The Effectiveness of Roles, Scripts and Prompts in Promoting Reading Comprehension During Computer-Supported Collaborative Learning

By

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B.Ed., University of Victoria, 2001

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Abstract

The purpose of this study was to examine the effectiveness of structured computer-supported collaboration in helping students with a vast array of comprehension skills, grapple with challenging text-based learning materials. Two collaborative discussion conditions were compared: (a) regular peer text chat and (b) structured peer text chat in which 62, grade 10 students were assigned to one of two conditions. In the structured condition, students were assigned to roles, scripts and prompts based on a modified reciprocal teaching model to guide their discussion on a difficult text on crystal methamphetamine. Reading comprehension competence was measured using the *Test of Reading Comprehension (TORC-3)* and a pre-post *Task Specific Reading Comprehension (TSRC)* test was used to measure comprehension of the target text for subjects in both conditions. Although students in the structured chat condition did not achieve greater gains in reading comprehension, those who scored lower on the *TORC-3* had greater gains than students who scored higher on the *TORC-3*.

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Chapter 1

Introduction

Learning is an active and social process of constructing knowledge rather than simply acquiring information (Vygotsky, 1978). With peer support, learners can overcome obstacles they could not master if working alone and increase their learning by working towards a common goal (McMaster & Fuchs, 2002). Thus, collaborative learning is pervasive in the education system today (Dollman, Morgan, Pergler, Russell & Watts, 2007; McGrath, 2004). The BC Ministry of Education's prescribed learning outcomes reflect a commitment to this educational approach, with sections dedicated to "working together" and "building community" (English Language Arts IRP, 1999).

Although collaborative learning has been used successfully in all academic disciplines, traditionally, the benefits of cooperative learning on reading, and in particular reading comprehension, have been well documented by researchers (Liang & Dole, 2006). Accordingly, small collaborative groups are used in classrooms (Johnson, Johnson & Holubec, 1993), and more recently in the online setting (O'Donnell, Hmelo & Erkens, 2005), to ensure that students maximize their own and other's academic potential (Jenkins & O'Connor, 2003).

With the advent of online courses, distributed learning (DL) has moved away from a "focus on knowledge transmission to knowledge building", where the objective is to provide ample opportunities for group interaction (Vrasidas, 2000, p.205). Changes to course funding in BC for students enrolled in grades 10 to 12 now allow learners in traditional classrooms to enroll in online courses offered at 39 DL schools within the province (Virtual School Society: LearnNowBC website). This means that students in both conventional and distributed learning schools have near universal access to Internet-connected computers and are increasingly relying on these computers as a tool for facilitating collaborative work (Vrasidas, 2000).

The use of computers for collaborative work is often referred to as computer-supported collaborative learning (CSCL); however, reviews of the literature on CSCL uncover a paucity of environments and research that actually incorporate true instructional support for collaboration (O'Donnell, Hmelo & Erkens, 2005). Often technology is not used effectively to scaffold cognitive skills and collaborative processes and there is sometimes little evidence of increased academic performance or transfer of skills learned (O'Donnell et al.). More recent research has focused on specific supports that demonstrate some benefits by creating structure that scaffolds the learning and collaborative process (Chou, Lin and Chan, 2002; Makitalo, Weinberger, Hakkinen, Jarvela, & Fischer, 2005; Robertson & Good, 2003). Assigning a variety of roles, supported by scripts and prompts can create this structure.

The research proposes that online structure may need to be used in innovative ways and therefore the effectiveness of these supports in this setting necessitates examination (Robertson & Good, 2003). In addition, research has found that too much or too little structure may lead to decreased academic performance (Weinberger et al, 2005). Finally, it is unknown if these types of structure impact reading comprehension in this online environment. Thus, the optimal type and level of structure needs to be more thoroughly examined to help guide educators and software developers to create effective supports that lead to productive online collaboration and increased reading comprehension.

Purpose of the Study

This study is important because it examines the effectiveness of an intervention designed to support students with a vast array of comprehension skills, grapple with challenging text-based materials in a computer-supported collaborative environment. The study has the potential to bridge the gap in the literature regarding the optimum amount and type of structure needed to enhance individual comprehension. Therefore, the purpose of this study was to compare the effectiveness of computer-supported collaborative chat using a modified reciprocal teaching structure versus no structure. This was done by measuring a pre-post Task Specific Reading Comprehension (*TSRC)* test on Saanich School District 63 secondary students in an online, collaborative learning activity that involved a reading task. Drawing on O'Donnell's (1999) and Palinscar and Brown's (1984) use of roles, scripts and prompts with the goal of supporting collaboration, this study guides the collaborative process of how and when to collaborate in reciprocal teaching roles to help all individuals in the group excel on a content reading task.

Through this study, the following research questions were examined: (a) Do students who participate in structured text-based collaborative chat demonstrate greater improvements in the pre-post *TSRC* test than students who participate in unstructured text-based collaborative chat? (b) Is there an interaction between the structured/unstructured support condition on the pre-post *TSRC* test?

Hypotheses

In order to guide this research, two hypotheses were formulated. These include:

H1. Students who participate in structured collaboration demonstrate greater improvements in the pre-post *TSRC* test than students who participate in unstructured collaboration.

H2. Is there an interaction between the structured/unstructured support condition on the pre-post *TSRC* test?

Below is an examination of what constitutes effective collaboration, including structured collaboration. This is followed by a critical review of the contemporary literature on CSCL and the types of structure that are used to aid learning and increase productive collaboration.

Chapter 2

Literature Review

Collaborating Effectively

Research on the impact of collaboration has changed from a general acceptance that all interaction leads to cognitive growth, to an emergent awareness that many factors can facilitate or hinder cognitive growth (Hogan & Tudge, 1999). A focus within the past few decades, based on the work of Piaget and Vygotsky, has begun to specifically examine conditions under which most collaboration should occur (Forman 1992). Variables, including age of partners, competence of partners, discourse level, nature of the task, group size, and support and structure, have been shown to have an influence on collaborative outcomes (Hogan & Tudge, 1999); however further research is needed to determine the optimal level for each variable (Hogan & Tudge, 1999).

Most research on collaboration is conducted on younger school-aged children or older post-secondary students (Hogan & Tudge, 1999). It is clear that older students can benefit from this interaction; however, Cooper (as cited in O'Donnell & King, 1999) found that discrepant results indicate that young children may not. Hogan and Tudge suggest that further studies need to examine other age levels, including older high school students to determine age-related restraints on collaborative learning.

Group size and homogeneity are another area of interest for researchers. A preponderance of current research examines dyads, even though larger groups are common in instructional practice and are considered ideal for optimum benefit of group work (O'Donnell, 2006). Groups of three or four appear to work well together; however, in larger groups, it is more likely that one person may withdraw from the group (Webb &

Farivar, 1999). Ames and Murray (as cited in O'Donnell & King, 1999) found heterogeneous groupings facilitate cognitive development where children learn best with a more skilled partner (Ames & Murray, 1982); although, this benefit may not occur if there is an asymmetrical social relationship between participants (Tudge, Winterhoff, & Hogan, 1996). Groups consisting of peers of a similar age and social standing, but are academically varied appear best. Although it is clearly beneficial for weaker students to be paired with stronger students, Tudge's (1989) earlier work found deleterious cognitive effects on children who were exposed to reasoning below their level. Levin and Druyan (as cited in O'Donnell & King, 1999) found that this regression appears to occur when relevant skills or knowledge are lacking and thus the higher skilled participant may be persuaded by the less competent partner to change their reasoning. It is clear that further research is needed in this area.

The task itself is a key variable that shapes collaborative results with the task goal associated with school learning outcomes (Derry, 1999). Usually goals surround affective or cognitive growth and may be individual or interdependent (Woolfolk Hoy & Tschannen-Moran, 1999). Certain tasks are more likely than others to encourage collaboration and interdependence. Working in groups may foster cooperation, but not collaboration. This distinction is important. Collaborative tasks distribute the thinking among the members of the group, with the students sharing cognitive responsibility for the task (Palincsar & Herrenkohl, 1999). All members of the group work on the same aspect of the problem at the same time. Thus, although responsibilities are divided among group member, all students share in the same cognitive task, perhaps prompted by one member.

Cooperative learning, however, can occur without collaboration (Palincsar & Herrenkohl, 1999). In cooperative learning cognitive tasks are usually divided between learners as in many forms of peer tutoring and jigsaw activities. Students usually individually work on their part, and then share their knowledge with the rest of the group. According to Palinscar and Herrenkohl, less has been written about collaborative tasks as compared to cooperative ones, despite more promising cognitive outcomes associated with collaboration.

In summary, effective collaboration is most likely to occur with academically heterogeneous groupings of students of equal social standing who are old enough to benefit from the level of discourse and who are involved in a true collaborative task which is suited for the particular goal. When this transpires, there is a deeper processing of material and a reconstructuring of what students know occurs, which leads to increased performance (O'Donnell, 1999).

Structure in Collaboration

Unfortunately, collaboration does not always lead to increased performance in learners, as there is often not a diffusion of responsibility towards completing the task. Only students who elaborate and actively participate will benefit from peer collaboration (Cohen, 1994). According to Mulryan, (as cited in O'Donnell & King, 1999) lower achieving students are frequently ignored or are off task and higher achieving students often dominate the group (Cohen). Webb's 1992 study (as cited in O'Donnell & King, 1999) found that students with high status contribute more, compared to students with low status within the group. Status is often associated with ability, gender, race, or social standing within the class. What is needed within the group to make collaboration effective is a positive interdependence where the outcome could not be achieved without the contribution of each group member (Johnson & Johnson, 1989).

Even if positive interdependence exists, however, the group may not possess the necessary cognitive skills to complete the task (Cohen, 1994). Incorporating structure into group tasks can remedy this problem by distributing responsibility to ensure all members evenly contribute, as well as providing scaffolds that help guide the cognitive process (O'Donnell, 1999). Methods of structuring interaction can include scripting interaction, having students assume a role, providing prompts to fulfill roles, giving specific task instructions, modeling, and providing instruction on specific discourse skills (King, 1999). Most commonly roles, facilitated by scripts and prompts, are used to create structure.

Types of Structure: Roles Defined

Roles provide the structure to facilitate collaboration and task completion. Roles can be defined as prescribed functions that guide individual behaviour and group collaboration (Slavin, 1995). They may also be viewed as a scaffold in the learning process where the goal of collaboration is to acquire new knowledge, including cognitive and collaborative skills. Assigning roles is imperative for collaboration as they can foster interdependence while concurrently requiring individual accountability (Slavin, 1995). Roles can further be classified as procedural or functional roles and cognitive or intellectual roles (Palinscar & Herrenkohl, 2002). Functional roles exist to help carry out a task. The 'recorder', which requires a student to take notes and record information, or the 'materials manager', who establishes what is needed for the task, are classic functional roles (Slavin).

A focus on functionality can be contrasted with cognitive roles, which require cognitive group or individual effort to complete tasks and can be thought of as scaffolding the discussion or learning (O'Donnell et al, 2005). Students in the role of the 'generator', for instance, examine the current problem in terms of possible approaches and therefore help the individual and the team with their learning. There are many examples of cognitive roles in the literature including the 'predictor', who applies understanding of the material to determine an outcome using the information already known (Palinscar & Herrenkohl, 2002).

Simply providing students with roles to aid collaboration does not necessarily provide enough structure. Students may not know how to carry out the role or may need additional structure to feel secure to collaborate or complete a task. This is especially true when tasks are too demanding, resulting in a cognitive overload. This then may require additional scaffolds to help deal with task completion and collaboration (Rummel & Spada, 2005). Roles can be accompanied by scripts on how to fulfill a role and prompts on what to do or say in that role. Scripts consist of instructions regarding how group members should collaborate and complete tasks in a particular role, whereas prompts provide suggestions and guidance to carry out the role (Beers, Boshuizen, Kirschner, Wim & Gijselaers, 2005).

