they stay safe when they are born	X	✓	X	X	X
Learn how to draw animals	X	X	X	X	X
Learn about how frog tadpoles turn into adult frogs	X	X	✓	X	X
Learn about the things frogs need and some of the dangers they encounter	X	X	X	✓	X
Learn that all animals go through similar lifecycle stages even though how they grow and change across life may be different	✓	✓	✓	✓	✓
Number of Target Items	3	2	2	2	1
Number of Seductive Items	4	5	5	5	6
Implicit Task Understanding (Top Quality Assignment): What do you think you will need to do to get a gold star on your Lifecycle Booklet?					
Draw Well	X	X	X	X	X

Show that there are things like food that animals need to stay alive and become an adult	✓	✓	✓	✓	✓
Print neatly	X	X	X	X	X
Share my answers with other students who need help	X	X	X	X	X
Answer questions on my own	✓	✓	✓	✓	✓
Show that I know how humans and frogs grow and change across the lifecycle	✓	✓	✓	✓	✓
Answer all of the questions on my worksheet correctly	✓	✓	✓	✓	✓
Show that I know that all animals go through lifecycle stages even though how they grow and change may be different	✓	✓	✓	✓	✓
Number of Target Items	5	5	5	5	5
Number of Seductive Items	3	3	3	3	3
Implicit Task Understanding (Resources): What is in the classroom that could help you with your Lifecycle Booklet?					
Computer	✓	✓	✓	✓	✓
Book	X	X	X	X	X
Teachers	✓	✓	✓	✓	✓
Other Students	X	X	X	X	X
Number of Target Items	2	2	2	2	2
Number of Seductive Items	2	2	2	2	2
Implicit Task Understanding (Purpose): Why do you think that your teacher is asking you to make a Lifecycle Booklet					
To show you that computers can teach you a lot about animals	X	X	X	X	X
To learn about the different stages of the human and frog lifecycle	✓	✓	✓	✓	✓
To practice drawing animals	X	X	X	X	X
To learn about lifecycles so I can understand what animals need to go from a new life to an adult	✓	✓	✓	✓	✓
To learn how to create my own animal	X	X	X	X	X
To learn that all animals go through similar lifecycle stages even though how they grow and change across the lifecycle may be different	✓	✓	✓	✓	✓
Number of Target Items	3	3	3	3	3
Number of Seductive Items	3	3	3	3	3

Task Understanding Interview. One-to-one structured interviews were also conducted to explore task understanding in young students (see Appendix F for full interview protocol). Interviews were short, lasting approximately five minutes, and took place in a secluded location in the classroom in order to minimize distractions. Task understanding interviews were conducted by two research assistants associated with the project. Students were interviewed twice, on the first day that the project task was incorporated into the classroom (after instructions for the task had been given) and on the last day of working on the Lifecycle Booklet.

The task understanding interview included five questions, strategically created to parallel questions found on the Task Understanding Questionnaire (see Table 2). Interview questions were open-ended and presented in a supportive and uncritical environment, aligning with interview procedure recommendations for ascertaining reliable interview data from young children (Birbeck & Drummond, 2005; Parkinson, 2001; Sternberg, Lamb, Orbach, Esplin, & Mitchell, 2001). Prompts were provided and used when students were unable to respond to interview questions to encourage elaboration on initial responses or to direct off track responses.

The task understanding interview was used to delve more deeply into students' task understanding, and to triangulate data between the TUQ interview questions. Interviews were audio recorded. The primary researcher reviewed the recordings and took general notes on the common themes in students' responses.

Table 2

Explicit and Implicit Task Features Targeted by TUQ and Task Understanding Interview Questions

Task Understanding Feature Targeted	Task Understanding Questionnaire	Interview Questions
Explicit Task Understanding		
Task Assignment Description—what are you supposed to do to complete the task.	What does your teacher want you to do today when you are working on your Lifecycle Booklet?	Can you tell me about this activity? Can you tell me about all of the things that your teacher wants you to do for this activity?
Implicit Task Understanding		
Purpose of the Task	Why do you think that your teacher is asking you to make a Lifecycle Booklet?	Can you tell me why you think it is important for you to do this activity? Why do you think your teacher wants you to do this activity?
Resources Required for the Task	What is in the classroom that can help you to make your Lifecycle Booklet?	Can you tell me where you think you will find all of the information that you will need to complete this activity (Lifecycle Booklet)?
Course Concepts Targeted by the Task—what are you supposed to learn from the task	What do you think that your teacher wants you to learn about today when you are working on your Lifecycle Booklet?	What do you think are the important things that your teacher wants you to learn about when you are working on this activity?
Features that Define a Top Quality Assignment	What do you think that you need to do to get a gold star on your Lifecycle Booklet?	Can you tell me what you are going to do when you are working on this activity to make sure that you do a good job? Are you going to do anything special to make sure that you get a gold star?

Contextual Data Sources

Additional data collected as a part of this larger research project was gathered in order to provide a context for interpreting student responses.

Knowledge Test. The Knowledge Test was created to assess students' domain knowledge of the human and frog lifecycle. The Knowledge Test included 10 true/ false questions; questions targeted instructional concepts included in the online instructional material (i.e., Perry and colleagues Lifecycle Learning Kits; see Appendix G for full version of the Knowledge Test). Instructions for the Knowledge Test asked students to read the sentences about the human and the frog lifecycle and to select "true" if they believed the statement was accurate or "false" if they believed the statement was inaccurate. The option of "I don't know" was also available for students to select if they were unsure of the accuracy of the statement. This was done to get an indication of what students felt they really knew about the instructional concepts as opposed to students' best guess on the test.

The Knowledge Test was administered at two points in time; students completed the Knowledge Test before and after being introduced to the instructional material. Assessing students' domain knowledge before introducing students to the activity (Time 1) was essential for determining students' prior knowledge. Prior knowledge is an important cognitive condition that influences SRL and task understanding (Greene & Azevedo, 2007). Having a better understanding of domain knowledge prior to engaging in studying activities has been associated with better planning for the task and a selection of more appropriate strategies. When students are familiar with the instructional course concepts they are more likely to select deeper learning strategies than their counterparts with limited prior knowledge (Green & Azevedo, 2007). As such, having an indication of students' prior knowledge was important to assess before introducing students to the project task.

The Knowledge Test was also administered after students had completed reviewing the online instructional material (Time 2). Having students complete the Knowledge Test after learning the instructional concepts was done to get an indication of what students learned from the instructional material and the project task.

Scoring the Knowledge Test. Students' scores on the Knowledge Test were calculated by summing the number of correct statements identified as true/ false out of a possible score of ten. Statements the student left blank or marked as, "I don't know" were scored as incorrect for the overall Knowledge Test score. However, "I don't know" responses were tallied and examined separately.

Task Performance. Students' Lifecycle Booklets were used as a measure of task performance. Students were evaluated on the quality of individual work demonstrated in the Lifecycle Booklet.

Scoring Task Performance. The primary researcher evaluated students' Lifecycle Booklet. Results were used for research but not classroom grading purposes. Based on the instructions for the task and the primary researcher's expectations for how students would complete the Lifecycle Booklet, a preliminary grading rubric was created. This rubric took into account whether or not students were able to complete the task on their own, answer questions correctly, demonstrate an understanding of animal lifecycles, and transfer their knowledge of the human/ frog lifecycle to create their own novel animal and show how it changes across its lifespan.

Scoring task performance was completed in two stages. In the first stage, the primary researcher examined students' Lifecycle Booklets in relation to the primary grading rubric. Although the primary researcher was familiar with the task and task expectations, she was unfamiliar with students and their differing academic abilities. As such, it was important to review student work to confirm that the grading rubric was sensitive to differences in performance.

In Stage 2, the grading rubric was refined to increase its sensitivity to individual differences in performance (See Appendix H for full grading rubric). The primary researcher then used this grading rubric to give a score out of 3 to each lifecycle booklet.

It is important to note that while the Knowledge Test and students' performance on the Lifecycle Booklet are both an indication of academic success, these scores still represent different types of learning. The Knowledge Test represents students' understanding of domain knowledge and instructional concepts. On the other hand, students' scores on the Lifecycle Booklet reflect their performance particular to the assigned project task.

Classroom Observations. A research assistant made pen and paper observations about the on-going activities that unfolded in the classroom for all five instructional lessons. Using a classroom observation protocol, the research assistant made continuous notes throughout each session including time, what was generally occurring in the classroom, and any necessary comments about those classroom occurrences. Although the observation protocol had an open structure, the protocol prompted the observer to specifically record any (a) administered task instructions, (b) student interactions, (c) student questions and instructor responses, and (d) a general description of activities incorporated into the classroom that day (see Appendix I for full observation protocol).

As research was conducted in an authentic classroom environment, rather than a controlled laboratory setting, collecting observations as an additional piece of data may have been necessary to provide a context to explain results. As the classroom observations were not necessary for interpreting findings, examining this data was beyond the scope of this project.

Teacher Interview. The classroom teacher was interviewed in order to acquire a perspective of the task and lifecycle unit from students' regular instructor (see Appendix J for teacher consent and Appendix K for full interview protocol). Questions posed to the teacher were open-ended and paralleled those given to the students in the task understanding interview.

After completing the unit on animal lifecycles, the classroom teacher was interviewed once by the primary researcher in order to explore (a) her understanding of the task students were expected to complete (one explicit question; four implicit questions), (b) how this task differed from those normally assigned (four questions), (c) other lifecycle activities completed in the class that may influence student responding (two questions). Although information gathered in this interview was used to explain some findings, a more thorough examination of the data from the teacher interview is again out of the scope of this research project.

Procedure

The lifecycle unit and activity as well as related research took place over five, approximately one-hour long lessons, which occurred between students' recess and lunch break. Lessons were delivered on the same days and times each week. The primary investigator and three additional research assistants familiar with the research project, lesson unit, and data that would be collected implemented the activity (i.e., provided instruction and oversight for the activity). The teacher and two additional teaching assistants normally assigned to the class also supported students as they worked through the unit.

Equipment for the lesson and activity were set-up during students' recess break. Each student was provided with a tablet PC laptop. Tablet laptops were chosen because they do not require keyboarding skills and are relatively easy for children to use. All computers were logged in to nStudy, with the instructional material that would be covered in that day's lesson open on the screen. Students were asked to refrain from touching the computers until they had been given instructions for the daily task. Each day's session was structured similarly. Students entered the class, listened to the task instructions, and then used their own computer to read about the human or frog lifecycle and complete the associated worksheet in the Lifecycle Booklet.

Lesson 1 familiarized students with the researchers, computers/ web-based learning program (nStudy), as well as the instructional material (animal lifecycles) and the project task (Lifecycle Booklet). The Knowledge Test was administered first (lasting 10-15 minutes). Next, a short story about animal lifecycles was read to students as a class. This was done to introduce animal lifecycles and the common themes that would be discussed in the lifecycle unit. Finally, students were presented with the instructions for the Lifecycle Booklet. Instructions for the task were included as the first page of the Lifecycle Booklet so students could refer back to the task requirements. These instructions were also read to students before they began work on the task. Students then began using the computers to read about the first topic covered, the human lifecycle, and answer the related questions in the Lifecycle Booklet.

Interviews were conducted on the first and fifth day of research. Students were pulled from the lesson for interviews. It was not possible to interview students prior to the first lesson due to constraints on instructional time. On the second, third, and fourth sessions students continued to use the computers to learn about frog eggs, frog tadpoles, and frog needs and dangers respectively. Each day, additional worksheets were added to students' Lifecycle

Booklet that they were expected to complete. On the fifth day, students did not need to use the computer as they completed the transfer task where they created their own animal and made comparisons between its lifecycle and that of the frog. Similar to the first day of data collection, before working on the task, students completed the Knowledge Test to see what they had learned about the human and frog lifecycle (see Table 3).

Table 3

Summary of Instructional Task and Research Measures and when they are Completed

Activities/ Instruments	Day 1	Day 2	Day 3	Day 4	Day 5
Lifecycle Booklet	Human Lifecycle	New Life: Frog Eggs	Growth and Change: Tadpole and Adult Frog	Frog Needs and Dangers	Novel Animal (Transfer task)
PK Test	Yes- Before students begin working on task.	No	No	No	Yes- Before students begin working on the task.
Computer Survey (Parent & Teacher)	Yes- Before task is completed	No	No	No	No
Observation Protocol	Yes- For entire session.	Yes- For entire session.	Yes- For entire session.	Yes- For entire session.	Yes- For entire session.
Task Understanding Interview (Teacher)	No	No	No	No	Yes- After students completed entire task.
Task Understanding Interview (Students)	Yes—After students receive task instructions.	No	No	No	Yes—After students receive day's instructions.
Task Understanding Questionnaire (Students)	Yes—After Completing Day 1 activity.	Yes—After Completing Day 2 activity.	Yes—After Completing Day 3 activity.	Yes—After Completing Day 4 activity.	Yes—After Completing Day 5 activity.

Pilot Testing

Two rounds of pilot testing were conducted to ensure the materials used in this study were appropriate. The first pilot study was carried out with adult participants (*N*=2). Adult participants completed all aspects of research including finishing the Lifecycle Booklet, answering Knowledge Tests, task understanding interview questions, and the Task Understanding Questionnaires. This pilot test was done to ensure the activity and research materials were clear and could be accurately answered by an adult.

The second pilot test was conducted with a third grade student. Again the child participant completed the instructional task as well as all related research components. Conducting this second pilot study was again important to ensure a child similar in age to the students targeted in this research project could accurately understand the instructional material and assessments. After each round of pilot testing, instruments and procedures were modified to make them clearer.

Chapter 4

Findings

Three research questions were examined: (a) how accurate and complete are young students understanding of the explicit task features; (b) how accurate and complete are young students' understanding of the implicit task features; and (c) how does learning relate to young students' task understanding?

Performance on the Instructional Task

Descriptive statistics were calculated to explore trends in terms of students' performance on the project task, the Lifecycle Booklet. In general, students performed well on the task. Scores ranged from 1-3, with a mean of 2.23 (*SD* = .73; see Figure 4).

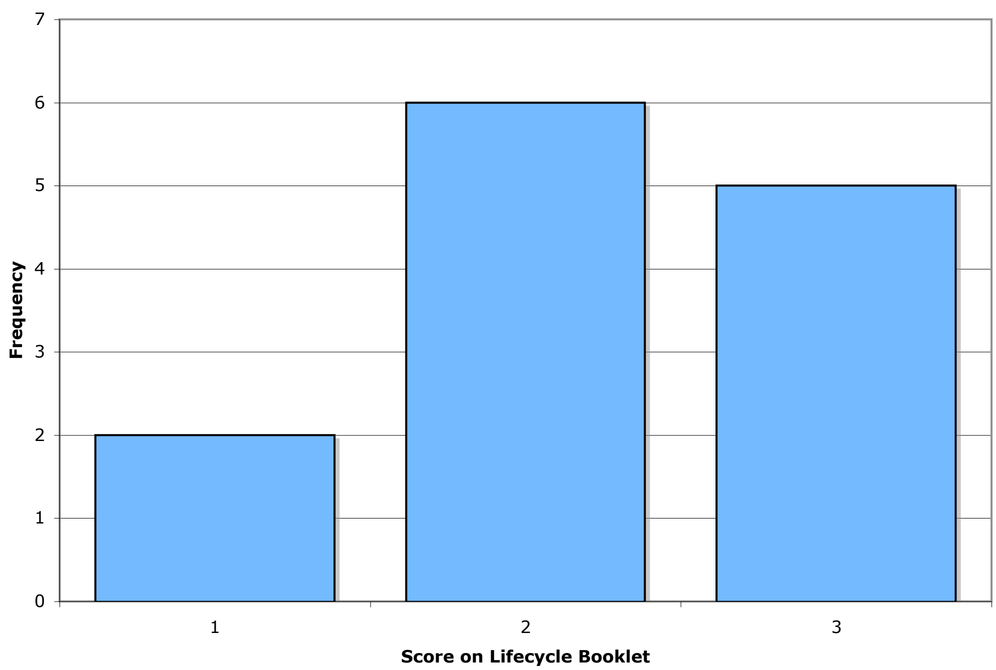

Figure 4. Historgram of students' performance scores on the Lifecycle Booklet. Students could receive a score of 1 (poor), 2 (moderate), or 3 (strong).

Qualitative examination of the Lifecycle Booklets indicated students were able to accurately and thoroughly answer worksheet questions for the daily tasks completed in instructional sessions 1 through 4. These questions asked students to select correct answers from the instructional material on the human and frog lifecycle. Conversely, students' responses to the transfer component of the Lifecycle Booklet (the final daily task) were often limited and lacked demonstrations of knowledge transfer. Students did not evidence using their knowledge about the human and frog lifecycle to infer what types of things their novel animal would need to grow and change. They also infrequently made comparisons between the lifecycle of their novel animal and the frog lifecycle.

As the majority of students performed well on the instructional task, there was limited variability for making comparisons between students' performance on the Lifecycle Booklets. Performance scores on the Lifecycle Booklet, however, may not be an appropriate measure of students' independent learning. The increased amount of individuals available to assist students on the task (i.e. four research assistants in addition to the teacher and two teaching assistants) and the mastery focus within the classroom meant all students received help when it was required. Students' high scores were likely inflated due to the high level of teacher support available while students were completing the Lifecycle Booklet.

Performance on Knowledge Tests

Conversely, students' Knowledge Tests scores may be a more accurate indicator of what students learned from the instructional unit as these tests were completed without instructor support. Scores on Knowledge Tests were examined to see if knowledge of instructional course concepts improved over the five-lesson unit. Findings indicate that before completing the project task (Time 1) students on average knew less than half of the tested material (M= 4.54, SD= 2.11). After exposure to the instructional unit (Time 2) students' scores substantially increased (M=7.38, SD= 1.26) verifying students were able to learn the important instructional concepts presented. A paired samples t-test confirmed there was a statistically significant difference between students' scores on the Knowledge Test at Time 1 and Time 2 ($t(12)=-5.64$, $p=.00$; $d=1.35$).

Students' selection of "I don't know" as a response option on Knowledge Tests was also compared at Time 1 and Time 2 (see Table 4). Although students did not frequently select this as a response option, results from a paired samples t-test indicated students were statistically more likely to select that they did not know an answer on the Knowledge test at Time 1 compared to Time 2 ($t(12)= 3.17$, $p=.01$; $d=0.80$).

Table 4

Descriptive statistics for Knowledge Tests at Time 1 and Time 2

	N	Min Score	Max Score	*Mdn*	*M(SD)*
Knowledge Test (Time 1)	13	2	8	4	4.54 (2.11)
Knowledge Test (Time 2)	13	5	9	7	7.38 (1.26)
"I don't Know" (Time 1)	13	0	8	2	3.15 (2.58)
"I don't Know" (Time 2)	13	0	4	0	1.08 (1.38)

Analysis Process

Due to the exploratory nature of this research, data was examined recursively and from multiple perspectives. One aspect of data analysis involved becoming familiar with students' responses to the Task Understanding Questionnaire and the task understanding interview. Students' scores on the TUQ were examined for students' accurate identification of target and seductive items. Initially composite TUQ scores were also calculated (i.e., combining student' identification of target and seductive items). These scores, however, were an inappropriate measure of students' task understanding. The number of target and seductive items were not equally matched within and across times on the TUQ. For example, for the question targeting students understanding of the implicit course concepts there were 3 target and 4 seductive items for Daily Task 1, but 2 target and 5 seductive items for Daily Task 2, Daily Task 3, and Daily

Task 4. If a composite score were calculated, more emphasis would be placed on students' recognition of seductive than target items. As such, TUQ scores continued to be examined separately as target and seductive items.

More qualitative descriptions of student profiles of responding to the Task Understanding Questionnaire were also created in order to understand how students were answering TUQ questions and what specific items students were actually selecting. Examining students responses in this way helped to elucidate that some students used strategies for answering the TUQ that involved identifying all items as either relevant or irrelevant for the task. Although scores on the TUQ for these students may appear to demonstrate accurate task understanding (e.g., by being able to identify target task features) in reality this strategy for answering the TUQ reflects poor task understanding. Becoming familiar with the data by examining students' responses to the TUQ from multiple perspectives was helpful for shedding light on how students were answering the TUQ and how task understanding accuracy on the TUQ should be scored and interpreted.

Students' responses to the task understanding interview were also reviewed. Students often did not elaborate on their responses to interview questions. For example, when one participant, Kevin, was asked about why the teacher thought it was important for him to complete the Lifecycle Booklet (purpose of the task) he responded with "so we can learn". When prompted by the interviewer about what he would be learning, he added to his answer "frogs and humans". Matthew provided a similar response to this question. When asked about the purpose of the Lifecycle Booklet, Matthew responded with "you can learn lots from it". Again, when the researcher tried to get the student to elaborate on his response Matthew added, "learn lots about frog lifecycles". Although these students' answers showed some understanding of the task, the limitedness of responses did not provide an in-depth representation of their task understanding. As such findings from the task understanding interviews are not reported here.

A second part of the data analysis process involved looking for potential patterns in terms of students' task understanding. Profiles were created for each student using graphic representations of their TUQ scores, Lifecycle Booklet Performance, and Knowledge Test scores. Students with similar patterns of task understanding were grouped together. As the relationship between task understanding and learning was also a research question this study aimed to address, patterns in task performance and Knowledge Test scores were also explored. Patterns between TUQ scores and students' task performance were difficult to find due to the high scores and limited variability in student performance. However, patterns were evident when comparisons were made between TUQ and Knowledge Test scores.

Specifically, students with similar TUQ profiles also appeared to perform similarly across Knowledge Test scores. While some students seemed to have a strong understanding of the instructional concepts right away (i.e., before exposure to instructional material), other students improved in their understanding. A third group of students appeared to struggle to evidence learning of the instructional concepts. Three knowledge groups were created, based on students' Knowledge Test median scores, to see if these initially observed patterns prevailed.

Knowledge Groupings. Accordingly, the groupings created for analysis purposes included a High Knowledge, Low Knowledge and Improver Group. Participants classified as High Knowledge (n= 4) scored at or above the Time 2 median score on both the Time 1 and Time 2 Knowledge Tests (i.e., participants scored 7 or above on both Knowledge Tests), demonstrating these participants had a strong understanding of the instructional concepts before and after completing the Lifecycle Booklet.

Participants classified as Low Knowledge (*n*=3) scored at or below the Knowledge Test median score at Time 1 and below the median at Time 2 (i.e., participants scored at or below 4 on the Time 1 Knowledge Test and below 7 on the Time 2 Knowledge Test). Finally, students classified as Improvers (*n*=5), scored at or below the Time 1 median score, and at or above the Time 2 median score (i.e., participants scored at or below 4 on the Time 1 Knowledge Test and at or above 7 on the Time 2 Knowledge Test; see Table 5). One student, with moderate knowledge, could not be classified according to the above-described criteria. Results for this participant have not been examined.

Importantly, all students showed knowledge gains from Time 1 to Time 2, with the smallest gains made by High Knowledge students who were already scoring above the Time 2 median at Time 1. While the magnitude of Time 1 to Time 2 knowledge gains was similar for the Low knowledge and Improver groups, students classified as Improvers also performed at or above the median at Time 2 indicating a strong grasp of learning concepts. In contrast, students in the Low Knowledge Group underperformed at Time 2 indicating a weaker grasp of the concepts.

Table 5

Breakdown of participants' Knowledge Test scores and classifications

Participant	Knowledge Test Time 1 (*Mdn*=4)	Knowledge Test Time 2 (*Mdn*=7)	Classification
Liam	2	5	Low Knowledge
Emily	4	6	Low Knowledge
Fred	4	6	Low Knowledge
Cheryl	2	7	Improver
Daniel	2	9	Improver
Ian	3	8	Improver
George	4	7	Improver
James	4	7	Improver
Matthew	5	7	Moderate Knowledge
Adam	7	8	High Knowledge

Hilary	7	8	High Knowledge
Kevin	7	9	High Knowledge
Ben	8	9	High Knowledge

Excluded TUQ Data. Although initially all five questions on the Task Understanding Questionnaire were examined, students' responses to two questions (required resources and features that define a top quality assignment) were more variable. An interview with the regular classroom teacher indicated that, although the Lifecycle Booklet was conceptualized as an individual task, students in the class would often seek help from classmates while working on school activities. Differences in terms of expectations specific to the task associated with research and strategies commonly used in the classroom for completing school activities may have interfered with students' responding to these questions. As such these questions were dropped from findings.

In addition, students' TUQ scores were only examined across the first four instructional sessions. Again, the first four daily tasks were similarly structured. Students used instructional material to answer questions about the human and frog lifecycle. The fifth daily task was used to assess transfer of students' learning, asking them to create their own imaginary animal and discuss its lifecycle. As the structure for this daily task differed from the first four and appeared to be more challenging for students, it was assumed to be inappropriate to compare students' TUQ scores for the fifth daily task to the first four.

Description of Patterns in Task Understanding Within Knowledge Groupings

High Knowledge Group. The High Knowledge Group included students Adam, Ben, Hilary, and Kevin. Students in the High Knowledge Group showed similar patterns of responding. Adam, Hilary and Kevin all tended to show accurate identification of target items. While initially these participants over identified seductive items as relevant for the task, Adam and Kevin improved in distinguishing seductive items over time. Hilary, on the other hand, continued to over identify seductive items as relevant for the task. Ben's pattern of responding to TUQ questions was more variable. Although sometimes Ben was able to recognize target items and avoid selecting seductive items, at other times he struggled to identify what was relevant/ irrelevant for the task. On the Task Understanding Questionnaire, Ben specifically had difficulty answering questions about the explicit task instructions and the instructional course concepts for the task. Ben did show a strong understanding of the task purpose (see Figure 5).

Explicit Task Understanding. For the TUQ question assessing students' understanding of the explicit task features, students had to identify four target items and avoid selecting four seductive items for the first daily task. For the second, third and fourth daily task there were two target and six seductive items. The High Knowledge Group generally showed accurate identification of target items on the TUQ question assessing explicit task features. Adam and Hilary identified all target items at times 2, 3, and 4 and Kevin identified all target items at times 3 and 4. Ben, on the other hand, fluctuated in his identification of target items over time. The item, "draw pictures of animals at different stages of the lifecycle" was a consistent target instruction across all instructional sessions. Ben, however, only recognized this as a target item at Time 3. As Ben only sometimes identified this item as relevant, his score for identifying target explicit task features varied.

Despite being able to recognize what was important for the task, students in this analysis group (High Knowledge Group) often struggled to distinguish task instructions that were unimportant. Initially, participants in the High Knowledge Group over identified half or more of the seductive items as relevant explicit task features. Although students in the High Knowledge Group could often distinguish more obvious seductive items (e.g., "practice using a computer"), seductive items that were more difficult for students in this group were those that reflected subtle shifts in daily task instructions as students learned about the different stages of the frog lifecycle. For instance, in the second instructional session, students learned about frog eggs. On the TUQ, in addition to identifying the target item ("answer questions about frog eggs"), students in the High Knowledge Group would also often identify seductive items such as, "answer questions about how tadpoles grow and change" (a task instruction for the third daily task) as a relevant task instruction.

Over time, Kevin improved at distinguishing seductive items. He also identified target items, indicating an improvement in explicit task understanding over time. Ben was variable in his identification of seductive items, as was Adam. Both Ben and Adam were unable to consistently distinguish seductive items indicating some difficulty in understanding explicit task features. Hilary continued to over identify explicit task items as relevant for the task across time. Although Hilary's score for identifying target items appeared to be a strong indicator of accurate task understanding, her responses to seductive items tell another story. In fact, Hilary indiscriminately identified all explicit task requirements as relevant (see Table 6; Figure 5).