Types of Structure: Scripts Defined

Scripts specify and sequence collaboration through complex instructions (Makitalo, Weinberger, Hakkinen, Jarvela, & Fischer, 2005). Scripts can further be subdivided into social or epistemic scripts. Social scripts help learners structure discourse and collaborative activities (Weinberger et al., 2005), whereas epistemic cooperative scripts facilitate cognitive processes by providing strategies to solve tasks (O'Donnell & Dansereau, 1992). Epistemic scripts that facilitate cognitive processes may be more task-specific and focused on the domain studied (Palinscar & Herrenkohl, 2002). The research literature does not clearly endorse scripts. Some literature purports that scripts that are highly structured with too many detailed guidelines, may actually impede learners to think for themselves (Weinberger et al., 2005). Having less detailed scripts with prompts may aid with this issue.

Types of Structure: Prompts Defined

Prompts are often sentence openers or question stems that facilitate scripts (Weinberger et al., 2005). Question prompts are one way to direct the group to effectively collaborate, while providing a balance between structure and flexibility (Ge & Lund, 2001). Prompts encompass procedural prompts, reflection prompts, and elaboration prompts. Procedural prompts help students complete specific tasks and learn cognitive strategies. '*What comes next is*…' is an example of this type of prompt (Ge & Lund, 2001). Elaboration prompts help learners articulate thoughts and elicit explanations (Ge & Lund). *'This is important because*…' or '*This a new example of*…', are samples of elaboration prompts (King & Rosenshine, 1993). Finally, reflection prompts encourage reflection on a metacognitive level. A possible prompt of this type could be: '*To do a good job we need to*…' (Ge & Lund, 2001). Many researchers examine all three types of prompts, without distinguishing between the different classifications.

Purpose of Structured Collaboration: Aiding Reading Comprehension

An examination of the literature on structured collaboration illustrates that most structures are in place to aid text processing and comprehension across subject areas (O'Donnell, 1996). Understanding text in all disciplines is vital if students are to succeed academically (O'Donnell, 1999). When texts are challenging and difficult to understand, collaborative discussion can support members of the group to share and construct better understandings of the text than might otherwise be possible (Jenkins & O'Connor, 2003). There are, however, a number of individual processes that are critical for understanding text.

According to the 'simple view of reading', reading is considered to be the product of both decoding and comprehension (Gough & Tunmer, 1986). Most adolescents have mastered decoding words and thus may generally appear to be fluent readers; yet, they may not have the ability to tackle more difficult words or have higher-order comprehension skills (Williams, 2003). Older readers are more likely to have problems with vocabulary knowledge, grammatical skills, working memory, inference making, comprehension monitoring, and domain knowledge (Williams, 2003). Such students may have mastered word-level decoding skills quite effectively but they still have difficulty understanding the main ideas of what they read, especially with difficult text, and they may lack problem-solving strategies.

Reading comprehension necessitates students find the main ideas from the text (Pearson & Duke, 2002). Without this understanding, inferences cannot be made, nor comparisons between texts achieved. Yet teaching students how to find the main idea is complex. One way to increase comprehension is to have structures in place that aid metacognition where students are made aware of their cognitive processes and how to best utilize them (Williams, 2003). During the reading process, students are guided to use metacognitive strategies and are taught why each strategy is important and when it is appropriate to use such strategies (Englert & Mariage, (2003). Metacognition refers to an individual's knowledge of their own cognitive processes and their ability to control these processes by organizing, monitoring and modifying them. During metacognition, students reflect upon the task and select and employ the appropriate strategy (Fuchs & Fuchs, 2003).

There are a host of metacognitive strategies employed in the classroom, including supporting students to search for connections to familiar problem structures while solving mathematical problems (Fuchs & Fuchs, 2003). Another strategy teaches struggling readers strategies to aid reading comprehension by getting them to connect to what they know about the particular topic, predict what will happen next, summarize the main points, or clarify the text (Palinscar & Brown, 1984). It has often been found that for students with learning issues, a combination of strategy training and direct instruction is most effective (Scruggs & Mastropieri, 2003). Direct instruction refers to a model of teaching that emphasizes well-developed and carefully planned lessons designed around clearly defined and prescribed teaching tasks. It is based on the theory that clear instruction eliminates misinterpretations and can then improve and accelerate learning (Adams & Carnine, 2003).

Metacognitive strategies are often used with adolescents. Peverly, Brobst & Morris (2002) found that metacognitive strategies are better used by older students as these readers are more likely to benefit from strategy instruction, and high school tasks are enhanced more by metacognitive reading strategies than tasks at the younger grades. Metacognitive strategies are especially effective when the text is challenging (Beck, McKeown, Hamilton, & Kucan, 1998).

Students may be able to adequately comprehend simple works, but may have difficulties when encountering challenging text; especially in subject areas they are not as familiar with (Beck, McKeown, Hamilton, & Kucan, 1998). When text is particularly difficult, students are often unable to connect the ideas they have read, to information that is presented later. This is especially true of expository text (Beck et al., 1998). Often expository text is written at a challenging level that assumes a level of background information a student may not possess (Beck et al.). Thus Beck et al.'s research uncovered that many students' recall after reading challenging expository text, was at the surface level. Certainly comprehension of narrative compared to expository text does differ as the former involves story grammar and the latter entails a variety of different forms, including cause and effect or compare and contrast structures (Williams). It is imperative, therefore, that students understand the different structural elements of a particular type of text and be guided to use a host of strategies that can cue the necessary metacognitive skills to aid comprehension (Williams, Brown, Silverman, & deCani, 1994). Often working with other students can help aid reading comprehension, especially when students are faced with challenging text.

The use of small groups has been used in both traditional classrooms (Johnson, Johnson & Holubec, 1993) and in the online setting (O'Donnell, Hmelo & Erkens, 2005) to ensure that students maximize their own and other's reading comprehension. Individual differences, in these instances, are viewed as resources in the group. In fact, peer support can work as a compensatory mechanism enabling learners to overcome obstacles they could not overcome working alone (Jenkins & O'Connor, 2003). Through group discourse, learners co-construct new knowledge and ways of thinking (Vygotsky, 1978) to become self-regulated learners and to foster metacognitive strategies. When students collaboratively discuss and try to identify main ideas in a text they provide informal and formal feedback for one another to help (a) metacognitively monitor their own accuracy and skills in identifying main ideas, and (b) learn to accurately identify main ideas. By doing this, students are able to tackle and understand challenging text that they would have otherwise been unsuccessful with on their own (O'Donnell, 1999). Within this research area there are several leaders, including O'Donnell, and Palincsar and Brown, who have extensively examined the impact of structured collaboration on reading comprehension.

O'Donnell and Structure

Angela O'Donnell has extensively researched scripted cooperation with the goal of aiding declarative (knowing that) or procedural knowledge (knowing how) gained from text (Chinn, O'Donnell & Jinks, 2002; O'Donnell, 1999; O'Donnell & Dansereau, 1992). This type of structured collaboration reflects a cognitive elaboration perspective where students take on cognitive roles in a highly structured environment to work on a task in pairs (O'Donnell). Unlike other roles, scripts or prompts used by other researchers, O'Donnell's structure only involves cognitive activities. Students are provided with a script where they play a particular cognitive role, such as 'listener' or 'recaller'. The script dictates when the student should fulfill the role and prompts certain cognitive processes that may not occur otherwise and limits negative social processes

(O'Donnell, 1999). Students are either provided with a cooperative teaching script (students do not share the same material) or a cooperative learning script (students share the same material). Within O'Donnell's framework, students alternate roles within a dyad where participants both model and learn from strategic behaviour. O'Donnell suggests using scripted cooperation for a variety of tasks that involve text processing or learning procedures.

Within O'Donnell's work, she has discovered (a) scripts that promote helping behaviours with unfamiliar tasks reduce anxiety (O'Donnell, 1986); (b) cooperative teaching scripts tend to be more successful than learning scripts (O'Donnell, 1999); (c) a single script does not work well for all tasks (O'Donnell, 1999). Instead, O'Donnell suggests that scripts may need to be modified as needed for the task or a specific outcome or information found within the text (O'Donnell, 1999).

I propose that further research that builds on O'Donnell's work should examine the following variables: (a) larger groups (b) younger students, (c) prompts altered to fit the environment, and (d) level of structure. The majority of O'Donnell's work has examined the effectiveness of scripted cooperation with dyads; larger groups therefore should be examined as they have been found to be more effective (Slavin, 1995). In addition, school-aged students should be included in research, as O'Donnell states most studies have been conducted at the university level. O'Donnell's work extensively examines roles and scripts, but does not delve deeply into the use of prompts to support the roles and thus prompts should be more comprehensively studied. Finally, O'Donnell's work has found that scripted cooperation can lead to issues with motivation, as there is little room for student innovation within this highly structured environment. Thus the type and level of structure should also be thoroughly examined.

Palinscar and Brown and Structure

Palincsar and Brown's research has also extensively examined structured collaboration (Brown & Palincsar, 1989; Palinscar & Brown, 1984, 1989). Their cognitive supports specifically aid reading comprehension and promote discourse skills. Palincsar and Brown's reciprocal teaching method was originally designed as an intervention to be used with students who demonstrated significant disparities between their ability to decode and comprehend text; however it has been used successfully with other groups of students (Palinscar & Brown, 1984, 1989). Within this model, student's mental processes are transformed publicly to aid metacognitive skills (Englert & Mariage, 2003). In particular, students adopt reciprocal teaching roles, supported by scripts to facilitate reading comprehension (Palinscar & Brown, 1984). They fulfill particular roles to help formulate questions for one another about the text and then teach that material to their peers. Students have to process the material themselves and learn how to focus on the essential elements of the reading passages before they are able to do comprehension modeling. Roles alternate within the learning group of usually four learners. The roles consist of: a summarizer, who synthesizes text; a questioner, who poses questions to aid comprehension; a clarifier, who resolves any lack of understanding; and a predictor, who hypothesizes what will occur next in the text. By fulfilling the role, students are exposed to alternative views of the text (Palinscar & Herrenkohl, 1999).

Studies of reciprocal teaching in the regular classroom have supported its effects on student achievement as it has found to be highly effective for understanding and remembering complicated text (Järvelä, 1996). There are, however, some limitations as it should not be assumed that all students internalize the use of the four roles as some researchers have found that assuming reciprocal teaching roles may be too constraining and not conducive to higher-ordered thinking (Van Garderen, 2004). Salomon and Globerson's work (1987) found that adopting reciprocal teaching roles might even impede learning. Cohen suggests that cooperation should be structured to promote high-level discourse; however that structure should be flexible and should support collaboration (1994).

I propose that future research should build on Palinscar and Brown's work and should (a) alter the reciprocal roles so that they foster not only cooperation, but collaboration, and (b) examine the roles under different settings. As Cohen (1994) and O'Donnell (1999) have suggested, flexibility within structure is important, and thus one script may not work in all settings. Reciprocal teaching roles, therefore, may need to be adapted to fit the particular task or goal. In addition, despite the large body of research that endorses the use of reciprocal teaching to aid comprehension, this method has not been examined extensively in other common settings such as the online environment. It is largely unknown how these supports may aid students who are collaborating at a distance.

Reading comprehension is vital for student success and thus is often the focus of study in structured collaboration (O'Donnell, 1999). Roles, scripts and prompts based on O'Donnell, and Palinscar and Brown's work have been shown to effectively aid text processing and reading comprehension in the classroom. O'Donnell's structure tends to be more flexible than Palinscar and Brown's with the understanding that no one role or script suits all tasks (O'Donnell, 1999). In addition, here roles tend to support collaboration, in addition to cooperation. Reciprocal teaching supports, however, have resulted in gains in student's reading comprehension, although this has not been extensively examined in an online environment. Thus what is needed is an examination of computer supports that aid collaboration and reading comprehension. Given the body of literature that supports reciprocal teaching, the success of these supports should be transferable to the online environment; however, the roles, scripts and prompts may need to be altered to fit the environment and goal of the task. As the use of and need for computer-supported collaborative learning (CSCL) environments to enhance productivity increases, and team work and learning becomes more prevalent, there is a growing need for tools that can support the collaborative process as these environments are unique and therefore may require specific supports not needed in the classroom.