Table 6

High Knowledge Groups' *identification of target and seductive statements of explicit & implicit task features*

	Explicit Target Items				Explicit Seductive Items				Summary
	Time 1 (4 Items)	Time 2 (2 Items)	Time 3 (2 Items)	Time 4 (2 Items)	Time 1 (4 Items)	Time 2 (6 Items)	Time 3 (6 Items)	Time 4 (6 Items)	
Adam	.50	1.00	1.00	1.00	.50	.33	.50	.33	Weak-Poor seductive
Ben	.75	.50	1.00	.50	.75	.17	.50	.17	Weak-Variable
Hilary	.75	1.00	1.00	1.00	.75	.83	1.00	.83	Weak –Everything relevant
Kevin	.75	.50	1.00	1.00	.50	.33	.33	.17	Improved- Identifying seductive

Note. When identifying target items, higher proportion scores indicate more accurate task understanding. When identifying seductive items, lower proportion scores indicate more accurate task understanding. (*N* Items) in the header row reflect the number of target/ seductive items.

	Implicit (Course Concepts) Target Items				Implicit (Course Concepts) Seductive Items				Summary
	Time 1 (3 Items)	Time 2 (2 Items)	Time 3 (2 Items)	Time 4 (2 Items)	Time 1 (4 Items)	Time 2 (5 Items)	Time 3 (5 Items)	Time 4 (5 Items)	
Adam	.67	1.00	1.00	1.00	.75	.60	.60	.40	Improved- Identifying seductive
Ben	.67	.00	.50	.50	.00	.20	.40	.20	Weak- Variable
Hilary	1.00	1.00	1.00	1.00	1.00	.60	1.00	.80	Weak –Everything relevant
Kevin	1.00	1.00	1.00	1.00	.75	.40	.40	.20	Improved- Identifying seductive

	Implicit (Purpose) Target Items				Implicit (Purpose) Seductive Items				Summary
	Time 1 (3 Items)	Time 2 (3 Items)	Time 3 (3 Items)	Time 4 (3 Items)	Time 1 (3 Items)	Time 2 (3 Items)	Time 3 (3 Items)	Time 4 (3 Items)	
Adam	1.00	1.00	1.00	1.00	.00	.00	.00	.00	Good- Identified target/ seductive
Ben	1.00	1.00	1.00	1.00	.00	.00	.00	.00	Good- Identified target/ seductive
Hilary	1.00	1.00	1.00	1.00	.33	1.00	1.00	1.00	Weak –Everything relevant
Kevin	1.00	1.00	1.00	1.00	.00	.00	.33	.00	Good- Identified target/ seductive

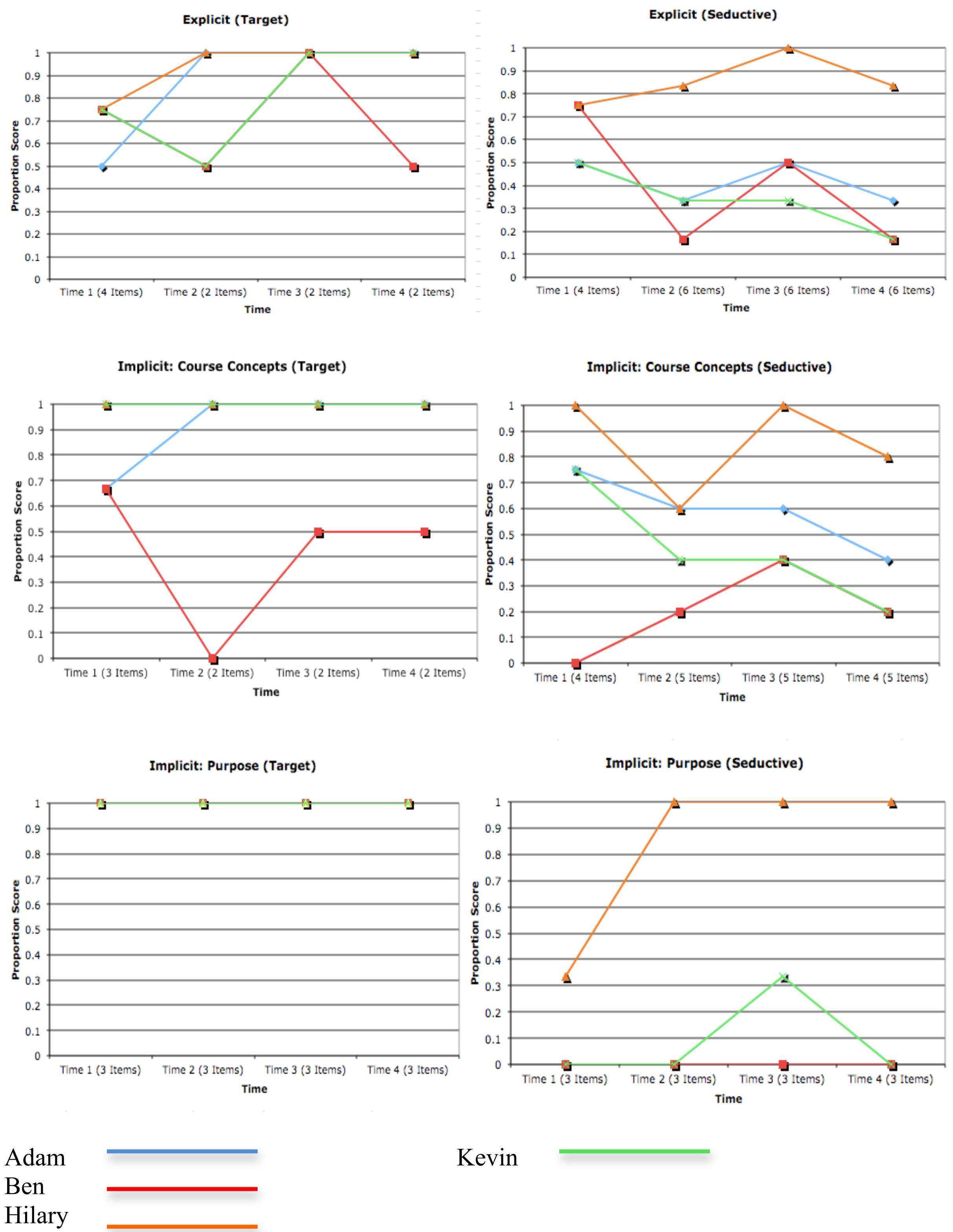

Figure 5. Graphic representation of High Knowledge Group's individual proportion scores on the TUQ.

Implicit Task Understanding (Course Concepts). The question assessing students' understanding of the instructional course concepts (an implicit task feature) was composed of three target items and four seductive items for the first daily task. For the second, third and fourth daily task students needed to identify two target items and five seductive items. In the High Knowledge Group, students Adam, Hilary, and Kevin were able to identify all target items times 2 through 4. Ben, on the other hand, struggled to identify target items. Ben was unable to identify either of the two target items at Time 2. At Time 3 and Time 4 Ben was able to identify 1 out of 2 target items. Ben continually missed identifying the target item "to learn that all animals go through lifecycles but how they grow and change across the lifecycle may be different" as a relevant course concept.

Although the High Knowledge Group generally appeared to be able to identify target items, they initially struggled to distinguish seductive items. For instance, at Time 1 students Adam, Hilary, and Kevin all identified over half the seductive items as relevant course concepts for the Lifecycle Booklet. Although Hilary continued to over identify seductive items as relevant throughout all four instructional sessions, Kevin and Adam began to distinguish between concepts that were relevant from those that were not relevant, misidentifying only 1 or 2 of 5 seductive ideas in the final instructional episode (Time 4). Again, Ben's profile of responding differs from other students in the High Knowledge Group. Ben increased in his identification of seductive course concepts. The actual items Ben selected varied across all four instructional episodes, indicating Ben struggled to understand the relevant and irrelevant instructional course concepts and how they shifted day to day (see Table 6; Figure 5).

Implicit Task Understanding (Purpose). For the question on the TUQ assessing students understanding of the task purpose, students had to identify three target items and avoid selecting three seductive items. Target and seductive items were consistent across all four instructional episodes. The High Knowledge Group evidenced a strong understanding of the purpose of the Lifecycle Booklet. This group consistently identified all target items.

Analysis of the seductive items helps to provide a more complete picture of students' understanding of the task purpose. Adam, Ben and Kevin rarely, if ever, identified a seductive task purpose as relevant. This indicates they could distinguish relevant task purposes from non-relevant task purposes throughout the instructional episodes. In contrast, Hilary's response profile (high target and high seductive) indicates she identified all task purposes as important and was unable to distinguish relevant from irrelevant purposes across all four instructional episodes. With the exception of Hilary, who consistently selected all task purposes as relevant, findings indicate the High Knowledge Group had a good understanding of the implicit purpose of the Lifecycle Booklet, and that this understanding was consistent over time (see Table 6; Figure 5).

Improvers. Students classified as Improvers (Cheryl, Daniel, George, Ian and James) often demonstrated similar patterns of task understanding. Although the majority of students in the Improver Group exhibited a weak understanding of the explicit task features, this group of students did display accurate task perceptions for the implicit task features. Students in the Improver Group often demonstrated accurate task understanding by consistently identifying target and distinguishing seductive items on the TUQ, or by improving in their identification of relevant/ irrelevant task features over time. Admittedly, one student (George) differed from students in the Improver Group by demonstrating weak task understanding across both explicit and implicit task features.

Explicit Task Understanding. To successfully evidence accurate explicit task understanding on the TUQ, students had to identify four target items and avoid selecting four seductive items on the first daily task. For the second, third and fourth daily tasks students had to shift their responses to the TUQ, identifying two target and avoiding six seductive items.

In responding to the TUQ question assessing explicit task understanding, Ian demonstrated an understanding of the target explicit task features; he identified all target items except for Time 3 where he missed identifying one target item, "answer questions about how tadpoles grow and change into big frogs". Participants Daniel and George improved in their identification of target explicit task features over time. Cheryl was more variable in her identification of explicit target items. Although Cheryl identified all target items at Time 2 and Time 3, at Time 1 she missed identifying two target instructions, "practice using a computer" and "draw pictures of animals at different stages of the lifecycle". At Time 4 she missed identifying one target item, "answer questions about what frogs need to grow and change". Finally, James struggled to identify target explicit task features. Except for Time 2, James continually neglected to recognize the target item "draw pictures of animals at different stages of the lifecycle" as a relevant task requirement.

Examining the Improvers identification of seductive items on the TUQ question assessing explicit task features provides a more complete picture of students' understanding of the task requirements. For example, Ian improved in his task understanding over time. Ian recognized relevant explicit task features, but improved at recognizing irrelevant task requirements. Ian shifted from misidentifying three out of four seductive items at Time 1 to only misidentifying one or two seductive items out of six in the third and fourth instructional sessions.

Cheryl, Daniel, and James' low scores for identifying seductive items suggest these students recognized irrelevant task instructions. Daniel's improvement in identifying target items and recognition of seductive items showed an improvement in explicit task understanding over time. However, Cheryl's varied identification of target explicit task features and James low identification of target task features indicate even though these students may recognize irrelevant task requirements they still struggled to understanding the explicit task features. George struggled to distinguish target and seductive items. Examining George's responses to the TUQ reveals that he struggled to refine his task perceptions over time. George selected all items related to the frog lifecycle as relevant explicit task requirements across time regardless of the focus of each daily task. With the exception of Daniel and James, who improved in their identification of the explicit task features over time, the majority of students in the Improver group struggled to evidence understandings of the explicit task requirements for the Lifecycle Booklet (see Table 7; Figure 6).

Table 7

Improvers' *identification of target and seductive statements of explicit and implicit task features*

	Explicit Target Items				Explicit Seductive Items				Summary
	Time 1 (4 Items)	Time 2 (2 Items)	Time 3 (2 Items)	Time 4 (2 Items)	Time 1 (4 Items)	Time 2 (6 Items)	Time 3 (6 Items)	Time 4 (6 Items)	
Cheryl	.50	1.00	1.00	.50	.00	.33	.17	.00	Weak- Variable target
Daniel	.50	.00	-	1.00	.25	.33	-	.33	Improved – Identifying target
George	.75	.50	1.00	1.00	.50	.67	.17	.50	Weak- Variable seductive
Ian	1.00	1.00	.50	1.00	.75	.50	.08	.17	Improved- Identifying seductive
James	.50	1.00	.50	.50	.25	.17	.08	.33	Weak- Poor target

Note. Cells left blank in tables reflect missing data due to student absence or participants not answering questions on the TUQ.