Structure in CSCL: CSCL Defined

Computer-supported collaborative learning (CSCL) seeks to promote learning through sharing and co-constructing knowledge, using technological tools to support the process (O'Donnell, Hmelo & Erkens, 2000). During CSCL, students participate in the learning process from remote areas, rather than from the same location (Makitalo, Weinberger, Hakkinen, Jarvela, & Fischer, 2005; Weinberger et al., 2005). There is an increased focus on discourse as a means of collaborating, usually through a synchronous or asynchronous chat tool. CSCL can range from being highly unstructured where free collaboration is encouraged to very structured, scripted collaboration. More structured collaboration can take on many different forms, and be supported through a myriad of technologies. Support tools mainly fall into two categories: internal support tools and external support tools. Internal tools support collaboration, self-regulation, and learning structures by scaffolding the learning and offering feedback (Winne et al., 2006). These structures are usually built in and designed to provide immediate feedback. External technological support tools include online help, email help, and help menu type formats.

In the online environment students may need complex internal and external supports, compared to in the classroom, as they are often uncertain of how to proceed when collaborating and expert help may not be available. As online learners lack visual feedback from other students and are often deprived of knowledge on the quality of their contributions, they remain uncertain as how to proceed (Kester & Paas, 2005; Makitalo et al., 2005). Unfortunately, a review of the literature suggests basic supports constitute approximately 80%-90% of the supports for CSCL with a lack of more sophisticated tools that support the collaborative process (Hadwin, Gress, Page, & Ross, 2005). Basic chat tools were labeled as support despite the fact learners may not know how to implement these tools, nor have these tools been found to scaffold the collaborative process or metacognition necessary to complete most tasks. More complex supports, however, such as roles, scripts and prompts, have not always produced positive results. Issues surrounding motivation, academic achievement, and the degree of support are some of the areas that need to further be examined. What follows is a specific review of the literature on roles, scripts and prompts in the CSCL environment.

Review of the CSCL Literature

The CSCL literature on structured support that employs roles, scripts, and prompts is lacking in many areas. First, a good portion of the research on CSCL is conducted in laboratory settings and not in schools. Thus, it is unclear how motivating or successful these supports would be if the distractions and social dynamics of a typical class were part of a study. In addition, rarely are groups larger than dyads used in a collaborative setting, despite the fact most groups in the classroom are larger, and research shows a need to examine these larger groups. Moreover, studies are unclear on how much structure is optimal. Some research found that roles, scripts and prompts could impede academic and group performance, whereas others discovered the opposite.

Perhaps the area of greatest concern is the lack of clarity around the purpose of collaboration. Group collaboration occurs for a variety of different purposes with a variety of different tasks; yet, we know very little about how specific forms of collaborative support help students with specific kinds of tasks in an online setting. In many studies it is not easy to determine if it is the collaboration that is responsible for improvements in cognition or if online collaboration was even needed to accomplish the task. One common purpose for collaboration in classroom studies is to improve reading comprehension, yet this has been mostly ignored in the CSCL literature. Although most CSCL studies on structure are interested in scaffolded learning and improvements in cognition, few have examined roles, scripts, or prompts that support reading comprehension in particular, despite its importance across all disciplines.

Setting, Group Homogeneity and Size

Previous research on classroom collaboration has shown that (a) groups that are varied academically are best (Tudge, Winterhoff, & Hogan, 1996); (b) students with low status contribute less frequently in group situations; and (c) groups larger than dyads should be examined as they are common in the classroom and appear to be more successful (O'Donnell, 2006). Consequently, studies that do not take this into account or are conducted in a laboratory setting with students who are unknown to each other may not be able to replicate results in the classroom. The validity of research results on roles, scripts and prompts in the CSCL literature is called into question in many cases as copious studies are conducted in research labs and not in a classroom setting with an intact class and an authentic task.

Strijbos, Martens, Jochems, Wim, & Broers' (2004) research examined the effect of functional roles on group efficiency during CSCL and claimed that roles increased group coordination. Since students were not part of an intact class, and the research was conducted in a laboratory setting, it is unclear if results could be replicated in a typical online educational surrounding. Rummel and Spada's (2005) work was also constrained by this issue. The researchers developed an instructional approach to improve CSCL by giving students the opportunity to learn from scripted collaborative problem solving. Their findings suggested that scripts were particularly important for some students. Again, like Strijbos et al.'s research, this study was conducted in a laboratory setting with students who had never worked together before. Since status within a group can impact the amount of contributions, it is unclear how results would vary with a group of students who had previously worked together and were aware of the academic or social status of other group members (Webb, 1992). It also appears that the above researchers did not create groups of students of similar age, but who were academically varied (Tudge, Winterhoff, & Hogan, 1996).

In the CSCL literature, many studies examined dyads even though larger groups are common in instructional practice, and are considered in the classroom ideal for optimum benefit of group work (O'Donnell, 2006). In fact, despite using the CSCL label, some studies considered individual work with a computer to be collaborative. Chou, Lin and Chan's (2002) research on computational supports for reciprocal teaching, advocated the use of the computer to fill a collaborative role with another student. Although results from this research may aid software developers when creating "learning coaches", this study does little to illuminate how group collaboration impacts learning.

In the classroom, groups of three or four do appear to work well together (Webb & Farivar, 1999), although this has largely not been tested in an online setting (Hsieh & O'Neil, 2002; Robertson & Good, 2003). Perhaps this is principally due to issues surrounding attrition, while conducting research. Certainly examining larger groups is more problematic for researchers as it is more likely that one person may withdraw from the group, especially is there are multiple sessions in the study. Despite this difficulty, researchers need to work around this issue to try and replicate what is likely to occur in an authentic setting.

Optimal Structure

The optimal level of support needed to create effective online collaboration is extensively debated in the CSCL literature. Some studies purported that roles, scripts and prompts are needed to aid discourse and learning, whereas others found that these supports may do just the opposite. It may be that these online cognitive supports need to be endorsed by social supports, which then should be eventually faded out, as novices become experts.

Roles, scripts and prompts in many cases have been found to increase learning and discourse. Burton, Brna and Pilkington's (2000) study, which investigated how to organize collaborative activities in a CSCL environment, found this to be accurate. Using the collaborative software, Clarissa, they examined the dialogue between a number of students, and the roles associated with this dialogue. Two conditions existed in this study: (a) a structured situation where students stopped using their current role every time an individual started a new dialogue game and (b) free collaboration. They found that the structured role situation benefited students more than free collaboration, as in the latter case participants resorted to socially normal roles. Socially normal roles were not conducive to collaboration as one student often controlled the conversation and remained in control.

Rummel and Spada (2005) also found that structure could be effective. These researchers developed an instructional approach to improve CSCL by giving students the opportunity to learn from scripted collaborative problem solving within a computer-mediated learning environment. This mixed-methods design found that collaborating with a script had positive effects on process and outcome. The researchers discovered that discourse levels were low with the unscripted group compared to the group that utilized scripts. Scripts were also found to be particularly important for novice students, as this group needs coordinative dialogue when collaborating for the first time. Poor results of unscripted learning indicate it is not effective for CSCL. Despite these positive finding, there are many other studies that have found contrary results.

Beers, Boshuizen, Kirschner, Wim & Gijselaers' study (2005) examined an ICT-tool, which looked at three levels of collaborative scripts to support complex problem solving. Their main goal was to create a CSCL environment that facilitated knowledge construction by creating common ground among novice collaborators. The researchers found that in two of the conditions, students actually posted fewer contributions. The authors suggest that when there is high script structure students post more wisely knowing they have less opportunity for discourse and, therefore, choose to word contributions more broadly, which necessitates fewer posts. This highlights a potential issue, as participants may not be able to raise a point when they feel it is necessary, as it may not adhere to the script. Prompts with too much structure can also be a concern.

Ge & Land (2001) looked at scaffolding ill-structured problem-solving processes using question prompts during CSCL. They used the rationale that students do not always engage in high level discourse unless prompted to do so. The researchers found that there were some limitations to question prompts. Students sometimes ignored the question prompts, resulting in a lack of attention to important areas of the task. The prompts, they found, may also restrict participants from responding. Makitalo et al. (2005) also found mixed results when studying supports.

Makitalo, Weinberger, Hakkinen, Jarvela, & Fischer's (2005) mixed methods study examined epistemic cooperative scripts on learning outcomes, information seeking and discourse. The researchers found those without epistemic scripts achieved better outcomes. Researchers do not know to what extent interaction should be structured on an epistemic level in order to support the way learners cope with an online setting. In Makitalo et al.'s research, the unscripted group sought information in a direct and successful manner, while the scripted group sought information more indirectly and less successfully. It may be that the epistemic script might have restricted the learners too much in the sense that its prompts used closed questions and therefore did not facilitate elaborative processes. Other studies that have examined social scripts, have found that these types of scripts appear more beneficial than epistemic or cognitive supports. It may be that epistemic scripts may need to be supported by social scripts and then faded out, as novices become experts.

In Weinberger et al.'s (2005) study, social scripts were found to be beneficial with respect to individual acquisition of knowledge, whereas as in the above study, epistemic scripts were not. Providing learners with an epistemic script may not always result in individual knowledge acquisition. Furthermore, epistemic scripts may need to be endorsed by social scripts. Prompts, combined with scripts were found to encourage students to explore and discuss alternative viewpoints. Too much structuring, however, through prompts and scripts may further impede interaction of learners when the script divides labour into tasks that can be worked on by each learner individually. Instead of receiving a task strategy, learners should be prompted to construct a conceptual model themselves and tasks should demand interconnectivity with other group members. Scripts, therefore, may sometimes need to make tasks more difficult for learners and then eventually be faded out.

Finally, Kester and Paas' study (2005) looked at how to foster learning in CSCL environments using scripts. They found that scripts sometimes enhance social and cognitive processes. Instead of suggesting that tasks need to be more difficult, they used cognitive load theory to suggest the opposite. If too scripted, a collaborative task can lead to a cognitive overload and hinder learning. To avoid this, they suggest fading script support as expertise increases and give more group control, by prompting.

Thus roles, scripts and prompts can sometimes improve learning and discourse, but at other times may impede the process and outcome. Epistemic support may need to be used in conjunction with social supports that guide and facilitate the actual collaborative process. Supports may be too rigid for students; however, they appear more beneficial at the novice stage. Clearly more work is needed in this area to determine the optimal degree and type of structure that will aid learning and discourse.

Purpose of CSCL Reasearch

One area of concern in the study of structure in CSCL is that published manuscripts are often unclear as to the purpose for online collaboration. Tasks are not plainly defined, nor is it apparent why online collaboration is needed in the first place to accomplish particular goals. It is often difficult to determine if an outcome is the result of collaboration. Axelsson, Abelin, Heldal, Shroeder, and Widestrom's study (2001) examined dyad collaboration where students completed a virtual puzzle solving task. Although the purpose of the study was to examine performance, it is not apparent why this task needed to be completed collaboratively online, versus independently or in person. The authors gave a number of inconsequential reasons for testing this puzzle in the virtual world, including citing difficulties with dealing with the weight of the puzzle. In addition, no rationale was given as to why this task needed to be completed with a partner. Collaboration should necessitate interdependence and multiple perspectives in order to accomplish an individual or group goal (Hogan & Tudge, 1999). Clear reasons should also be provided as to why this collaboration should occur virtually. Online collaboration occurs for a variety of different purposes with a variety of different tasks; yet, we know very little about how specific forms of collaborative support help students with specific kinds of tasks. Across all disciplines the need to understand complex text is often the real purpose of collaboration; although, it is often not explicitly stated by researchers (O'Donnell, 1999). Yet it is difficult to find in the CSCL literature, studies that specifically explore this goal.