	Course Concept (Implicit) Target Items				Course Concept (Implicit) Seductive Items				Summary
	Time 1 (3 Items)	Time 2 (2 Items)	Time 3 (2 Items)	Time 4 (2 Items)	Time 1 (4 Items)	Time 2 (5 Items)	Time 3 (5 Items)	Time 4 (5 Items)	
Cheryl	.67	1.00	1.00	1.00	.00	.20	.20	.20	Good- Identified target/ seductive
Daniel	.67	1.00	-	1.00	.00	.40	-	.40	Good- Identified target/ seductive
George	.33	1.00	1.00	1.00	.25	.40	.40	.60	Weak- Poor seductive
Ian	1.00	.50	1.00	1.00	1.00	.60	.40	.20	Improved- Identifying seductive
James	.33	.50	.50	1.00	.50	.40	.40	.20	Improved- Identifying target/ seductive

	Task Purpose (Implicit) Target Items				Task Purpose (Implicit) Seductive Items				Summary
	Time 1 (3 Items)	Time 2 (3 Items)	Time 3 (3 Items)	Time 4 (3 Items)	Time 1 (3 Items)	Time 2 (3 Items)	Time 3 (3 Items)	Time 4 (3 Items)	
Cheryl	1.00	1.00	1.00	1.00	.33	.33	.00	.00	Good- Identified target/ seductive
Daniel	.67	1.00	-	1.00	.33	.00	-	.00	Good- Identified target/ seductive
George	1.00	.67	.67	.67	.67	.67	.67	.67	Weak –Everything relevant
Ian	1.00	1.00	1.00	1.00	.33	.67	.67	.67	Weak –Everything relevant
James	1.00	1.00	1.00	1.00	.33	.33	.00	.33	Good- Identified target/ seductive

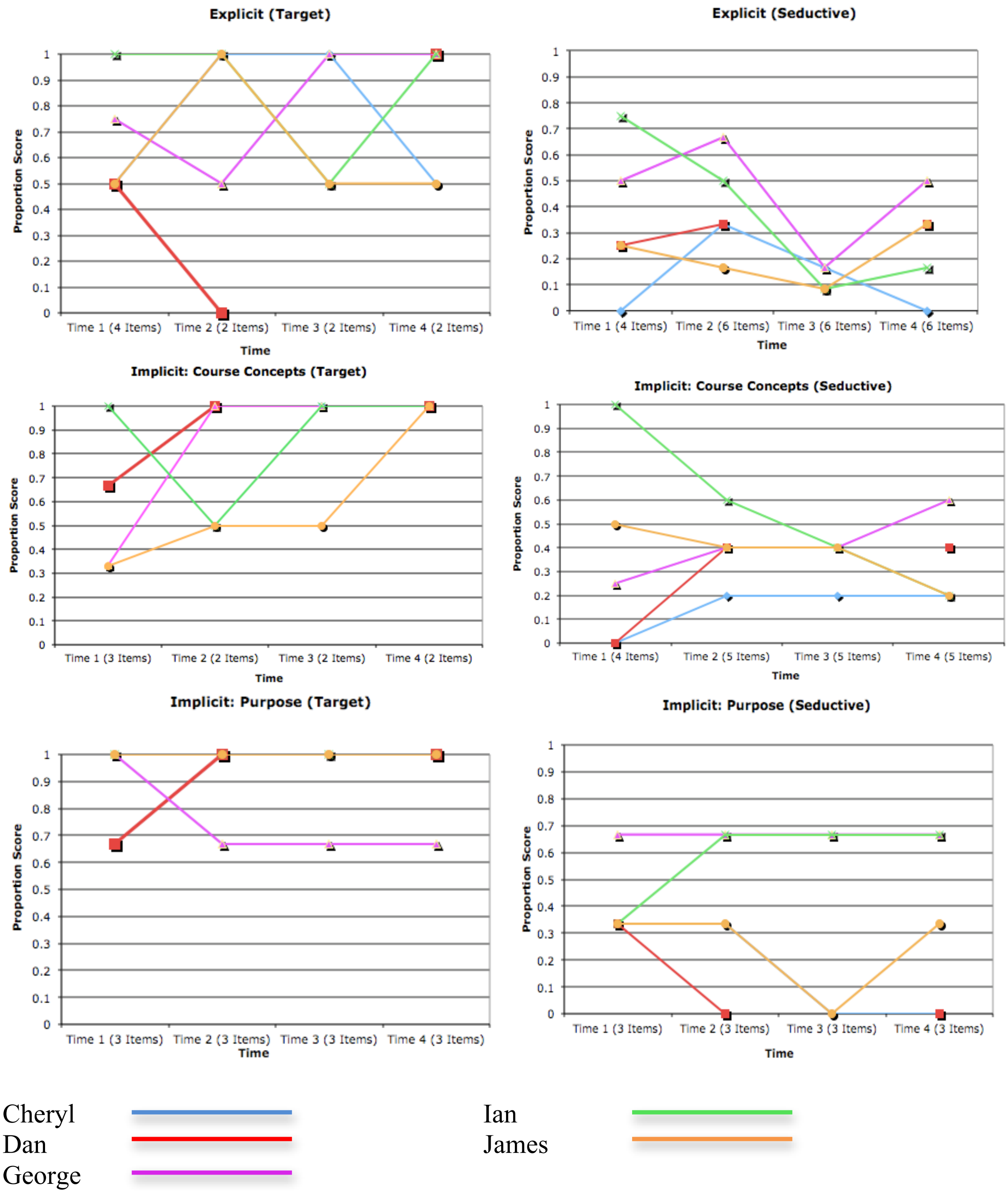

Figure 6. Graphic representations of Improvers' individual proportion scores on the TUQ.

Implicit Task Understanding (Course Concepts). On the TUQ question assessing students' understanding of the instructional concepts, students needed to identify three target items and avoid selecting four seductive items on the first daily task. For the second, third and fourth daily tasks students needed to identify two target items and avoid selecting five seductive items. Students Cheryl, Daniel, George and Ian all demonstrated they could identify relevant course concepts. James, on the other hand, improved over time at recognizing important instructional concepts for the task. In the first three instructional sessions, James struggled to recognize the item, "learn that all animals go through similar lifecycle stages even though how they grow and change across life may be different" as an important instructional concept. It was not until the fourth lesson that James showed a complete understanding of important instructional concepts by identifying all target items.

Examining the Improvers' selection of seductive items on this TUQ question elucidates Cheryl and Daniel had a strong understanding of the instructional course concepts required for the task. Not only were these students able to identify relevant course concepts, their low scores for identifying seductive items evidences they also recognized irrelevant course concepts. Students Ian and James improved at distinguishing seductive items over time. In the first instructional session Ian identified everything as a relevant course concept, at Time 4, however, Ian misidentified only one out of five seductive items. Although James also improved at distinguishing target and seductive instructional concepts, he consistently identified the item, "learn about how frog tadpoles change into adult frogs" as a relevant course concept even though it was only a target instructional concept for the third daily task.

Unlike other participants in the Improver Group, George increased in his identification of seductive course concepts. Over time, George began to over identify almost all items (whether target or seductive) as relevant, indicating he struggled to understand the implicit course concepts targeted in the Lifecycle Booklet. With the exception of George, students in the Improver group were able to demonstrate an understanding of the implicit task features by either being able to recognize relevant/ irrelevant instructional concepts or by improving in their recognition of instructional concepts over time (see Table 7; Figure 6).

Implicit Task Understanding (Purpose). In order to evidence a strong understanding of the purpose of the Lifecycle Booklet, students had to identify three target items and avoid selecting three seductive items on the TUQ questions assessing task purpose. Students Cheryl, Daniel, Ian, and James identified all target purposes for the Lifecycle Booklet from Time 2 to Time 4. Although George identified all target items at Time 1, in the remaining three instructional sessions George struggled to recognize the target item, “to learn about the different stages of the human and frog lifecycle” as a relevant purpose of the Lifecycle Booklet.

Examining the Improver’s identification of seductive items helps to clarify that while Cheryl, Daniel, and James evidenced accurate understanding of the implicit purpose, Ian and George struggled. In addition to recognizing target/ relevant purposes of the task, Cheryl, Daniel, and James also distinguished irrelevant purposes. These students in the Improver Group often misidentified only one or none of the seductive items. On the other hand, Ian and George often over identified seductive items as relevant purposes for the Lifecycle Booklet. For example, both Ian and George thought a relevant purpose of the Lifecycle Booklet was “to show that computers can teach you a lot about animals”. Ian also consistently identified “to practice drawing animals” as a relevant task purpose. Ian and George’s high scores for identifying target and seductive items indicate these students identified all items as important and were not distinguishing between relevant and irrelevant purposes of the Lifecycle Booklet. With the exception of Ian and George, the remaining students classified as Improvers showed a strong understanding of the task purpose (see Table 7; Figure 6).

Low Knowledge Group. The Low Knowledge Group (students Emily, Fred, Liam) struggled to evidence accurate task understanding of the explicit and implicit task features. Students in the Low Knowledge Group often showed different profiles of responding to the Task Understanding Questionnaire. While Emily varied in her identification of target and seductive items, Fred and Liam relied on strategies for answering TUQ questions that involved either identifying the majority of items as relevant or as irrelevant (see Table 8; Figure 7).

Explicit Task Understanding. To demonstrate accurate explicit task understanding, students needed to adjust their understanding of the target and seductive task requirements to align with the focus of the daily task. For the first daily task students needed to identify four target items and avoid selecting four seductive items. Students needed to identify two target items and avoid selecting six seductive items on the second, third, and fourth daily task.

Emily's identification of explicit target items varied. At Time 1 and 4 Emily identified all target items; however, she struggled to accurately identify target items at Time 2 and Time 3. In the second and third instructional session, the only item Emily identified as a relevant task instruction was, "answer questions about how tadpoles grow and change into big frogs". As this was a target item for the third daily task, for this instructional session Emily identified one out of two target items correctly. At both Time 2 and Time 3 Emily missed identifying the target task requirement, "draw pictures of animals at different stages of the lifecycle". At Time 2 Emily also missed identifying the target item, "answer questions about frog eggs".

Fred and Liam showed very different scores for identifying explicit target items. Fred improved in his identification of target items over time. By the third instructional session Fred was selecting all relevant task requirements. Conversely, Liam struggled to recognize relevant task requirements. Except for the third instructional session, in which Liam accurately identified the target item “draw pictures of animals at different stages of the lifecycle”, Liam continually failed to identify any of the relevant target task requirements for the Lifecycle Booklet.

Both Emily and Liam had low scores for identifying seductive items on the TUQ question assessing explicit task features. Fred’s high score for identifying seductive items indicates he was not distinguishing between relevant and irrelevant task requirements. Although Fred’s high scores for identifying target items appears to indicate accurate explicit task understanding, his high seductive scores for identifying seductive items demonstrate a pattern of responding to the TUQ that involves selecting almost all items as relevant task requirements.

While Liam and Emily did avoid selecting seductive items, Emily’s variable score for identifying target items suggests she still struggled to fully understand explicit task instructions. Liam’s low scores for identifying both target and seductive items, indicates a pattern of responding to the TUQ that involved identifying the majority of items as irrelevant task requirements. Although all students in the Low Knowledge Group showed different profiles of responding, they all nevertheless showed a weak understanding of the task requirements for the Lifecycle Booklet (see Table 8; Figure 7).

Table 8

<u>Low Knowledge Group's</u> *identification of target and seductive statements of explicit & implicit task features*

	Explicit Target Items				Explicit Seductive Items				Summary
	Time 1 (4 Items)	Time 2 (2 Items)	Time 3 (2 Items)	Time 4 (2 Items)	Time 1 (4 Items)	Time 2 (6 Items)	Time 3 (6 Items)	Time 4 (6 Items)	
Emily	1.00	.00	.50	1.00	.00	.17	.00	.17	Weak- Variable (target)
Fred	.75	.50	1.00	1.00	.50	.67	.67	.83	Weak- Everything relevant
Liam	.00	.00	.50	.00	.00	.33	.00	.00	Weak- Everything irrelevant

Note. Cells left blank in tables reflect missing data due to student absence or participants not answering questions on the TUQ.

	Course Concept (Implicit) Target Items				Course Concept (Implicit) Seductive Items				Summary
	Time 1 (3 Items)	Time 2 (2 Items)	Time 3 (2 Items)	Time 4 (2 Items)	Time 1 (4 Items)	Time 2 (5 Items)	Time 3 (5 Items)	Time 4 (5 Items)	
Emily	-	.00	1.00	.50	-	.00	.40	.20	Weak- Variable
Fred	-	.50	.50	1.00	-	.60	.60	.60	Weak- Everything relevant
Liam	.33	.00	.00	.00	.00	.00	.00	.00	Weak- Everything irrelevant

	Task Purpose (Implicit) Target Items				Task Purpose (Implicit) Seductive Items				Summary
	Time 1 (3 Items)	Time 2 (3 Items)	Time 3 (3 Items)	Time 4 (3 Items)	Time 1 (3 Items)	Time 2 (3 Items)	Time 3 (3 Items)	Time 4 (3 Items)	
Emily	-	1.00	1.00	.67	-	.33	.33	.33	Good- Identified target/ seductive
Fred	1.00	1.00	1.00	1.00	.00	1.00	1.00	.67	Weak- Everything relevant
Liam	.33	1.00	.00	.00	.33	.33	.33	.33	Weak- Everything irrelevant

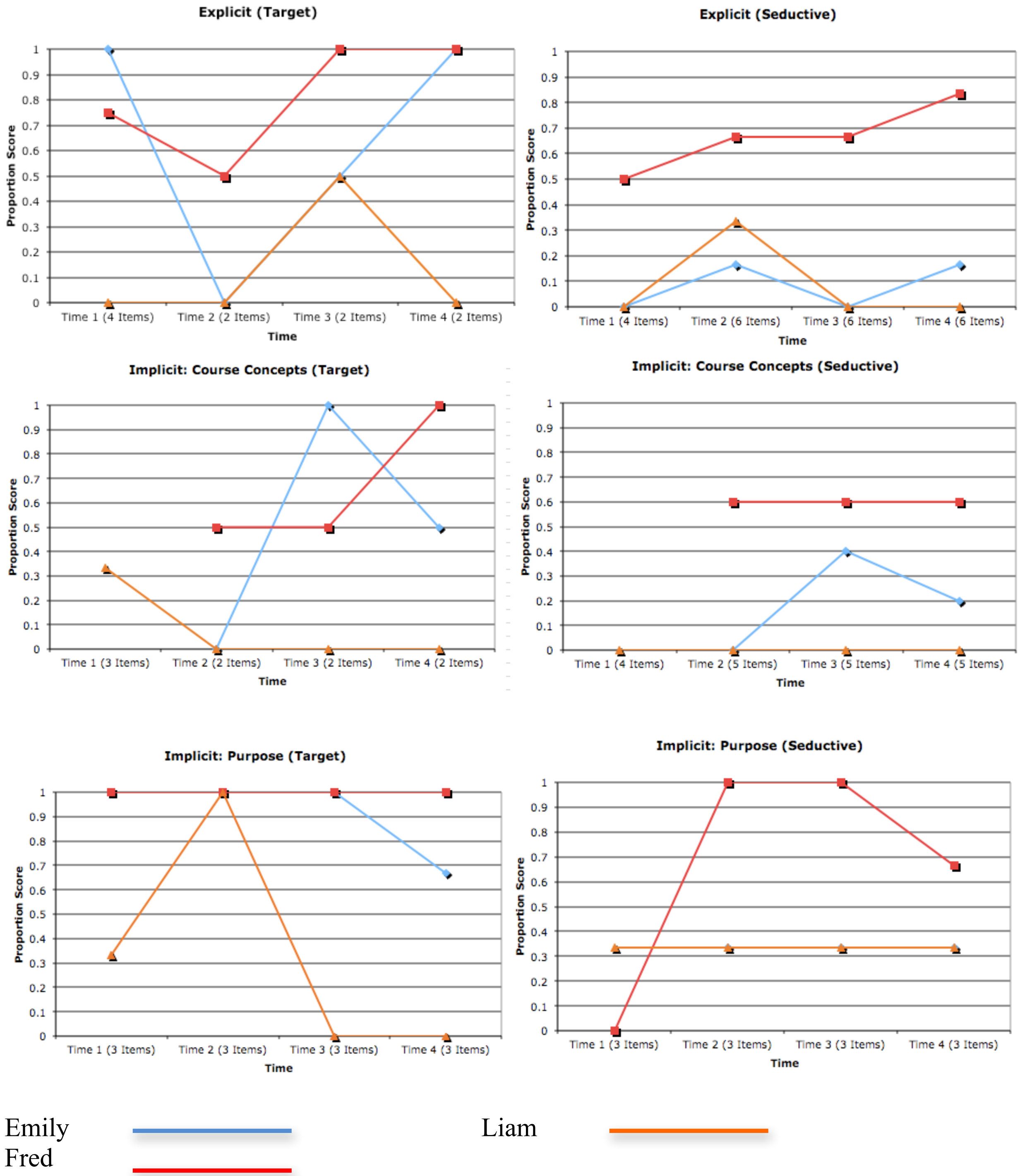

Figure 7. Graphic representations of the Low Knowledge Group's individual proportion scores on the TUQ.