Reading Comprehension

Adequately comprehending what you read is perhaps the most important skill a student can acquire. It is linked to both academic achievement and with one's ability to effectively collaborate (O'Donnell, 1996; Prinsen, Volman & Terwel, 2007). Thus, often a primary goal or purpose for structured collaboration is to aid text processing and comprehension across subject areas (O'Donnell, 1996). As O'Donnell, and Palinscar and Brown discovered in the classroom, supports that aid collaboration and the individual understanding of text are closely related to academic gains (O'Donnell, Palinscar & Brown, 1989). Furthermore, a few CSCL studies have determined that a student's comprehension level can influence the quality and quantity of collaborative contributions, impacting the individual and group's performance (Prinsen, Volman & Terwel, 2006; 2007). Yet, despite this area's importance, the CSCL literature has few studies that have examined this topic sufficiently. In the CSCL literature that does address reading comprehension, there appear to be major design flaws. Either gains in comprehension could not be sufficiently attributed to an intervention, or they were not examined at all. Furthermore, there was often a lack of interconnectivity within groups, illuminating the question as to why students needed to collaborate in the first place.

Reciprocal teaching is a common structured intervention that is found in the classroom to facilitate students to collaborate in order to improve their comprehension (Palinscar & Brown, 1984, 1989). Studies of reciprocal teaching in the regular classroom have supported its effects on student achievement as it has found to be highly effective for understanding and remembering complicated text (Järvelä, 1996). It is not surprising then, that reciprocal teaching, or a form of this structure, has also been examined in the online setting. Wong, Chan, Chou, Heh & Tung (2003), Chau, Lin & Chan (2002) and Chan & Chou (1997) have all looked at the impact of a form of reciprocal teaching, known as reciprocal tutoring, in the virtual environment.

In online reciprocal tutoring, students take turns playing the cognitive role of tutor and tutee, taking on the four roles of the classic reciprocal teaching. The software in the above studies utilized scaffolding tools and a virtual participant to aid in reciprocal tutoring. This virtual companion either collaborated with or competed against a student. The researchers found that learning with an artificial intelligent tutoring system, was almost as effective as learning with an expert teacher, as comprehension of the material greatly increased (Chan & Chou, 1997; Chau, Lin & Chan, 2002; Wong, Chan, Chou, Heh & Tung, 2003). There were, however, a number of flaws with these studies that lessen their contribution to this area. First, although cognitive gains were reported, it is unclear if actual comprehension was impacted. None of the above studies examined baseline comprehension scores in order to determine if gains were made. Next, since these studies were conducted with only one student and a virtual learning companion, it is questionable if this body of research could be considered to be examining collaboration. It is the interconnectivity and collaboration between group members that Palinscar and Brown (1984; 1989) and O'Donnell (1998) found so important for improving reading comprehension.

Bruckman's (1998) research was also affected by similar issues. She studied a peer-supported, text-based virtual reality environment meant to improve student's reading and writing. Although she found that students' reading improved, there was no evidence that baseline reading comprehension scores were obtained, or comprehension gains examined. Thus it is unclear if greater comprehension scores were due to a particular group's superior reading ability or if rates could be attributed to the intervention. It is simply not adequate to compare groups after an intervention unless there are baseline scores to determine if actual gains have been made (Khoo & Muthen, 1997). Prinsen, Volman & Terwel (2007) did examine baseline reading comprehension scores, however their study explored whether or not differences occur in the participation during collaboration of students who diverge in comprehensive reading scores. Thus, they were not interested in whether or not a particular intervention increased scores, but rather if comprehension influenced the quality of collaboration.

It is important, then, that the field of CSCL expand to more thoroughly study the area of reading comprehension. It is clear that reading comprehension is vital to student success as it impacts the quality of collaboration and academic achievement (Prinsen, Volman, & Terwel, 2007). Studies should examine various interventions or structures that have shown to work in the classroom to determine if their success can translate to the online environment. The design of studies should determine if interventions are successful in improving reading comprehension by including baseline comprehension scores. Collaboration should include true collaboration with other students, and not just with virtual learning companions and that collaboration should necessitate interconnectivity between group members.

Comprehension is increased when structures are in place that aid metacognition where students are made aware of their cognitive processes and how to best utilize them

(Williams, 2003). Vygotsky (1978) posited that higher forms of thinking develop from experiences with peers when groups collaborate to co construct meaning. Alexander and Manion (1997) examined the benefits of peer collaborative activity on metacognitive strategy use and found that strategy acquisition when acquired through group collaboration is very effective. Thus, researchers need to clearly define their goal and thus structure collaborative tasks to fit the goal of aiding individual text comprehension by scaffolding metacognition and the collaborative process. Here researchers may draw on the work of O'Donnell, and Palinscar and Brown. As reciprocal teaching supports have been found to enhance reading comprehension in the class, this cognitive structure should be examined in the online setting. Like O'Donnell (1999) and Chou, Lin and Chan (2002) suggest, this classic type of support may need to be modified to fit the online environment and achieve the individual goals of the researchers.

Summary

Self-regulated learners are academically successful and motivated. They manage their time and environment through learning and seeking help from peers through collaborative activities (Paris & Paris, 2001). Vygotsky believed both that self-regulation was promoted through social interactions and that those interactions fostered intellectual growth (O'Donnell & King, 1999). Today, collaborative activities are commonly used in the class and in the online setting. Collaboration is not always effective with numerous variables linked to successful collaborative learning. These include age, social standing, group composition, and the task and purpose of the collaboration. Usually, the purpose for collaboration is to improve individual understanding of the text, although researchers do not always readily recognize this. In the online environment collaboration may be even more ineffective, as students often do not know how to collaborate online, are unsure how to interact, or need extensive help to manage learning and collaborative tasks. Learning can be improved in both the regular and online classroom by drawing on the work of O'Donnell, and Palinscar and Brown to structure collaborative interaction.

O'Donnell, and Palinscar and Brown create structure through providing roles, scripts or prompts to aid collaboration, text processing and comprehension. Palinscar and Brown's reciprocal teaching roles have been found to significantly impact reading comprehension; however, other studies have resulted in mixed findings (Palinscar & Brown, 1989). It may be that these supports are too structured, do not allow for student innovation, and are more likely to promote cooperation rather than collaboration (Cohen, 1994). O'Donnell suggests that altering or modifying the supports to suit the purpose of collaboration may allow that needed flexibility (O'Donnell, 1999).

The current CSCL literature on roles, scripts and prompts uncovers a variety of concerns. What is deemed as support often provides minimal guidance and does not scaffold cognition. In addition, research is often conducted in laboratory settings and not in schools. Intact classes with groups larger than dyads need to be examined. Furthermore, it is unclear how much structure is optimal: some studies discovered that supports decreased performance whereas others found the opposite. Epistemic or cognitive supports may need to be used in conjunction with some sort of social support that guides the collaborative process. Supports should be in place for novices, but then faded out once students become more expert in order to facilitative motivation and to allow for unscripted responses. It also needs to be clear why researchers are studying online collaboration and if online collaboration is actually needed to achieve the goals of the researcher. Studies should clearly outline why collaboration is important to the research task, and why that collaboration should occur online. Tasks should then be authentic and necessitate interconnectivity of group members.

Although one common purpose of collaboration is to aid reading comprehension, it has been often ignored in the CSCL literature. Most CSCL studies on structure are interested in scaffolded learning and improvements in cognition, yet few have examined roles, scripts, or prompts that support reading comprehension in particular, despite its importance across all disciplines. Studies should examine various interventions that improve comprehension or structures that have shown to work in the classroom to determine if their success can translate to the online environment. The design of studies should clearly determine if interventions are successful in improving reading comprehension by including baseline comprehension scores.

Thus what is needed is an examination of reciprocal teaching structures, modified to suit the purpose and to structure discourse in an online chat environment. These modified supports should then be compared to unstructured collaboration to determine if this type of intervention is successful in improving reading comprehension. To determine gains in comprehension, individual reading comprehension should be examined before and after the intervention. A measure of pre-existing differences in reading comprehension will be important to determine if there is a relationship between existing comprehension levels and subsequent gains. In the end, one must not assume that the use of technology always promotes learning as in the past, these assumptions left the field of CSCL mostly unexamined. Yet upon consideration of the financial and emotional costs involved, there is too much at stake to allow this to happen.

Chapter 3

Methods

Overview

This thesis research was conducted within the context of Dr. Allyson Hadwin's SSHRC-INE funded project (The Learning Kit Project) and includes one other thesis. Data for all projects were collected simultaneously. The methods section describes all data that was collected for these studies; however, instruments that are not part of this thesis study are not described in detail and are clearly marked with [square brackets].

Participants

Participants included 62, Planning 10 students distributed across one school within the Saanich school district. The sample represents a range of reading abilities and comprehension levels. Participants were drawn from Parkland Secondary, which serves grades 9-12 students from a variety of socio-economic backgrounds. For piloting testing, 8 participating students were drawn from The Individual Learning Centre (ILC): an alternative high school located at two locations where "at risk" youth work independently with tutors.

Criteria for inclusion in study. A convenience sampling strategy was used to select participants who were willing and available to be studied from the above school populations. A minimum of 60 participants was needed in order to ensure sufficient numbers for planned statistical procedures (Creswell, 2005). As the collaborative learning activity is directly related to the prescribed learning outcomes for English 10 and Planning 10, only students in those subject areas were asked to participate (See Table 1).

Five teachers from the above schools expressed interest in participating (2 from ILC and 3 from Parkland).

Instruments

As this study was part of a larger research project, a number of instruments were used to collect data. All instruments are listed here, however they are only described in detail when they are pertinent to this particular study.

(a) Test of Reading Comprehension (TORC-3)

The TORC-3 (Brown, Hammill, & Wiederholt, 1986) is a standardized measure of reading comprehension, which takes approximately 20 minutes to administer. This test measures reading comprehension competence relative to a normative group and is appropriate for use with individuals between the ages of 7-0 and 17-11. The TORC-3 is made up of 8 subtests: (a) General Vocabulary, (b) Syntactic Awareness, (c) Paragraph Reading, (d) Sentence Sequencing, (e) Mathematics Vocabulary, (f) Social Studies Vocabulary, (g) Science Vocabulary, and (h) Reading the Directions of Schoolwork. The last 4 subtests are optional to administer (Brown et al.). The first 4 subtests make up the General Reading Comprehension Core, where these tests are used in combination to arrive at a measure of the student's general reading comprehension. Each subtest, however, is reliable enough to be used alone (Brown et al., 1986). This study only used the paragraph reading subtest, as the other subtests are not applicable to this study and due to time constraints. The Paragraph Reading subtest has 6 paragraphs that are progressively more difficult to read and are of varying words in length. Students respond to 5 corresponding questions per paragraph. Each question has 4 multiple-choice options to choose from (A, B, C or D). Students read each paragraph and then answer questions, while continuing to have access to the text. This data was entered into an excel sheet with a listing of the participant and then coded for correct and incorrect answers to the multiple-choice questions (1 = correct; 2 = incorrect for a maximum total of 20). Raw scores can be converted to grade equivalents, age equivalents, percentiles, and standard scores. For this study, raw scores were used.

Table 1.

Number of Words Per Paragraph for TORC-3 Paragraph Reading Subtest

Paragraph Number	Number of Words
1	31
2	57
3	112
4	77
5	86
6	131

The TORC-3 can be administered to individuals, small groups, or an entire class (Brown et al., 1986). The proper use of ceilings is an essential part of the TORC-3 administration (Brown et al.). Ceilings measure the highest level of performance or score a test can reliably measure. With individual administration of the Paragraph Reading subtest, a ceiling is reached when 2 or more questions for any paragraph are answered incorrectly. If administered to a group, however, Brown et al. suggest all test items are to be attempted within the subtest so that ceilings can be calculated after the test. The test is not timed and therefore students complete the test at their own speed. For this particular study, this test was provided on paper. Students read a paragraph and then answered the set of questions associated with the paragraph. Students had access to the paragraph while answering the text. Once students finished the set of questions, they were directed to read the next paragraph and answer the next set of questions, if there was time.