Implicit Task Understanding (Course Concepts). Students in the Low Knowledge Group showed weak task understanding of the instructional concepts targeted in the Lifecycle Booklet. For this question on the Task Understanding Questionnaire, students needed to identify three target and four seductive items in the first instructional session, and two target and five seductive items for the remaining instructional sessions.

Again, students in the Low Knowledge Group showed different profiles of responding to the TUQ. Emily evidenced poor task understanding of the instructional concepts. Although Emily often avoided selecting seductive items as relevant course concepts for the task, her scores for identifying target items fluctuated. This suggests Emily struggled to consistently recognize important instructional course concepts for the task. Examining the responses Emily selects on the TUQ emphasizes this weak task understanding. For instance, in the second instructional session, Emily identified all items, whether target or seductive, as irrelevant for the task. This response is in contrast to her responding to the TUQ in the third instructional session in which she identified the majority of items as relevant instructional concepts.

Liam also struggled to recognize relevant instructional concepts for the task. Although at Time 1 Liam recognized the target concept, "learn about the different stages of the human lifecycle", for the remaining instructional sessions he identified all items as irrelevant.
In contrast, Fred had high scores for identifying target items, but also high scores for selecting seductive items. These scores reflect that, rather than distinguishing seductive from target items, Fred identified almost everything as a relevant instructional concept.

These differing response patterns suggest that while students sometimes identified target course concepts or avoided identifying seductive items, the Low Knowledge Group had a weak understanding of the implicit course concepts and how they changed with the task day to day (see Table 8; Figure 7).

Implicit Task Understanding (Purpose). Out of participants in the Low Knowledge Group, Emily had the strongest understanding of the implicit purpose for the Lifecycle Booklet. In order to evidence an accurate understanding of the task purpose, students needed to identify three target and three seductive items that were consistent across all instructional sessions. Although Emily missed answering this question in the first instructional session, at Time 2 and Time 3 Emily identified all target items. At Time 4 Emily missed identifying the target item, "to learn about the different stages of the human and frog lifecycle". Fred's scores for identifying target items were also high. Fred identified all target items across all four instructional sessions. Liam's scores for identifying target items were low. Although at Time 2, Liam identified all three target items, in the last two instructional sessions he was unable to identify any target items. These scores indicate Liam lacked awareness as to why he was being asked to complete the Lifecycle Booklet.

Emily's low scores for identifying seductive items helps to evidence her strong understanding of the task purpose. In addition to recognizing the important reasons for her teacher assigning the Lifecycle Booklet, Emily was also able to recognize irrelevant task purposes. Across all four instructional session, Emily avoids selecting two out of three seductive items. The seductive item Emily did continually select was, "to show that computers can teach you a lot about animals". This seemed to be a particularly seductive purpose for students in the Low Knowledge Group as both Liam and Fred also identified this non-target item as a relevant purpose of the Lifecycle Booklet. Indeed, this is the one item Liam identified as a relevant task purpose across all instructional sessions, even though his low scores for identifying target and seductive items suggest a pattern of responding that involves identifying most items as irrelevant for the task.

In contrast to Emily and Liam, Fred had high scores for identifying seductive task purposes. Fred's high scores for identifying target and seductive items indicate he over identified items as relevant purposes for the task. Indeed, at Time 2 and Time 3 Fred identified all items as a relevant task purpose. These scores suggest Fred struggled to develop an accurate understanding of the purpose or why he was expected to complete the Lifecycle Booklet (see Table 8; Figure 7).

A Comparison of Task Understanding Between Knowledge Groups

Comparisons were made between the High Knowledge Group, Improvers, and Low Knowledge Group's understanding of the explicit and implicit task features. Comparisons indicate students had the most difficulties identifying explicit task features. Students in the High Knowledge Group and the Improvers, however, often showed a more accurate understanding of the implicit task features including an awareness of the instructional concepts and especially the task purpose. The Low Knowledge Group struggled to understand both the explicit and implicit task features.

Explicit Task Understanding. The majority of students in the High Knowledge Group, the Improvers, and the Low Knowledge Group struggled to evidence accurate understanding of the explicit task features. In the High Knowledge Group Kevin was the only individual to demonstrate an understanding of the task requirements, identifying target items and improving in recognizing seductive items over time. Adam, Ben and Hilary, however, struggled to demonstrate an accurate understanding of the task requirements. Adam and Ben as they varied in their responding to the TUQ question assessing explicit task features, and Hilary as she selected almost all items, target and seductive, as relevant explicit task requirements.

The majority of students in the Improver Group showed a weak understanding of the explicit task features. For example, students Cheryl and George were variable in their responding to this TUQ question. While Cheryl was only sometimes able to identify target items, George struggled to consistently avoid selecting seductive items. James also showed weak task understanding for the explicit task features as he often missed identifying target task requirements. However, Ian and Daniel were two students in the Improver Group who improved over time in their recognition of explicit target and seductive items.

Finally, similar to the High Knowledge and the Improver Groups, students in the Low Knowledge Group struggled to evidence an accurate understanding of the explicit task features. Participants Liam and Fred used the same strategy for answering TUQ across time. Liam identified the majority items on the TUQ as irrelevant while Fred identified almost all items as relevant for the task. Emily, on the other hand, varied in her identification of target explicit task features suggesting she struggled to recognize relevant requirements for the Lifecycle Booklet (see Table 9).

Table 9

Comparison of High Knowledge, Improvers, and Low Knowledge Groups' explicit task understanding

	Explicit Task understanding		
	Good	Improved	Weak
High Knowledge Group		• **Kevin** (Identified target and improved at distinguishing seductive items)	• **Adam** (Varied identification of seductive items) • **Ben** (Varied in identification of target and seductive items) • **Hilary** (Over identified all items as relevant for the task)
Improvers		• **Daniel** (Improved in identification of target items; consistent in low identification of seductive) • **Ian** (Strong understanding of target items; improved in recognition of seductive items)	• **Cheryl** (varied in identification of target items) • **George** (Over identified items as relevant for the task) • **James** (Varied in identification of target and seductive items)
Low Knowledge Group			• **Emily** (Varied in identification of target items) • **Fred** (Identified majority of items as relevant) • **Liam** (Identified majority of items as irrelevant)

Implicit Task Understanding (Course Concepts). Students in the High Knowledge Group were split in their ability to evidence accurate task understanding for the instructional course concepts. Out of the four students that the High Knowledge Group was comprised of, two students showed improved understanding of the instructional concepts while the two showed poor understanding. Students Adam and Kevin identified target implicit course concepts and improved at distinguishing seductive items over time. Ben and Hilary struggled to understand the implicit course concepts. Ben was variable in his identification of target and seductive items. Hilary, on the other hand, tended to over identify the majority of course concepts as relevant for the task.

In contrast, the majority of students in the Improver Group showed accurate understanding of the implicit course concepts. While Cheryl and Daniel demonstrated good task understanding (i.e., identified target items and distinguished seductive items), Ian and James improved in their understanding of the implicit course concepts over time. George struggled to understand the implicit course concepts. Over time, George increased in his identification of seductive items as relevant for the task.

The Low Knowledge Group struggled to understand the implicit course concepts. While Liam identifies all course concepts as irrelevant, Fred identifies almost all items as relevant. Again, Emily was variable in her identification of target and seductive items (see Table 10).

Table 10

Comparison of High Knowledge, Improvers, and Low Knowledge Groups' understanding of the implicit course concepts

	Implicit Course Concepts		
	Good	Improved	Weak
High Knowledge Group		• **Adam** (Identified target and improved at distinguishing seductive items) • **Kevin** (Identified target and improved at distinguishing seductive items)	• **Ben** (Varied in identification of target and seductive items) • **Hilary** (Over identified all items as relevant for the task)
Improvers	• **Cheryl** (Identified target and distinguished seductive items) • **Daniel** (Identified target and distinguished seductive items)	• **Ian** (Strong Understanding of target items; improvement in recognition of seductive items • **James** (Improved in identification of target and seductive items)	• **George** (Increased in his over identification of seductive items as relevant course concepts)
Low Knowledge Group			• **Emily** (Varied in identification of target and seductive items) • **Fred** (Identified almost all items as relevant) • **Liam** (Identified almost all items as irrelevant)

Implicit Task Understanding (Purpose). Both the High Knowledge Group and the Improvers demonstrated a strong understanding of the implicit purpose of the Lifecycle Booklet. In the High Knowledge Group, Adam, Ben and Kevin identified all target items and distinguished seductive items. Hilary continued to over identify all items as relevant task purposes.

Students in the Improver group also showed a strong understanding of the implicit purpose. Participants Cheryl, Daniel, and James all identified target and distinguished seductive items on the TUQ question assessing students' understanding of the implicit purpose of the Lifecycle Booklet. Participants in this group that struggled to understand the implicit purpose included George and Ian. George and Ian over identified items (whether target or seductive) as relevant for the task.

The Low Knowledge Group struggled to understand the implicit purpose of the Lifecycle Booklet. Again, Liam continued to employ a selection strategy for answering the TUQ that involved identifying the majority of items as irrelevant. Fred, on the other hand, identified the majority of items on the TUQ as relevant for the task. Although also in the Low Knowledge Group Emily did evidence an understanding of the implicit purpose of the task as she identified target and distinguished seductive items (see Table 11).

Table 11

Comparison of High Knowledge, Improvers, and Low Knowledge Groups' understanding of the implicit purpose

	Implicit Task Purpose		
	Good	Improved	Weak
High Knowledge Group	• **Adam** (Identified target and distinguished seductive items) • **Kevin** (Identified target and distinguished seductive items) • **Ben** (Identified target and distinguished seductive items)		• **Hilary** (Over identified all items as relevant for the task)
Improvers	• **Cheryl** (Identified target and distinguished seductive items) • **Daniel** (Identified target and distinguished seductive items) • **James** (Identified target and distinguished seductive items)		• **George** (Over identified items as relevant course concepts) • **Ian** (Over identifies items as relevant course concepts)
Low Knowledge Group	• **Emily** (Identifies target and distinguished seductive items)		• **Fred** (Identified almost all items as relevant) • **Liam** (Identifies almost all items as irrelevant)

Chapter 5

Discussion

As little research has specifically examined young students' task understanding, the aim of this study was to explore grade two students' perceptions about a series of four instructional tasks within an animal lifecycles module. Findings indicated that task understanding accuracy varied greatly amongst students in this study. Furthermore, for those students in this study who had limited prior knowledge, developing accurate task understanding was found to be important for successful learning. Perhaps most importantly, this study revealed new methods for measuring task understanding in young children.

Young Students' Task Understanding Accuracy

It has been theorized that as elementary students are new learners and novices in terms of their experiences with academic tasks, these students may have misrepresentations of task expectations (Paris & Newman, 1990). However, current findings indicate even young students are able to develop accurate task perceptions. Understanding the instructional purpose of an assignment has been described as one of the foundational components of task understanding (Butler & Cartier, 2004; Hadwin, 2006). Although grade two students have had limited opportunities to experience a multitude of tasks, seven out of the twelve students participating in this study demonstrated accurate task perceptions for the purpose of the Lifecycle Booklet across all four instructional sessions.

Nevertheless, for the young students in this study, task understanding accuracy varied. While some students were consistent in their accurate task perceptions, others improved at recognizing explicit and implicit task features over time. Finally, others still, struggled to accurately interpret task perceptions (see Table 12). For example, Cheryl and Dan were two students from the Improver Group who demonstrated accurate task understanding of the implicit task features (instructional concepts and task purpose). Across all four instructional sessions these students identified target items and avoided selecting seductive items. Students like Liam or Fred (Low Knowledge Group) demonstrated weak task perceptions. These students used strategies for responding to the TUQ that involved selecting almost all items as either relevant or irrelevant for the task.

An important finding was young students from this study frequently improved in their task understanding accuracy over time. In this study, improved task understanding resulted in an accurate recognition of relevant but also irrelevant task instructions over the course of the four instructional sessions. For some students, improvement in task understanding accuracy included becoming better at recognizing both relevant *and* irrelevant task features. For example, James, from the Improver Group, became better over time at identifying target and avoiding seductive implicit course concepts. For other students who were able to identify relevant task features, task understanding accuracy improved because these individuals became better at recognizing specifically seductive items. An example of this is Adam's (High Knowledge Group) consistent recognition of target explicit task features, but improved awareness of what explicit task features were not pertinent task instructions.