The TORC-3's psychometric properties have been examined, with the test appearing to be a valid and reliable measure of reading comprehension. The TORC-3 was normed on a sample of 1,962 persons between the ages of 7-0 and 17-11, from 19 states. It has a content sampling error that exceeds .90, a standard error of measurement of 1, and a test, retest reliability of .81 for the Paragraph Reading subtest.

(b) Task-Specific Reading Comprehension Pretest

This instrument was developed for this research and took approximately 20 minutes in total for students to complete. It consists of 18, multiple-choice questions, with 4 choices per question (A, B, C, or D). The questions are based on 2 of the 5 sections of an article on crystal methamphetamine, which is described above (See Appendix C for the complete text). The multiple-choice questions, target 3 of the 4 levels of comprehension processing targeted in the grade 10 English Provincial, Reading Comprehension Subtest (Appendix E) and include: retrieval of information, recognition of meaning, and interpretation of the text. The questions were drawn from super ordinate idea units contained within the sections, with care taken to ensure that questions were representative of the main idea units contained within the text.

The Task Specific Reading Comprehension test was administered in 2 parts. At the beginning of each section, students were asked to rate the difficulty of the text on a scale of 1 to 7, with 1 representing very comprehensible and 7 equaling very incomprehensible. Students answered 9 questions (3 at each depth of processing level) after reading each section of text. For this particular study, the sections were accessed through the collaborative learning kit, with the questions administered on paper. Students had access to the text they have just read while answering the test questions. Once students finished the set of questions, they were directed to read the next section and answer the next set of questions, if there was time. Correct questions were given a score of 1, and incorrect questions a score of 0. Like the TORC-3, this test was not timed.

While no official psychometric properties were obtained from this test, it was deemed adequate by the researchers for their intent. It was pilot tested on three, grade ten students not involved in the study to ensure its validity and reliability. The three students were categorized by their English teacher as poor, average, and superior readers. The amount of time it took the students to read the text and answer the questions was noted to ensure the task was reasonable. The total amount of time for the complete task varied from 17 minutes, for the superior reader, to 30 minutes for the poor reader. The superior reader answered 80% of the questions correctly, compared to the average reader's score of 70%. The poor reader answered 60% of the questions correctly. Correct and incorrect answers were recorded and compared across the three sets of responses.

(c) Task-Specific Reading Comprehension Posttest

The same instrument was used for the pretest and posttest. This instrument used the same set of questions, based on the same text used with the pre test, as described above. As this test was administered twice to the same group of students, a practice effect is expected as both groups would have been (a) exposed twice to the same text and (b) had 2 exposures to the test. It is anticipated, therefore, that if the instructional condition does not impact comprehension than the practice effect should not vary between the regular peer text chat group and the structured peer text chat group. This study, however, is interested in whether or not one group will improve more that the other group in the task-specific reading comprehension measure.

(d) Computer Efficacy Survey [This instrument is not part of my thesis.]

This 10-item test uses a 6-point Likert scale inventory to measure a student's perceptions of their capabilities, knowledge, and skills related to computers (Cassidy and Eachus, 2002). Questions were administered electronically through WebQuestionnaire.

(e) Self Efficacy Measurement [This instrument is not part of my thesis.]

This 10-item test uses a 6-point Likert scale inventory to measure a student's perception of their independent capabilities to perform during collaborative work (Seyyed Babak Alavi, 2005). Questions were administered electronically through WebQuestionnaire

(f) Collective Efficacy [This instrument is not part of my thesis.]

This 10-item test uses a 6-point Likert scale to measure a group's collective efficacy during collaborative work (Seyyed Babak Alavi, 2005). The above 3 efficacy measures took approximately 10 minutes to complete in total. Questions were administered electronically through WebQuestionnaire

(g) Participation in Collaborative Discussions [This instrument is not part of my thesis.]

This instrument uses *gChat* records to decode chat contents to determine the quantity and quality of postings. Postings will be given scores of 1 if there is evidence of cognitive contribution and 0 if there is no evidence of cognitive contribution.

(h) Prior knowledge [This instrument is not part of my thesis.]

This instrument was developed specifically for this research. The test consists of 10 multiple-choice questions that cover broad issues on crystal methamphetamine use. A complete listing of the 10 questions can be found in Appendix G. This test took approximately 5 minutes to complete. This instrument was administered electronically through WebQuestionnaire.

Assignment to instructional conditions. A preponderance of current research examines dyads, even though quadrads are (a) common in instructional practice, and (b) considered ideal for optimum benefit of group work (O'Donnell, 2006). Thus, within each participating class, participating students were assigned to groups of 4 classmates (described later in detail). Approximately 15 quadrads participated in the study. It is important to note that due to an unforeseen drop in attendance for session two, some of the groups were made into a group of three (2) and some into groups of five (2). During this time for the structured condition, the predictor role was dropped for the groups of three and the questioner role was added to the groups of five. Groups were randomly assigned to two conditions, so that approximately half the groups in each class were assigned to each condition: (a) regular peer text chat or (b) structured peer text chat. Given the complexity of conducting applied classroom-based research, sample sizes for the study were limited by teacher and student availability within one school district and interest in incorporating the instructional module into the Planning 10 curriculum. The final sample consisted of 62 participants (see table 2).

Table 2.

Table of Group Size

Condition	*N*
Unstructured	31
Structured	31

Note. $N = 62$

Research Context

Instructional context. Participants individually read (session 1) and collaboratively discussed (session 2), a very challenging text (grade 13, using Fry's readability graph) on crystal methamphetamine with the goal of understanding the article sufficiently to answer a series of comprehension questions based on the text. (Task instructions for students can be found in Appendix A for the regular peer text chat group and Appendix B for the structured peer text chat group).

Instructional value of exercise. The instructional task, reading materials, and collaborative activities were strategically selected to support a number of Prescribed Learning Outcomes for English 10 and Planning 10, as indicated in table 3. This adds ecological validity to the study because students are working with an authentic text and task. In addition, participating in this activity helped students prepare for the reading comprehension portion of the English 10 provincial exam (Table 3).

Table 3.

Fit Between Prescribed Learning Outcomes and Instructional Tasks

Instructional Task	Prescribed Learning Outcome
Collaborate with peers	English 10: students will interact and collaborate with others to explore ideas and to accomplish goals.
Read and comprehend text	English 10: students will consciously use reading comprehension strategies, interpret main idea of text, and consistently consider more than one interpretation when reading.
Examine crystal methamphetamine use	Planning 10: students will analyze strategies for preventing substance misuse.

Note. Prescribed Learning Outcomes from the Ministry of Education website, Appendix A.

Instructional text. Members of the research team authored the instructional text, titled *Crystal Methamphetamine Use* (Appendix C), for this research. The president of the Victoria Crystal Methamphetamine Task Force and a University of Victoria PhD student of Neuropsychology reviewed the text for content accuracy. The text contains 5 sections in total including: (a) an introduction, and sections on: (b) neurological effects; (c) the combined effects of crystal methamphetamine, alcohol, and other drugs; (d) social issues; and (e) prevention. The text is 3,300 words in total with 650 to 750 words per section. The readability level for each section was calculated as grade 13, using Fry's readability graph (Fry, 2002), where the level is determined by graphing the average amount of syllables per 100 words in a section by the average amount of sentences per 100 words in a section. Each section, besides the introduction, is a self-contained unit and therefore the sections may be read in any order. Originally students were slated to read 2 of the 4 sections; however, due to time constraints, students only read the introduction, in addition to 1 or 2 of the 4 sections of text (neurological effects and if time, social issues). This decision was based on asking 4 teachers which sections would most benefit their instruction and students. The introduction served as a demonstration tool for the researchers and initial practice for the participants in the *gStudy* software environment. The other text sections were made available to the teachers for further instruction, if desired.

Software. Participants completed most tasks in this study, using a computer with three software tools: (a) *gStudy*, (b) *gChat*, and (c) WebQuestionnaire.

Presentation of Text in gStudy. The text and instructions were presented on the computer using a software program called *gStudy*. *gStudy* presents collections of digital learning materials in a learning kit. *gStudy* encourages users to interactively engage with the multimedia information in order to learn, apply, or transfer that information (Winne et al., 2006). Users may employ a range of tools in *gStudy* including concept maps, glossaries, notes, text highlighting, and collaborative chat. For the purposes of this study, students were encouraged to limit their use to: selecting, reading and scrolling through text, highlighting text, and using a collaborative chat tool. The text was presented one section at a time (figure 1) in *gStudy* in much the same way a textbook passage is presented on a webpage. Access to the other texts could be obtained by either clicking on a link at the bottom of each page that took the student to a previous text, or forward to a future text. Students had access to a table of contents along the left side of the screen that allowed them to click on the text topic they wished to access.

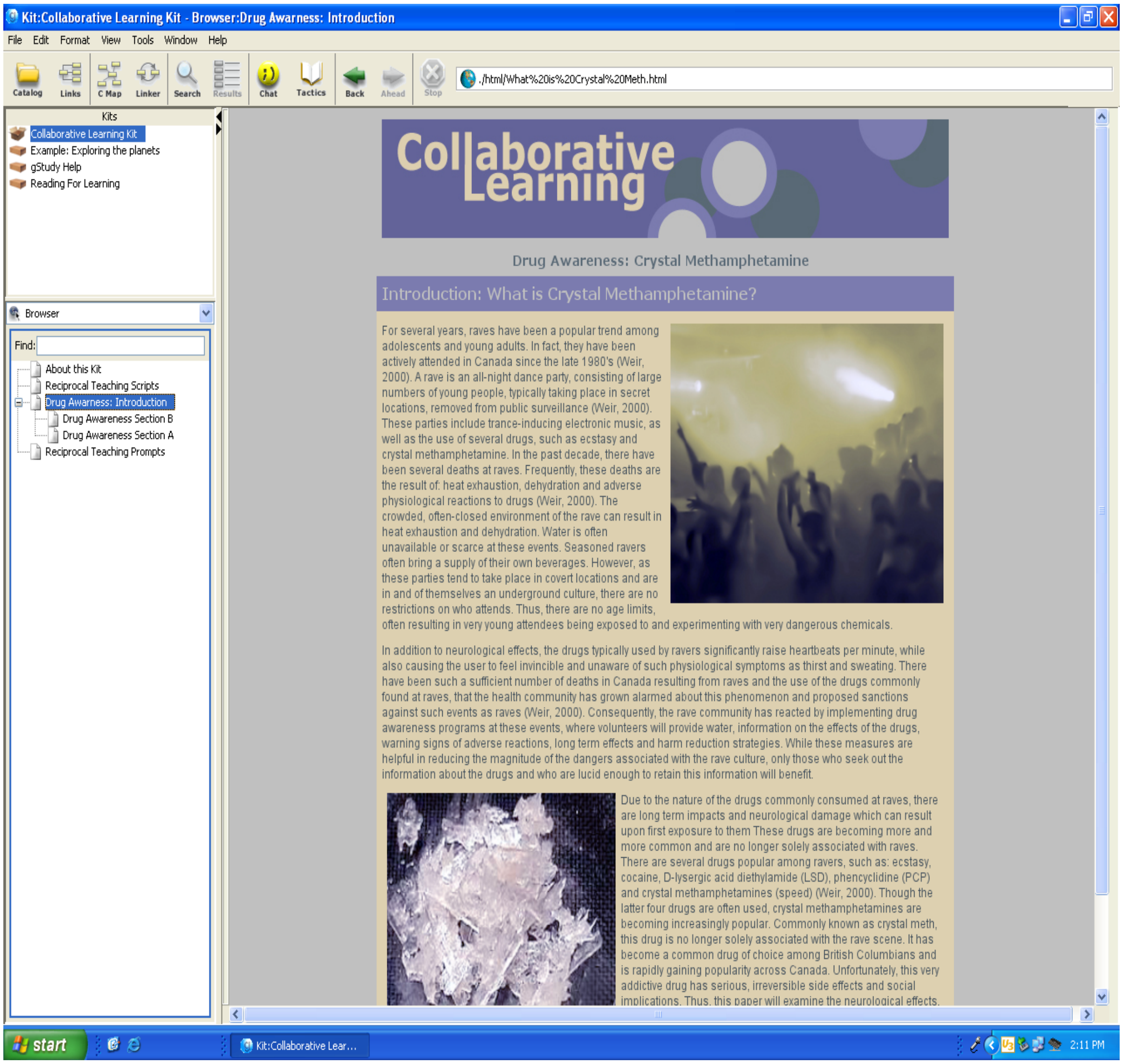

Figure 1. Section of the instructional text embedded in *gStudy*.