Although there was variability in students' task understanding, examining students' responses according to analysis groups (i.e., High Knowledge, Improver, Low Knowledge) helped to elucidate patterns evident in task understanding accuracy. Specifically, the majority of students in the High Knowledge, Improver, and Low Knowledge Group struggled to understand the explicit task features. Students in the Improver Group seemed to show an understanding of the implicit course concepts and the task purpose. While the High Knowledge Group also showed a strong understanding of the task purpose, students were split in their ability to show accurate task perceptions for the instructional course concepts. Compared to the Improvers and the High Knowledge Group, the Low Knowledge Group showed weak task understanding for both explicit and implicit task features (see Table 12).

Importantly, the young students in this study rarely evidenced *perfectly* accurate task understanding (i.e., students rarely identified all target items and avoided selecting all seductive items across time). Findings from this study add to previous research by illustrating students of any age can struggle to develop accurate task perceptions. For instance, even at a post-secondary level, where students have had the opportunity to experience a host of academic tasks, students still struggle to develop accurate and thorough task perceptions (Hadwin et al., 2008; Jamieson-Noel, 2004; Miller, 2009; Oshige, 2009).

Taken together, these findings suggest that for these students, much like older students in previous studies, developing accurate task perceptions can pose challenges. Future research needs to continue exploring why certain students may struggle to develop accurate task perceptions and how best to support the development of accurate task understanding with students at any age.

Table 12

High Knowledge, Improvers, and Low Knowledge Group's task understanding accuracy

	Knowledge Test Performance		
	High Knowledge	Improved	Low Knowledge
Explicit			
Good			
Improved	Kevin	Daniel Ian	
Weak	Adam Ben Hilary	Cheryl George James	Emily Fred Liam
Implicit Course Concepts			
Good		Cheryl Daniel	
Improved	Adam Kevin	Ian James	
Weak	Ben Hilary	George	Emily Fred Liam
Implicit Purpose			
Good	Adam Kevin Ben	Cheryl Daniel James	Emily
Improved			
Weak	Hilary	George Ian	Fred Liam

Young Students' Task Understanding and Learning

Supporting students in their development of accurate task understanding is particularly important in light of the relationship between task understanding and academic success (Hadwin et al., 2008; Miller, 2009; Oshige, 2009). Theoretically task understanding is conceptualized as important for academic success as it directs students along an appropriate path for completing the task. Findings, from this study with younger students also suggest a relationship between task understanding and learning.

Findings from this cross case analysis indicated students who successfully learned instructional concepts also evidenced accurate task understanding, particularly for the implicit task features. Conversely, students who displayed weak task understanding struggled to demonstrate successful learning. This finding is most clearly illustrated when task understanding accuracy and Knowledge Test scores are compared between the Improver and the Low Knowledge Group. Although initially the Improvers had limited prior knowledge, these students performed well on the second Knowledge Test, indicating successful learning of the course concepts targeted in the instructional unit. The majority of students in the Improver Group also developed accurate task perceptions of the implicit task features. While the Low Knowledge Group is similar to the Improvers in that they also had limited prior knowledge before exposure to the instructional material, these students were unsuccessful in their learning of important course concepts. The Low Knowledge Group also struggled to develop accurate task perceptions.

For the High Knowledge Group, the relationship between task understanding and learning appeared different. There was often a split in the High Knowledge Group between students who evidenced strong or improved task understanding (e.g., Adam and Kevin) and students who exhibited weak task understanding (e.g., Ben and Hilary). Regardless of students' task understanding, participants in the High Knowledge Group showed continued high understanding of the instructional course concepts.

That some students classified within the High Knowledge Group demonstrated strong task understanding corresponds with SRL and task understanding theory and research. Having strong prior knowledge is seen as an important cognitive condition for developing an accurate representation of the task (Greene & Azevedo, 2007; Winne & Hadwin, 1998). However, it may be that for students who already have a strong understanding of the instructional material, developing accurate task perceptions may not be as important as for students with weak prior domain knowledge.

Together these findings suggest developing an accurate understanding of an assignment may be important for successful learning primarily for those students with limited prior knowledge. Developing accurate task understanding may help to compensate for low domain knowledge, as in the case of the Improver Group (see Figure 8). These findings corroborate results from research with older students. Oshige (2009), for example, found implicit task understanding, in post-secondary students, was a significant predictor of academic performance, even when university entrance grades (assumed to be an indication of prior knowledge) were controlled. Oshige argues for the importance of these findings, suggesting that developing an understanding of the implicit task features may help to compensate for low prior knowledge.

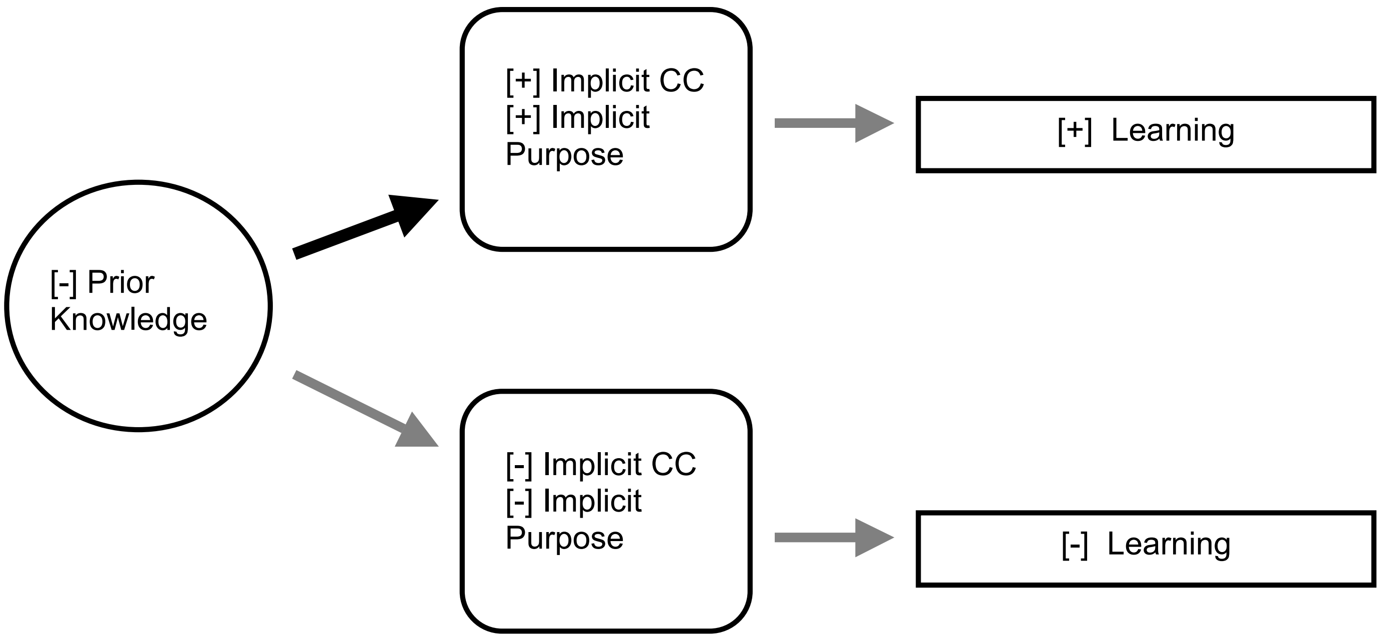

Figure 8. Influence of Task Understanding on Learning

Admittedly, there were students whose task perceptions and Knowledge Test scores did not align with the observed relationship between accurate task understanding and successful learning. In particular, George, a student classified within the Improver Group, showed weak task understanding for the explicit and implicit task features. Although evidence from this study suggests George did not develop an accurate perception of the task, he still nevertheless showed improved knowledge of the instructional concepts. In contrast, a student from the Low Knowledge Group, Emily, demonstrated accurate task understanding for the implicit task purpose. While in some cases she displayed accurate task understanding Emily nonetheless did not evidence successful learning of the instructional material.

Another interesting findings was explicit task understanding was a task feature for which few students in this study showed a strong understanding, regardless of whether they were classified within the High Knowledge, Improver, or Low Knowledge Group. As few students demonstrated accurate explicit task perceptions, yet most students improved in their understanding of the instructional concepts, it appears as if explicit task understanding may not be as important for learning as implicit task understanding. This aligns with past research that found explicit task understanding did not independently contribute to academic performance, while strong implicit task understanding was a predictor of success (Oshige, 2009).

The influence of explicit task understanding on learning should, however, be interpreted with caution. As explicit task understanding includes requirements/ instructions particular to the assigned task, this component of task understanding may have a larger influence on academic success when success is measured by task performance as opposed to Knowledge Test scores. Future research needs to continue exploring the relationship between task understanding and learning in order to more fully understand when/how explicit and implicit task understanding may influence learning. Also, why some students (e.g., George/ Emily) may not show typical patterns of learning based on accuracy of task perceptions.

Measuring Task Understanding In Young Students

The Task Understanding Questionnaire, developed for the current study, was a useful measure for examining young students' task perceptions. This measure of task understanding is unique as students answered the same questions each day, but correct responses to questions assessing the explicit task instructions and the implicit course concepts changed in accordance with the focus of the daily task. This approach provides a way to examine whether students monitor and adapt their task understanding to align with specific task instructions.

Scoring of the TUQ also conceptualized task understanding accuracy in a new way as students were given a score for identifying target task features, but also for distinguishing seductive features. Theoretically, both scores should be important; identifying target items should help students attend to the important task instructions, while avoiding seductive items should help the student attend to only relevant task features and allow them to effectively complete the task (Winne & Hadwin, 1998, 2008).

Findings demonstrated the young students in this study displayed different profiles for selecting target/ seductive items on the Task Understanding Questionnaire. Continuing to conceptualize students' task understanding as an ability to recognize both what is relevant but also what is irrelevant for the task elucidates how students' task perceptions may go off-track. For instance, some students struggled to understand the task because they missed identifying important task instructions while other students showed weak task understanding because they assumed all task instructions were important. Comparing Kevin (High Knowledge Group) and Liam's (Low Knowledge Group) scores illustrate this difference. Kevin over identified seductive explicit task requirements. In contrast, Liam missed identifying relevant task requirements. Future research should continue to tease apart how these two types of scores reflect students' task understanding.

Limitations to Research

Although the current study has important implications for SRL theory and research, there are a number of limitations worth mentioning. Acknowledged limitations include (a) instances of missing data, (b) limits to task understanding measures, and (c) difficulties assessing task performance in young students.

Instances of missing data were one limitation to research. As commonly occurs in elementary classrooms, there were a number of student absences (e.g., due to sickness). Incorporating research into regularly occurring classroom activities meant, on some occasions, data were collected while not all participants were present. Since students completed the Task

Understanding Questionnaire daily, even one absence resulted in missing data for that particular participant. Inclusion criteria were established to ensure enough data had been collected from participants to draw appropriate conclusions. It also ensured students had received enough of the instructional material/ task instructions to have the opportunity to develop an accurate understanding of the task.

Another limitation to the current study relates to the task understanding measures used in research. As no previous research has explored task understanding in younger students, measures were specifically created for this study. Although pilot testing was done to ensure measures were clear and effective, some challenges arose during administration. The task understanding interview, although designed based on prior research for interviewing young children, did not successfully elicit elaborations about students' task understanding. Students provided brief or very general descriptions of the task even after being prompted for details.

However, as demonstrated in responding to the TUQ, students' task perceptions were often more developed than represented in interview responses. One reason for this discrepancy may be that while the interview required free recall of information about the task, the TUQ provided specific statements that prompted recognition of task information. The TUQ may be a more fruitful way of measuring young students' task understanding as it provided students with an appropriate starting place to think about task features, purposes, and concepts.

A final limitation involved assessing task performance through daily work in the Lifecycle Booklet. At an early elementary level, classrooms often have a mastery focus in which students are supported and scaffolded in their academic work in order to successfully learn instructional concepts. As the animal lifecycle unit used for research and incorporated into classroom activities had a similar aim, the additional help provided to students meant that the quality and accuracy of task performance activities was high across all students. From this perspective task performance measures become more an indication of task completion. As a result, Knowledge Test scores were used as an indirect measure of performance reflecting what students learned through completing the Lifecycle Booklet.

Future Research

Although this study was exploratory in nature, it lays the foundation for future research examining young students' task understanding. Findings successfully revealed the ways grade two students in this study perceived an activity extending over multiple days. Specifically, these grade two students displayed a range of task perceptions that changed over the course of the task. Expanding these findings will be important for understanding how students in other classrooms completing other forms of academic work (e.g., spelling tests, math worksheets) understand the school tasks they are assigned.

Future research should also continue exploring different ways of assessing task understanding in young students. Although the task understanding interviews were not effective at eliciting thorough representations of students' task perceptions, adapting interview procedures may make this a more effective means of data collection. Researchers who helped to conduct this study often noted that while students completed the TUQ, they verbalized interesting perceptions of the task or clarifying statements about their interpretation of TUQ questions. Rather than asking semi-structured questions about the task, an alternative may be to encourage students to discuss or explain answers they gave to the TUQ.

Including a think-aloud procedure to the Task Understanding Questionnaire could be a useful alternative to the original interview protocol. Having students explain their TUQ responding rationale to a researcher would help to provide a deeper perspective of young students' task understanding. It would also help to identify whether or not students are interpreting TUQ questions as they are intended. Together these findings could potentially be useful for validating the Task Understanding Questionnaire.

Finally, additional research should more thoroughly investigate how task understanding may compensate for low prior knowledge. Findings from the current study revealed that for some students, having accurate task understanding might have compensated for low prior knowledge, enabling students to successfully learn instructional concepts. Knowing how this more specifically functions could be particularly useful for teachers working with young learners. Grade two students frequently encounter instructional tasks in relatively new domain areas for which they have limited prior knowledge. Knowing how task understanding can enhance learning in students would benefit teachers working with this population of students. Extending this work to examine patterns of task understanding across larger samples of students in a range of contexts would provide a means for testing the hypothesis that having accurate task perceptions predicts task performance above and beyond the prior knowledge learners bring to the task

Implications for Theory, Research, and Practice

These results hold important implications for theory, research and practice. First, this study adds to current knowledge of SRL and task understanding by looking at this construct in a subset of the population (young elementary students) that has previously not been explored. Results validate that Hadwin's (2006) model of task understanding works to describe young as well as older students' task understanding. Practically these results are important for educators working with young children. Results emphasize the significance of helping even young students to develop task understanding, as this in turn may help them to successfully learn instructional concepts.

Taken together this research provides important new insight into the first phase of the SRL cycle, task understanding, and how it functions in young students. It is hoped this research can provide a foundation for future research seeking to explore how young students understand their school activities.

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Appendix A

University of Victoria Ethical Approval

Human Research Ethics Board
Office of Research Services
University of Victoria
Administrative Services Building B202
Tel 250-472-4545 Fax 250-721-8960
Email ethics@uvic.ca Web www.research.uvic.ca

University of Victoria

Human Research Ethics Board
Certificate of Approval

Principal Investigator	Department/School	Supervisor
Stephanie Helm **Master's Student**	**EDUC**	**Dr. Allyson Hadwin**

Co-Investigator(s):

Dr. Allyson Hadwin, Co-Investigator, UVic
Dr. Nancy Perry, Co-Investigator, UBC

Project Title: **Task Understanding in Young Students**

Protocol No.	Approval Date	Start Date	Expiry Date
10-126	**18-Mar-10**	**18-Mar-10**	**17-Mar-11**

Certification

This certifies that the UVic Human Research Ethics Board has examined this research protocol and concluded that, in all respects, the proposed research meets the appropriate standards of ethics as outlined by the University of Victoria Research Regulations Involving Human Participants.

This Certificate of Approval is valid for the above term provided there is no change in the protocol. Extensions and/or amendments may be approved with the submission of a "Request for Annual Renewal or Modification" form.

Dr. Afzal Suleman
Associate Vice-President, Research

10-126 Helm, Stephanie

Appendix B

Parent Consent Form

University of Victoria

CONSENT FORM

Department of Educational Psychology & Leadership Studies
Technology Integration & Evaluation Research Lab

Technology Integration & Evaluation Research Lab

To complete an online version of this consent form please enter the following link into your browser:

http://www.learningkit.sfu.ca:8080/WQ3/RespondentServlet?projectID=496

PLEASE READ AND RETURN THE FOLLOWING CONSENT FORM WHETHER OR NOT YOU AGREE TO PARTICIPATE IN RESEARCH

Invitation to Participate in Research

We would like to take this opportunity to invite you and your child to participate in a study entitled "Task Understanding in Young Students". The study will be conducted by Stephanie Helm (MA candidate, University of Victoria) as required research for a Master's level thesis. Reseach will be conducted under the supervision of Dr. Allyson Hadwin. Dr. Hadwin is a faculty member in the department of Educational Psychology and Leadership Studies at the University of Victoria.

Statement of Research Purpose

The purpose of this study is to explore early elementary (grades 1 to 3) students' perceptions of school activities as well as how these self-reported perceptions relate to later performance on assigned class work. The specific research questions that this study aims to address include:

1. What are young students perceptions of a school activities/ tasks?
   a) What explicit features of a school activity do they identify (e.g. instructions and standards)?
   b) What implicit features of a school activity do they identify (e.g. purpose for the activity, strategies for completing the activity)?
   c) How accurate are their perceptions of the class activity?
2. Does a student's self-reported level of understanding of a school activity relate to later academic performance or academic success on that activity?

Description of Research Procedures

The research will occur in an e-learning activity about animal lifecycles that is being used in your child's classroom as part of regular classroom activities. The e-learning activity will occur over five 1-hour long sessions and will include having your child use a computer to complete online/ electronic activities designed to scaffold students' learning about animal lifecycles (e.g. students will be able to view and follow web links to pertinent information about the frog lifecycle). Your classroom teacher will review student work and give feedback on work as per usual. Participation involves letting the researchers examine student work for research purposes.

Activities will include:

- Learning about the frog lifecycle using interactive software designed to scaffold learning in young students.
- Completing an assignment that get students to compare and contrast the life cycle of frogs to that of another animal and a fictional animal that they create.

Activities that are particular to research and not class content include:

- Each time students work on their class activity they will be asked to answer a *short* questionnaire targeting their perceptions of the class activity.
- Two short 5 minute interviews with the student regarding his or her perceptions of the class activity. Interviews may be conducted in a separate room/ space outside of the child's classroon.

Participation required from students' parent/ guardian:

- In order to assess students' familiarity for working with computers, we would appreciate it if students' parents/ guardians would complete the *short* computer survey included with this consent form. This questionnaire will be important for ensuring that students familiarity for working with/ using computers is not a confound in this research.

Potential Risks and Benefits Associated with Research

Participating in this study will help researchers and teachers understand how to help elementary students with academic work. Specifically, it will help us to identify when students need help understanding the academic work they are asked to complete as opposed to when when students need help actually completing academic activities. There are no known risks associated with this research, as it will be embedded within already occurring classroom activities.

Freedom to Withdraw

All students will participate in the e-learning lesson as part of regular classroom instruction. Your consent, however, to have your child and his or her's work included in this research project is completely voluntary. If at any point in time you wish to withdraw from participating in this study you are free to do so without any consequences. Any data that may have already been collected will be destroyed and will not be used in any future data analysis.

Anonymity and Confidentiality

Children's school work, interviews, and parent surveys will be labelled with the student name to help organize data and make school work available to teachers. However, all analysis and reporting of research findings will be completely confidential. Names and identifying information will be removed for analysis and reporting purposes.

Analysis of Data and Dissemination of Results

Trained researchers, associated with this project or future related research projects, will analyze data collected as a part of this study. Findings will be reported to:

- Teachers as part of professional development training
- Scholarly associations in Educational Psychology
- Academic journals in the learning sciences, Educational Psychology, and teacher practices
- Results will be part of a masters level thesis and possible doctoral dissertation

Disposal of Data

Paper based data will be stored in a locked filing cabinet in the TIE research lab (A210b MacLaurin) for 10 years, after which it will be shredded. Electronic data will be archived and stored anonymously on a password-protected server accessible to researchers. After approximately 10 years the electronic files will be erased.

Contacts

Any questions or concerns about this study can be addressed to the Department of Educational Psychology & Leadership Studies.

In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).

Please indicate below your decsion to either participate or not participate in the outlined researh project. Should you agree to consent, your signature indicates that you understand the above conditions and are willing to participate and have the child under your guardianship participate in this study. It also shows that you have had the opportunity to have your questions answered by the researchers.

++

_____ Yes, I agree to participate and have my child participate in this study.
_____ No, I do not agree to participate or have my child participate in this study.

Child's Name : ___________________________________

Parent/ Guardian Name: ___________________________________

Parent/ Guardian Signature: _________________________ Date: _____________

Appendix C

Computer Survey, Parent & Teacher Version

Computer Survey, Parent Version

If you would prefer to view/ submit an electronic version of this survey please use the following link: http://www.learningkit.sfu.ca:8080/WQ3/RespondentServlet?projectID=499

Parent/ Guardian name: ________________________

Child's name: ________________________

Grade: ______________________________

1. Does your child use a computer in your home?

____

2. If yes, what is the make and model of the computer?

____

3. How much time does your child spend on the computer each week? Estimate the hours/minutes spent.

____

4. What does your child do on the computer? Circle all that apply.
   (a) Plays computer games
   (b) Interacts with educational software
   (c) Interacts on the Internet
   (d) Instant messaging
   (e) Uses word processing software
   (f) Other (explain)

____

5. How interested is your child in using the computer?
   (a) Very interested—it's one of his/her favourite things to do.
   (b) Interested but it's not a favourite activity.
   (c) Not very interested—there are lots of things he/she would rather be doing.

Computer Survey, Teacher Version

To complete an online version of this survey please enter the following link into your browser:

http://www.learningkit.sfu.ca:8080/WQ3/RespondentServlet?projectID=501

1. Do students have access to computers in your classroom? If yes, what is the ratio of computers to students in your classroom? What is the make and model of the computers (e.g., MacIntosh PowerBook)?

2. Is there a computer lab in your school?

3. How much time do students spend on computers in your classroom and/or in the computer lab each week? Estimate the hours/minutes spent.

4. What do students use the computers to do? Circle all that apply.

(a) Play computer games

(b) Interact with educational software

(c) Interact with the Internet

(d) Email or Instant Messaging

(e) Use word processing software

(f) Other (explain)

Appendix D

Instructional Task and Task Instructions

Our Activity

What we are going to learn about!

- We are going to learn about animal lifecycles together!
- Lifecycles are the different stages of life that all animals go through as they grow-up!
- All animals begin as a new life. Then they grow and change until they are adults.
- Sometimes how animals change across their life can be different.
- Some animals change a lot between different lifecycle stages while other animals don't change very much.
- We are going to learn about are the human and frog lifecycle!

How we are going to learn about animal lifecycles!

- To learn about animal lifecycles you will get to use a computer!
- On the computer you will be able to read, look at pictures, and answer questions about animal lifecycles!
- This is where you will get all of the information you need to create your own **Lifecycle Booklet**.

Our Lifecycle Booklets

- While you are learning about animal lifecycles you will make a **Lifecycle Booklet**.
- Each day you will have a different worksheet with questions to answer and pictures to draw.
- After learning about the human and frog lifecycle you will get to create your very own animal and talk about how it changes over its stages of life!
- Each of your worksheets will be used to make up your **Lifecycle Booklet!**

Remember…

- Try to do the work on your own but you can ask the teacher for help if you need it.
- You will know you have done your best work on your Lifecycle Booklet if you have tried your best to answer all of the questions with the information you have learned about animal lifecycles.

ANIMAL LIFE CYCLES

We are going to be learning about animal life cycles. Like animals, humans also go through different stages of life!

STAGE 1: NEW LIFE. In the first stage of life, all animals start out in this world as a new life. Animals can begin life in many different forms.

When humans are born they are called a ____________________!

Can you draw a picture of what you looked like when you were born?

STAGE 2: GROWTH AND CHANGE. In the second stage of life, animals begin to grow and change until they become an adult.

Just like other animals, human children grow and change. Can you suggest one way that children change, as they get older? (Find 1 Point)

____

____

Do all animals grow and change the same way? Can you explain your answer? (Find 1 point)

STAGE 3: ADULTHOOD

As children get older they turn into adult men or women.

Can you list some important needs for human babies to grow? (Find 3 Points)

Name: ________________

STAGE 1: NEW LIFE

What does the animal look like in its first stage of life?

This is a picture of an ________________________________!

Where does the mom frog lay her eggs? (Find 1 Thing)

When they are close to hatching where do the eggs go? (Find 1 Thing)

How does the protective jelly keep the eggs safe? (Find 2 Things)

Name: ________________

STAGE 2: GROWTH AND CHANGE

What does the animal we are studying look like in its second stage of life?

This is a picture of a ______________________________!

Where does the animal we are studying live and what does it eat now that it has hatched from its egg and gotten a little bigger? (2 Things)

What are some special things about this animal in its second stage of life that helps it live? (3 Things)

How does the animal we are studying change over time? (3 Things)

____

____

____

____

____

STAGE 3: ADULTHOOD

What does the animal we are studying look like in its final stage of life?

This is a picture of a ______________________________________!

Now that our animal is all grown up, where does it live? How has it changed? (2 Things)

____

____

____

Name: ____________________

ANIMAL NEEDS

Can you draw a picture of something our animal needs to grow up!

What are some things that the animal we are studying needs to grow and change into an adult? (4 Things)

____

____

____

____

____

____

____

DANGERS

Can you draw a picture of a danger that our animal may need to stay away from to stay safe!

In order for the animal we are studying to safely grow and change into an adult it must stay away from some dangers. What are some dangers that our animal may face? (4 Things)

LIFECYCLES

It's time for you to create your own animal! Can you draw a picture of what your animal looks like in its different s

Stage 1	Stage 2	Stage 3

How does your animal change as it gets older?

____

____

____

____

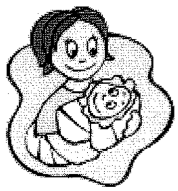
____

What does your animal need to grow and change from one lifecycle stage to the next?

How is your animal's lifecycle different from the frog lifecycle?

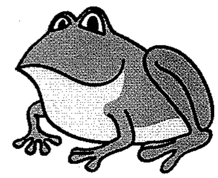
Appendix E

Task Understanding Questionnaire (TUQ)



Name: ____________________________

Questions About Our Activity!



What did your teacher want you to do <u>TODAY</u> when you were working on your Lifecycle Booklet?		
Read a book about animal lifecycles	○	○
Practice using a computer	○	○
Answer questions about the human lifecycle	○	○
Draw pictures of animals at different stages of the lifecycle	○	○
Answer questions about frog eggs.	○	○
Answer questions about how tadpoles grow and change into big frogs	○	○
Answer questions about what frogs need to grow and change	○	○
Create my own animal	○	○

What do you think that your teacher wants you to learn about <u>TODAY</u> when you are working on your Lifecycle Booklet?

		
Learn about the different stages of the human lifecycle.	○	○
Learn about using computers	○	○
Learn about frog eggs and how they stay safe when they are born	○	○
Learn how to draw animals	○	○
Learn about how frog tadpoles change into adult frogs	○	○
Learn about the things frogs need and some of the dangers that they encounter	○	○
Learn that all animals go through similar lifecycle stages even though how they grow and change across life may be different	○	○

What do you think you will need to do to get a gold star on your Lifecycle Booklet?		
Draw Well	○	○
Show that I know that there are things like food that animals need to stay alive and become an adult	○	○
Print neatly	○	○
Share my answers with other students that needed help	○	○
Answer questions on my own	○	○
Show that I know how humans and frogs grow and change across the lifecycle.	○	○
Answer all of the questions on my worksheet correctly	○	○
Show that I know that all animals go through lifecycle stages even though how they grow and change may be different	○	○

What is in the classroom that could help you with your Lifecycle Booklet?