gChat Collaborative Software. Embedded within *gStudy* is a text-based chat tool called gChat (Hadwin, Gress, Winne, & Jordanov, 2006), where students can work on a learning kit together. The chat tool (gChat) allows multi-users "real-time", synchronous[1] communication through a text-based virtual environment, where utterances are typed on the keyboard rather than spoken. gChat works much like other text-based chat tools such as

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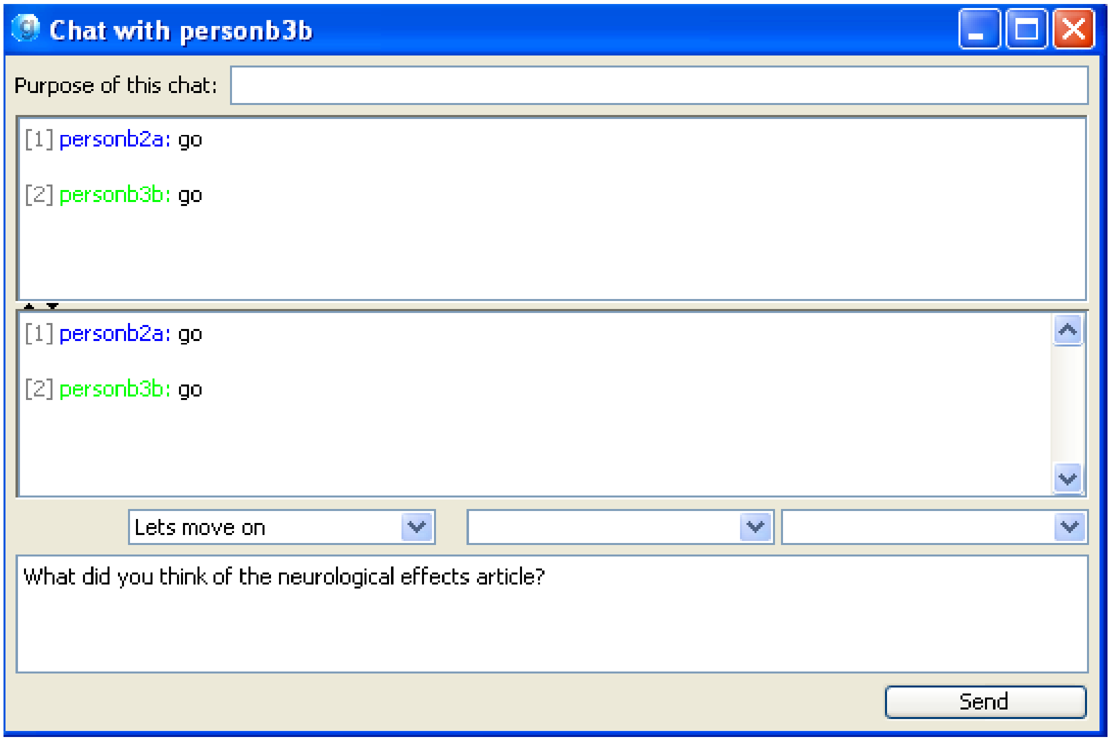
[1] In this study, I use the term real time/synchronous to refer to being online simultaneously and viewing text in the chat when it is submitted by a user to the chat history. I recognize that computer scientists reserve the term synchronous to refer to environments where each keystroke is seen as it is typed.

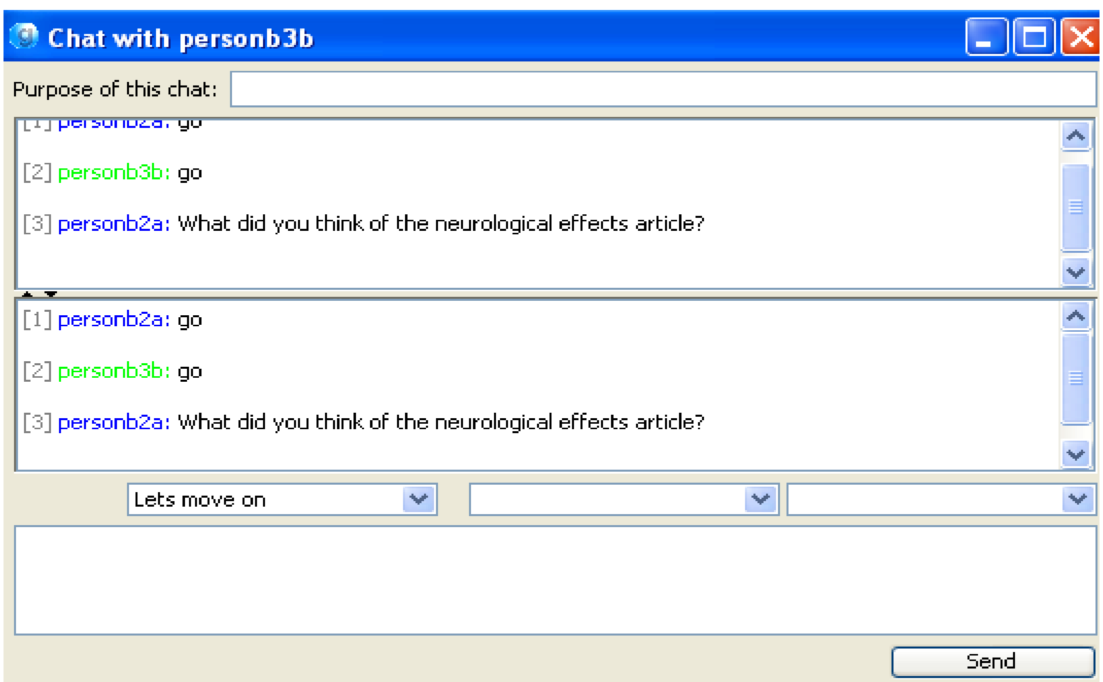
MSN Messenger, AIM or Skype text chat. A participant can click on the gChat icon embedded in the *gStudy* interface and be instantly connected to friends and other students, online. The participants can click on a name and select to have a one-on-one chat with that individual, or they can select the multi-user chat function to chat with a few individuals simultaneously. The basic functions of chat work the same whether chat takes place between two individuals or a number of individuals. Once the participant clicks on a participant's name to initiate chat, a chat window text box opens. Messages are composed in one area of the split screen (two text boxes) seen by the participant that include: (a) the upper box which records an ongoing record of the chat that occurs between individuals (see Figure 2a), while (b) the lower box records what is currently being typed to be submitted to the online discussion (see Figure 2b). In addition, the upper text box can be split so that participants can scroll to find previous chat text while watching the text development of the current text chat (see Figure 2c). Thus, participants have a private area to compose their text-based response and a public area to share and view the chat.

The chat tool differed depending on the condition to which students were assigned: (a) regular peer text chat or (b) structured peer text chat. The regular peer text chat is a standard text-based chat tool similar to MSN, AIM, or Skype text chat and is as described above. The structured peer chat augments regular peer text chat with prompts based on specific roles designed to structure the task and thereby support collaborative exchanges. In contrast to the peer chat interface, students were required to select a role (See Figure 3, Part A). Choosing a role populates a drop down list, (See Figure 3, Part B) with a list of question stems and sentence starters associated with that role. When students click on those question stems and sentence starters they automatically populate the text screen so that the student does not need to type out each character or word when contributing to the chat (see Figure 3, Part C). In addition to the role-specific prompts, students in both chat conditions had access to a set of generic prompts that helped scaffold the discussion.

a. A gChat text message being input into the lower text-based chat box.



b. The text message input into the upper text-based box.



c. Split screen to preview earlier chats while still chatting.

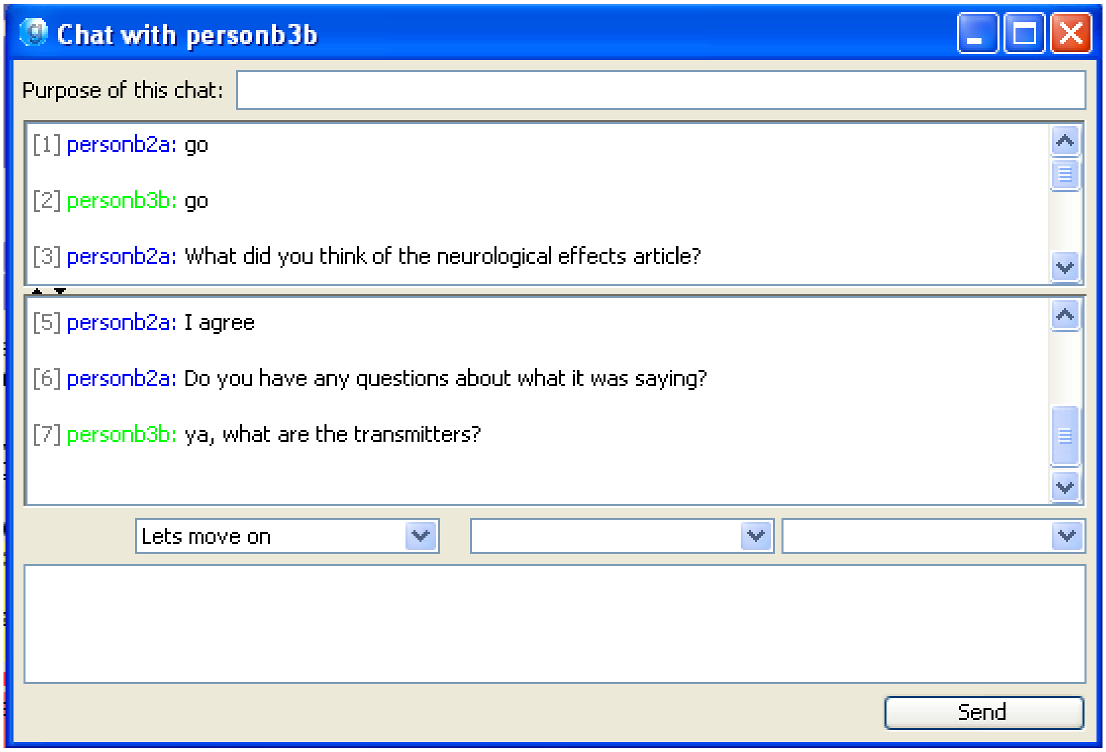


Figure 2. A *gChat* text message in *gStudy* input into the lower text-based chat box (a), input into the upper text-based box (b), split screen to preview earlier chats while still chatting (c).

gChat, however, also has tools that extend beyond conventional text-based chat tools. *gChat* is augmented with tools to support students in assuming different cognitive roles during a chat. By doing so, students are provided some structure and cues to scaffold collaborative work. In the structured peer text chat condition, participants were asked to select a particular cognitive role (e.g. summarizer) and then gain access to prompts or sentence starters in a drop-down box under the heading of their role in order to help start their sentence in their collaborative role (see Figure 3). The prompts were situated in a drop down menu found within the *gChat* tool interface in the multi-user chat (see Figure 3a, Figure 3b and Figure 3c). When participants click on these question stems and sentence starters, they automatically populate the text screen so that the participant does not need to type out each word when contributing to the chat. The full list of these roles, scripts and prompts will be listed in a following section; however, contained below are examples of prompts for the reciprocal teaching roles that are programmed into *gChat*.