Computer	○	○
Books	○	○
Teachers	○	○
Other students	○	○

Why do you think that your teacher is asking you to make a Lifecycle Booklet?

		
To show that computers can teach you a lot about animals	○	○
To learn about the different stages of the human and frog lifecycle	○	○
To practice drawing animals	○	○
To learn about lifecycles so I can understand what animals need to go from a new life to an adult	○	○
To Learn how to create my own animal	○	○
To learn that all animals go through lifecycles but how they grow and change across the lifecycle may be different	○	○

Appendix F

Task Understanding Interview Protocol- Student Version

Each participant will be interviewed separately outside of the classroom to ensure that students are not distracted and feel comfortable answering questions honestly. Before interviewing the researcher should introduce themselves and ask the students name. The researcher can engage in a short conversation with the participant in order to develop trust and rapport.

The researcher should explain to students that they are going to ask him/ her some questions about the class activity that was just explained to them by their teacher. The researcher should also explain that the students answers to these questions will not be shared to the teacher, but that honest answers are important as they will help the researcher learn about students understandings of class activities.

The researcher should then ask for verbal consent from the student to continue with the study. If the participant declines or seems upset before or during the interview, the researcher should stop questioning, thank the participant for all of their help and take them back to the classroom.

Questions	Prompts
Explicit Task Understanding	
• Can you tell me about this activity (pointing to Child's copy of lifecycle booklet)?	• If child does not respond after five seconds repeat the question. • If child does not respond again offer a suggestion (e.g. Are you going to learn about the frog lifecycle? Can you tell me about that?) • If child provides an incomplete/ short answer prompt them with "thank you, can you please tell me more about that?"
• Can you tell me all of the things that your teacher wants you to do for your lifecycle booklet?	• If child does not respond after five seconds repeat the question. • If child does not respond again offer a suggestion (e.g. do you have to answer some questions on worksheets?) • If child provides an incomplete/ short answer prompt them with "thank you, can you please tell me more about that?"
Implicit Task Understanding	

• Can you tell me where you think you will find all of the information that you will need to complete your lifecycle booklet?	• If child does not respond after five seconds repeat the question. • If child does not respond/ does not understand the question again offer a suggestion (e.g. where are you going to find the information about frogs to answer the questions for this activity? Are you going to find some of the information in books?) • If child provides an incomplete/ short answer prompt them with "thank you, can you please tell me more about that?"
• What do you think are the important things that your teacher wants you to learn about when you are working on this activity?	• If child does not respond after five seconds repeat the question. • If child does not respond/ does not understand the question again offer a suggestion (e.g. Do your teacher wants you to learn about animal lifecycles?) If child responds say "good now can you tell me what else your teacher may want to learn about? • If child provides an incomplete/ short answer prompt them with "thank you, can you please tell me more about that?"
• Can you tell me why it is important for you to do this activity? Why do you think your teacher wants you make a lifecycle booklet?	• If child does not respond after five seconds repeat the question. • If child does not respond/ does not understand the question again offer a suggestion (e.g. Do you think your teacher wants you to learn about the frog lifecycle?) If child responds say "good now can you tell me any other reasons? • If child provides an incomplete/ short answer prompt them with "thank you, can you please tell me more about that?"
• Can you tell me what you are going to do when you are working on this activity to make sure that you do a good job? Are you going to do anything special to make sure that you get a gold star?	• If child does not respond after five seconds repeat the question. • If child does not respond/ does not understand the question again offer a suggestion (e.g. Are you going to try to answer all of the questions correctly?) If child responds say "good now can you tell me what else you may need to do? • If child provides an incomplete/ short answer prompt them with "thank you, can you please tell me more about that?"

Appendix G

Knowledge Test

Questions About Animal Lifecycles!

Name: ___________________

Human Lifecycle

1. When human babies are born they look like an egg.

   True False I don't know

2. Humans and other animals change as they grow-up. They also need many things to keep them safe and help them grow.

   True False I don't know

Frog Lifecycle: Eggs

3. Frogs are born in grassy patches close to ponds and marshes.

   True False I don't know

4. Frog eggs stay safe in a little ball of jelly. The jelly provides the eggs with warmth, food, and protection from enemies.

   True False I don't know

Frog Lifecycle: Tadpoles

5. Once a tadpole turns into an adult frog it can use its new lungs to breath air when it is on land.

   True False I don't know

6. Tadpoles grow and change by losing their tail and growing scales.

   True False I don't know

Frog Lifecycle: Needs

7. Frogs need to be warm. Frog tadpoles need warmth to grow and big frogs have to sleep in the mud during cold winters to keep them warm.

   True False I don't know

8. Tadpoles can use their long tongues to snap up food

   True False I don't know

Frog Lifecycle: Dangers

9. Adult frogs do not have to worry about pollution. They have gills that help them to make clean air and water for them to breath.

    True   False   I don't know

10. Sometimes frogs and tadpoles have to use their strong legs or tail to swim away from other animals that may want to eat them.

    True   False   I don't know

Appendix H

Rubric for Scoring Performance on the Lifecycle Booklet

Score of 3 (Strong)

1. Students answer all but a couple of questions correctly. Responses should also be thorough (e.g. find all of the important points when something says find 2/ find 3 points, etc.)
2. Students demonstrate their understanding of the human lifecycle and the frog lifecycle in their answers. If students answers show some confusion about lifecycle stages move students down one mark.
3. Students show their ability to transfer their learning about lifecycles. All students struggled with the last question, but some indication that they understand how animals grow and change across the lifecycle and what they may need (e.g., food/ water to live) is important
4. Students worked on their own to complete the Lifecycle Booklet.

Score of 2 (Moderate)

1. Answered between 8-11 questions correctly out of 13.
2. Correct answers must demonstrate that the student has some understanding of both the human and the frog lifecycle. A moderate score may be given for answers that illustrate the student was confused on some of the details within each lifecycle stage or the student may not have been thorough in answering questions, or the student may have brought in some irrelevant information.
3. Tried to make some transfer of knowledge when creating their own animal. Usually this is limited. May see changes in how animal grows in drawings and what animal needs. Usually are not able to answer last question comparing the lifecycle of the novel animal to the frog lifecycle.
4. Students generally worked on their own to complete the Lifecycle Booklet

Score of 1 (Weak)

1. Answered less than 7 or 8 questions correctly out of 13.
2. Answers not demonstrating understanding of the human and frog lifecycle. This can include students who may have been confused on some of the details within each lifecycle stage, may not have been thorough in answering questions, or may have brought in some irrelevant information or the needs and dangers that they face.
3. Answers do not demonstrate transfer of learning. Animal may go from big creature to egg. When thinking about what needs, may not make sense in relation to what we have talked about in human and frog lifecycle.
4. Student needed considerable amounts of help/ scaffolding to answer questions.

Appendix I

Observation Protocol

CLASSROOM OBSERVATION INSTRUMENT

Teacher ________________________ Date ______________________

Activity _________________________

Beginning Time ____________________ Ending Time ______________

Description of Activity

(what's going on)

<u>Attribute of the Activity to Remember While Recording Observations:</u>

Class Instructions

Instructions for individual students

Responses to student questions

peer support (discussion between peers regarding the task)

Activation or prior knowledge

Time	Running Record/ Observations	Comments/ Notes

Appendix J

Teacher Consent Form

CONSENT FORM

Department of Educational Psychology & Leadership Studies

Technology Integration & Evaluation Research Lab

University of Victoria

Technology Integration & Evaluation Research Lab

To complete an online version of this consent form please enter the following link into your browser:

http://www.learningkit.sfu.ca:8080/WQ3/RespondentServlet?projectID=500

Invitation to Participate in Research

We would like to proivide you with the opportunity to participate in a study entitled "Task Understanding in Young Students". The study will be conducted by Stephanie Helm (MA candidate, University of Victoria) as a part of required research for a Master's level thesis. This study will be conducted under the supervision of Dr. Allyson Hadwin. Dr. Hadwin is a faculty member in the department of Educational Psychology and Leadership Studies at the University of Victoria.

Statement of Research Purpose

The purpose of this study is to explore early elementary students' (between grades 1 to 3) perceptions of school activities as well as how these self-reported perceptions relate to later performance on assigned class work. The specific research questions that this study aims to address include:

1. What are young students perceptions of a school activities/ tasks?
   a) What explicit features of a school activity do they identify (e.g. instructions and standards)?
   b) What implicit features of a school activity do they identify (e.g. purpose for the activity, strategies for completing the activity)?
   c) How accurate are their perceptions of the class activity?
2. Does a student's self-reported level of understanding of a school activity relate to later academic performance or academic success on that activity?

Description of Research Procedures

Research will occur over the course of approximately five 1-hour sessions. Students will be asked to complete an e-learning activity about animal lifecycles as part of regular classroom activities. The classroom teacher will review student work and give feedback on work as per usual. Student participation will involve letting the researchers examine student work for research purposes.

Students activities will include:

- Learning about the frog lifecycle using interactive software designed to scaffold learning in young students.
- Completing an assignments that get students to compare and contrast the life cycle of frogs to that of another animal and a fictional animal that they create.

Student activities that are particular to research and not class content include:

- Each time students work on their class activity they will be asked to answer a *short* questionnaire targeting perceptions of the class activity.
- Two short 5 minute interviews with the student regarding his or her perceptions of the class activity.

Participation/ data collected from the classroom teacher:

- It will be important to have the classroom teacher's perspective of the important features of the task in order to evaluate students' perceptions of the assigned e-learning activity. As such, we would like to have classroom teachers participating in this research project complete the same short task understanding questionnaire required of their students. Similarly, teachers will also be asked to answer interview questions that will be posed to students.
- In order to assess students' familiarity with computers, we would also ask teachers to complete a *short* computer survey.
- Finally, we would also like to conduct classroom observations specific to the e-learning activity (e.g. noting task instructions to students). This data will not be collected to look at teacher instruction of the material, but to provide a context for understanding/ interpreting students' responses and perceptions of the task.

Potential Risks and Benefits Associated with Research

Participating in this study will help researchers and teachers understand how to help early elementary (grades 1 to 3) students with academic work. Specifically, it will help us to identify when students need help understanding the academic work they are asked to complete as opposed to when when students need help actually completing academic activities. There are no known risks associated with this research, as it will be embedded within already occurring classroom activities.

Freedom to Withdraw

All students will participate in the e-learning lesson as part of regular classroom instruction. Your consent to participate in this study is completely voluntary. If at any point in time you wish to withdraw from this study you are free to do so without any consequences. Any data that may have already been collected will be destroyed and will not be used in any future data analysis.

Anonymity and Confidentiality

All analysis and reporting of research findings will be completely confidential. We will protect confidentiality by providing no personal information (e.g. name or school affiliation) in any reports stemming from this research.

Analysis of Data and Dissemination of Results
Trained researchers, associated with this project or future related projects, will analyze the data collected as a part of this study. Findings will be reported to:

- Teachers as part of professional development training
- Scholarly associations in Educational Psychology
- Academic journals in the learning sciences, Educational Psychology, and teacher practices
- Results be used as a part of a masters level thesis and possibly a doctoral level dissertation

Disposal of Data

Paper based data will be stored in a locked filing cabinet in the TIE research lab (A210b MacLaurin) for 10 years, after which it will be shredded. Electronic data will be archived and stored anonymously on a password-protected server accessible to researchers. After approximately 10 years the electronic files will be erased.

Contacts
Any questions or concerns about this study can be addressed to the Department of Educational Psychology & Leadership Studies.

In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).

Your signature below indicates that you understand the above conditions and are willing to participate in this study. It also shows that you have had the opportunity to have your questions answered by the researchers.

++

Name: ___________________________________

Signature: __________________________ Date: _____________

Appendix K

Task Understanding Interview Protocol- Teacher Version

Introduction	
With this activity we were hoping to get students learning about and working on animal lifecycles. I know that this is a topic that you have also been covering with the students. It would be really helpful for me to know what you have been working on with the students. • What have been some of the activities about animal lifecycles that you have done with the students? • Are there any particular learning objectives related to animal lifecycles that you have been working on with the students? • Were there elements of this task that would be hard for the students to understand?	Prompt: (e.g., What are some of the activities you have done in relation to the salmon lifecycle)
Explicit Task Features	
Thank you so much. This information will be very helpful for me when I am trying to interpret students' responses. I was also hoping to ask you some questions if you have time about the activity itself, just to get your perspective of the lifecycle booklet. • So from your perspective could you let me know what you think the students were required to do for their lifecycle booklet?	Prompts: Were students supposed to read about animal lifecycles on the computer and answer questions/ worksheets?
Implicit Task Features	
• From your perspective, could you let us know what resources were available to the student as they worked on their lifecycle booklet? • What resources are usually	

available to students when working on class activities? (e.g. Books in classroom?) • Are teachers usually available to help students on activities? • Do students commonly use each other when working on activities? Is this expected? Not allowed?	
• From your perspective, what were some of the important concepts that you would expect students to learn about when completing the lifecycle booklet?	Prompt: Would you expect students to learn about the different stages of the frog lifecycle?
• From your perspective what was purpose of the lifecycle booklet? What would you have liked students to learn about when completing the lifecycle booklet?	Prompt: to expose students to the frog lifecycle?
• When you look over the lifecycle booklet what will you be looking for? From your perspective, can you tell me what you think a good example of the lifecycle booklet would look like? If students were graded, what would an A+ lifecycle booklet look like?	Prompt: would you expect students to answer questions on their own?
Closing	
• Are there any comments that you would like to make about the lifecycle booklet, how the activity progressed, or any additional information about the students/ class?	