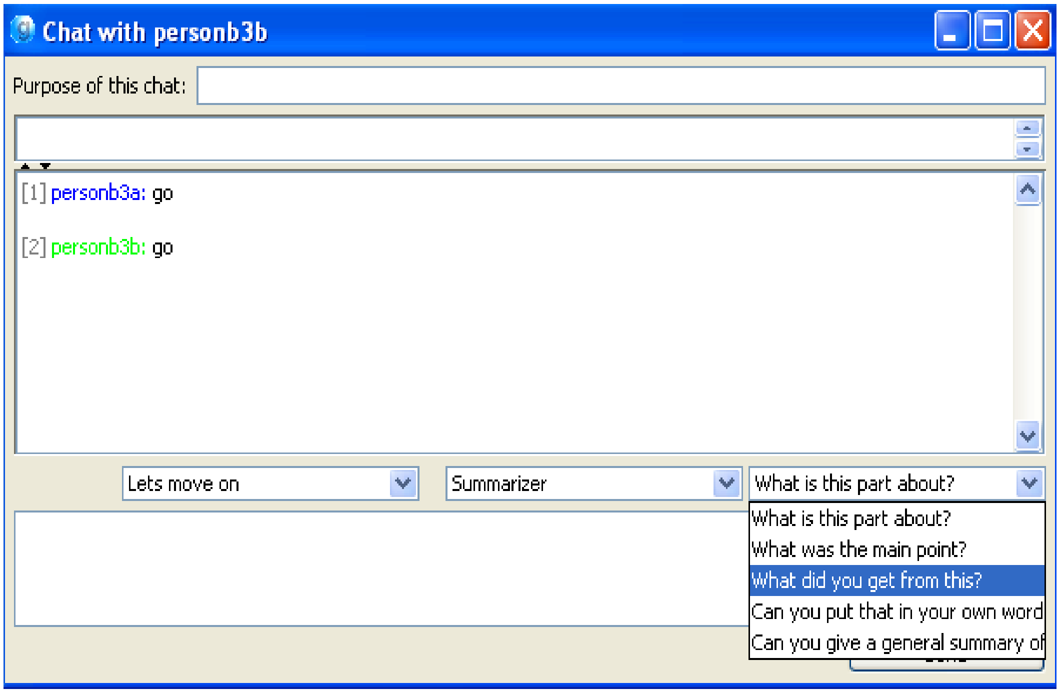
(a) Summarizer: "What was the main idea about…"

(b) Questioner: "Did you have any questions about…"

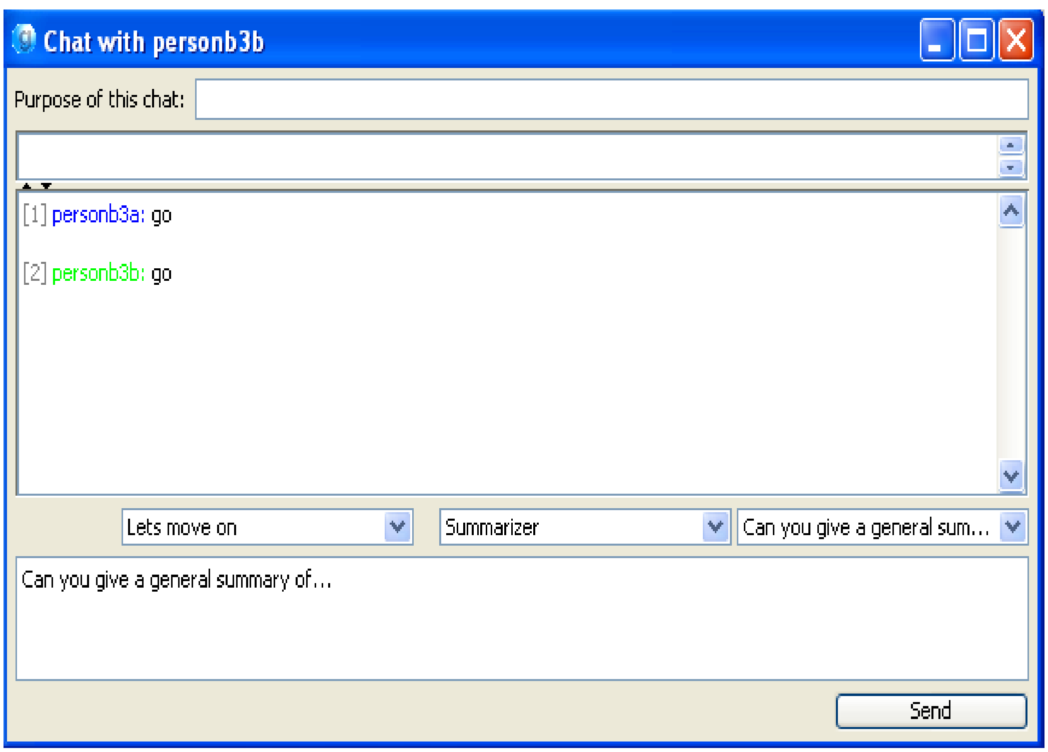
(c) Clarifier: "Can anyone explain..."

(d) Predictor: "Do you predict that…"

a. Example of Summarizer prompts in *gChat* from a drop-down list.



b. Role and prompt selection from *gChat* in the lower text box



c. Prompt selection recorded in the upper text box.

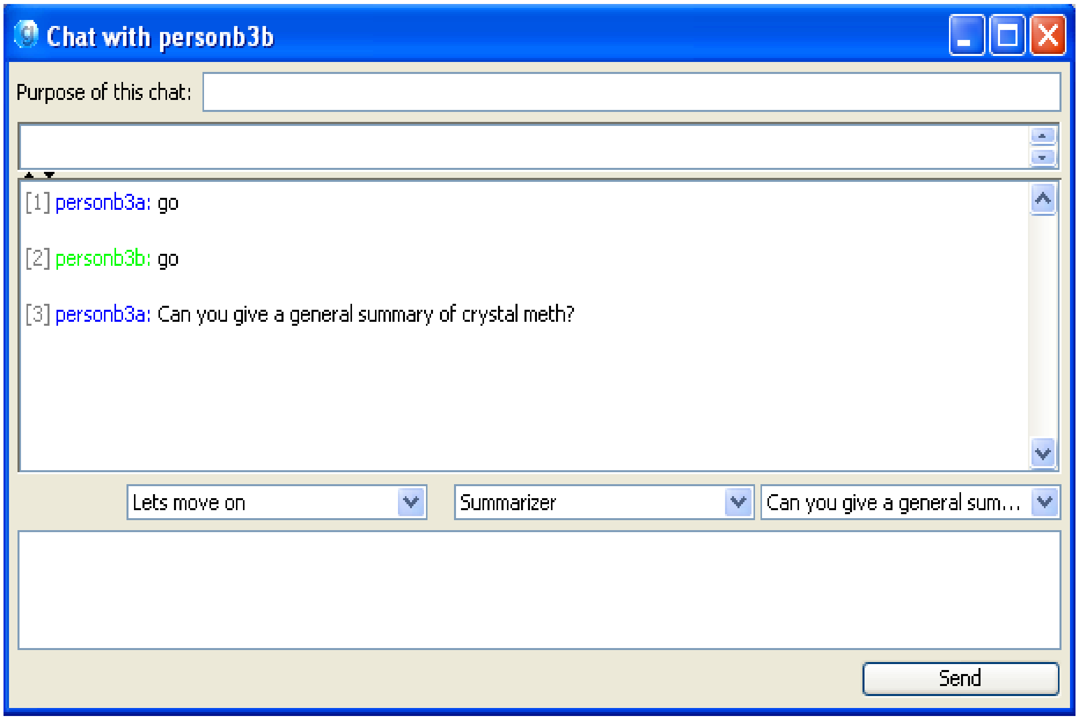


Figure 3. Example of Summarizer prompts in gChat from a drop-down list (a), role and prompt selection from gChat in the lower text box (b), prompt selection recorded in upper text box (c).

Presentation of Questions: Students completed the instruments (described above) either electronically in WebQuestionnaire or on paper. The web-based software tool is an authoring tool for developing and administering online questionnaires (version 1.0). WebQuestionnaire (Hadwin, Winne, Murphy, Walker, & Rather, 2005) opens in an Internet browser with a login page. After logging in, participants access a list of instruments to be completed. Clicking on an instrument opens it along with instructions for completing the instrument. After submitting data through WebQuestionnaire, researchers can access the data and download it to an excel spreadsheet. Instruments on paper were distributed to students in a folder, complete with a pencil to fill out the forms.

Experimental Conditions

Students were assigned to 2 conditions: (a) regular peer text chat or (b) structured peer text chat. In both instructional conditions the participants accessed the *Collaborative Learning Kit* in *gStudy* that contained: (a) each section of the crystal methamphetamine article, (b) instructions for completing the individual reading task (session one) and (c) instructions for completing the collaborative discussion task (session two). Contents of the collaborative learning kit were developed by the researchers (Fior, Church, Morris & Hadwin, 2006) while the software design was developed by research team members (Miller, Fior, Morris & Hadwin, 2006).

The instructions explained the activity, *gStudy*, the main goal, and step-by-step task instructions (Appendix A and B). In both conditions students were asked to read the crystal methamphetamine text individually, initially highlighting important or relevant information. During both sessions, students answered the same series of questions based on the crystal methamphetamine text and another series of questions to determine students' computer and collaborative efficacy. To verify individual reading comprehension levels, during session 2 students completed the paragraph reading portion of the Test of Reading Comprehension (TORC-3).

Structured peer text chat condition. In the structured peer text chat condition, students were randomly assigned a specific role for their group, based on O'Donnell (1999) and Palinscar and Brown's (1984) work on roles, scripts and prompts. Specifically, students adopted a form of one of the following reciprocal teaching roles that have consistently shown to enhance reading comprehension (Palinscar & Brown, 1984): (a) summarizer, (b) questioner, (c) clarifier, or (d) predictor. In order to encourage collaborative co-construction of comprehension, these roles have been altered from conventional reciprocal teaching roles where students in role cognitively process for the group, to collaborative roles that encourage the student to ask questions that prompt other group members to engage in the cognitive processing. The conventional use of reciprocal teaching roles divides the cognitive tasks between learners, whereas this altered form divides the responsibility for making sure the group engages in a particular type of cognitive processing amongst participants. The collaborative reciprocal teaching roles were fulfilled in the following way: the summarizer prompted the group to synthesize text information; whereas the questioner guided the group to ask questions regarding the text; the clarifier helped the group clarify and simplify terms or concepts that were unclear in the text; finally, the predictor assisted the group to see how one part of the text was related to or predicted other parts of the text.

Students were directed to read instructions for the task, and the script that corresponds with their role (Table 4, Figure 4 and Appendix D), which was located in the collaborative learning kit. Information on each role (Figure 5) and script were accessed by clicking on a page on the left hand side of the *gStudy* interface under the title, “table of contents”. Students were instructed to enter the chat by selecting the *gChat* button. A chat window opened, listing all participants in the chat. The chat tool provided: (a) a window for entering text, (b) a set of standard sentence starters (See Figure 4), (c) a window for viewing shared text in the sequence it was sent to the group (d) a drop down menu with the four roles, (d) a list of question stems and sentence starters associated with that role (see Table 4). Students were directed to choose the assigned role from the menu list of roles and shown how to use the general and role-specific sentence starters and question stems.

Regular peer text chat condition. In the unstructured peer text chat condition (session 2), the students were presented with a collaborative learning kit that did not include the description of roles to be used when collaborating. The unstructured chat group did not have access to roles or prompts in the *gChat* interface. Instead, participants had access to the generic sentence starters such as, "I think that…" and "I don't understand". Like the structured group, students were instructed to enter the chat by selecting the *gChat* button. A chat window opened listing all participants in the chat. The chat tool provided: (a) a window for entering text, (b) a set of standard sentence starters (See Figure 4), (c) a window for viewing shared text in the sequence it was sent to the group. The drop down menu of roles was visible but inoperable. Students were not able to select a role. Students were shown how to use the general prompts such as, "Let's move on" or "Slow down".

Table 4.

Roles, Scripts and Prompts

Roles	Scripts	Prompts
Predictor	You are the Predictor: As the predictor, your role will be to help your group see how one part of the text is related to or predicts other parts of the text. You will also help your group hypothesize what the consequences may be for an action or event described in the text. For instance, if you read about the introduction of a foreign species to a fragile ecosystem, you may want to ask your group about the consequences of that action.	-What might we need to know? -What might happen if... -How might that affect... -How might that relate to... -Are there consequences to...
Summarizer	You are the Summarizer: As the summarizer, you will ask your group questions to help them sum up the information in the text. The article can be summarized across sentences, across paragraphs, and across the article as a whole. Stop after each paragraph or major section of the passage. Ask your group to construct a sentence that sums up only the most important idea(s) that appear in that part. Good summary sentences include key concepts or events but leave out less important details.	-What is this part about? -What was the main point? -What did you get from this? -Can you put that in your own words? -Can you give a general summary of……?
Questioner	You are the Questioner: As the questioner, you will get your group to generate questions. For the main ideas that you read, have your group write down a question that the main idea will answer. Good questions should include words like “who, “where”, “when”, “why”, and “what”. For example, if you are reading an article about the extinction of the dinosaurs, you might find the following main idea: “Most scientists now believe that the extinction of dinosaurs was caused by a large meteor striking the earth.” You could	-Did you have any questions about... -What are you curious about? -What might your mom or dad ask about this? -What might a friend ask about this? -What question will the main idea answer?

	then write this question: "What event do most scientists now believe caused the mass extinction of the dinosaurs?" Also, have your group think about the types of questions other people (including themselves) may have about the text.	
Clarifier	You are the Clarifier: As the clarifier, your role will be to get your group to clarify anything that is unclear. Sometimes in your reading you will run into words, phrases, or whole sentences that really don't make sense. Here are some ways that you can get your group to *clarify* the meaning: *Unknown words.* If your group comes across a word whose meaning they do not know, suggest they read the sentences before and after to see if they give clues to the word's meaning. *Unclear phrases or sentences.* Suggest your group rereads the phrase or sentence carefully and try to understand it. Get them to think of other interpretations or examples.	-Can anyone explain... -What do you think that means? -Are there any other interpretations? -Can you think of an example? -How can we make sense of that?

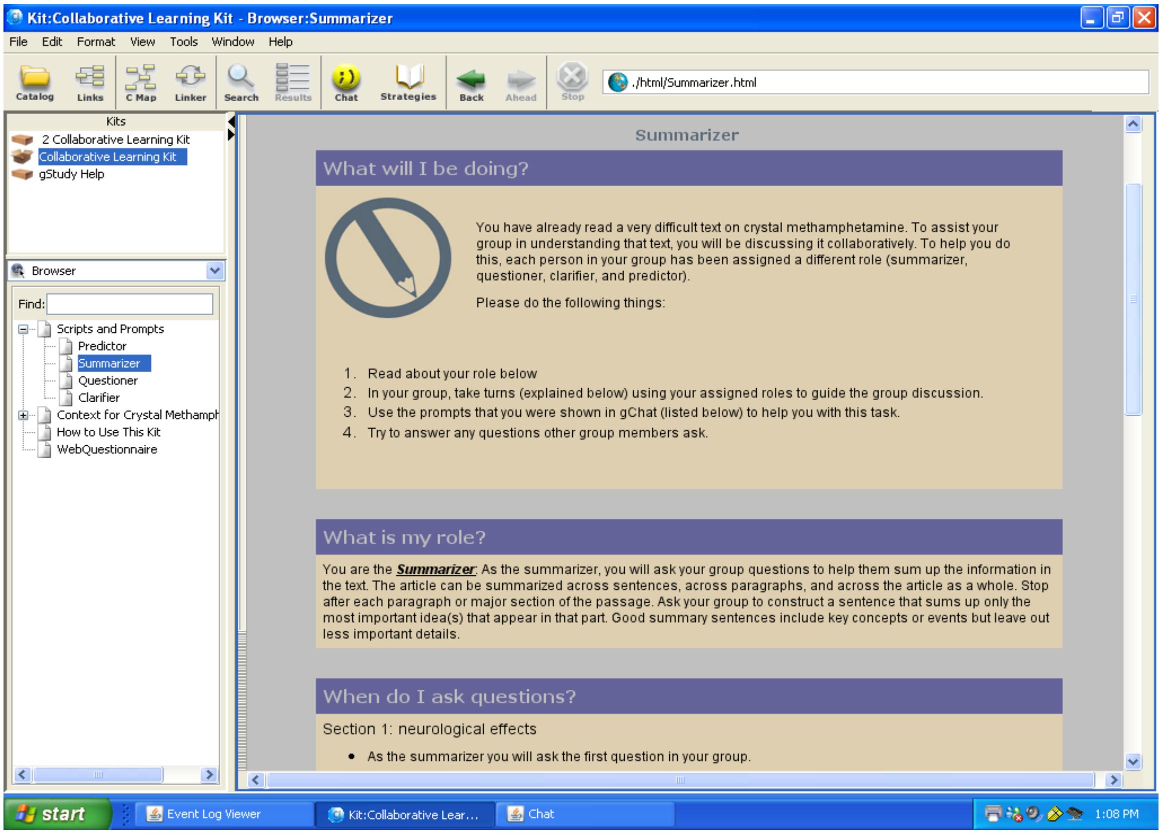


Figure 4. Example of reciprocal teaching roles in *gStudy*.

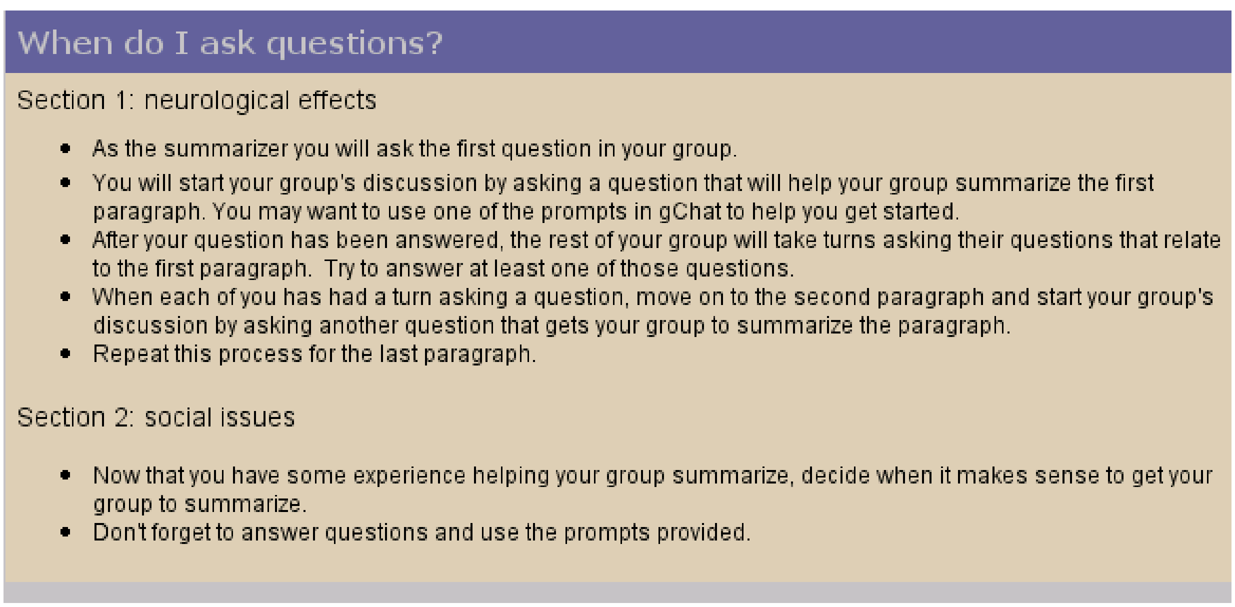


Figure 5. Example of script in gStudy.

Chapter 4

Design and Procedures

Pilot Testing

For the purposes of ensuring that the various areas of this study came together compatibly, extensive pilot testing was conducted on materials, instruments, and software across five main areas to ensure valid and reliable measures, dependable software, and acceptable procedures. The following were piloted tested: (a) the *Crystal Methamphetamine Use* text, (b) reading comprehension measure, (c) collaborative *gChat* tool, (d) prior knowledge measure and finally, (e) procedures. The study was conducted with both sessions on a structured group of four grade 10 students from SIDES (South Island Distance Education) and with an unstructured group of four grade 10 students from ILC (Individual Learning Center) high schools from Victoria, British Columbia.

(a) Crystal Methamphetamine Use text. The instructional text was reviewed and verified by two content area experts. Readability and length were tested by having three grade 10 students read the text: one student was a struggling learner, one student was an average reader and another student was a high achiever. The text was administered to these pilot subjects in written form, not on the computer. The text took the students twenty to thirty minutes to read in full. Due to time constraints regarding the amount of instructional time that could be devoted to this intervention, we reduced the number of text sections to two instead of four.

(b) Pre-Post Task Specific Reading Comprehension Measure. This instrument was examined by two content area experts, as well as administered to 3, grade 10 students. After these three students completed reading the instructional text, they were asked to

complete reading comprehension questions. These were filled out in written form, separate from the computer environment. The students completed questions across the four reading text sections which took approximately twenty minutes to complete. As the number of sections had been reduced to only 1 or 2, additional questions were added to provide a more valid measure (from 4 questions per section, to 9 questions).

(c) Collaborative gChat tool. Extensive pilot testing of the *gChat*, *gStudy*, and WebQuestionnaire software tools was conducted. The *gChat* tool was the newest addition to the *gStudy* application tools; therefore, in collaboration with the computer developing team at Simon Fraser University (SFU), the researchers tested and refined the functionality of *gChat* after each new software release. The tool was tested twice a week for eight consecutive weeks to ensure that the chat tool was functioning properly, that the correct roles and prompts were contained in the chat interface and that the data from these pilot testing sessions was being sent to the server at SFU and to the kit management system.

(d) Prior knowledge measure. The prior knowledge measure was tested on three grade 10 students from SIDES for face validity. The students had the marks of 3, 3 and 2 out of 10. The students informed the researchers that they knew a very little about crystal methamphetamine. This measure was deemed by the researchers to be adequate for testing students' prior knowledge of the subject matter.

(e) Procedures. The procedures for this study have been tested by the research team to ensure (a) time constraints could be met, and (b) the smooth and uniform delivery of the instruction by all team members. The research team mapped out the procedures while

keeping the grade 10 students in mind. The study was conducted in full on the aforementioned eight grade 10 students for each collaborative condition.

Procedures

Recruitment of Participants

Participant schools were recruited after receiving ethical approval from HREC at University of Victoria, and the Saanich School District to conduct research in Saanich District 63. The principals of 5 high schools, targeted for this proposed study, were contacted to request permission to conduct research at their schools (For letters, see Appendix H). Principals from 3 schools expressed interest in this research; however they were under no obligation to participate in the study. If principals expressed interest, then they were asked to forward an email invitation to their English 10 and Planning 10 teachers (Appendix I). English 10 and Planning 10 teachers at the participating schools (ILC, SIDES and Parkland Secondary) were invited to partake in the study. An information session at each site with teachers and computer technicians provided (a) an overview of the study, (b) information on how the instructional intervention in the study might supplement the curriculum, and (b) an information package that included the consent form (see Appendix J), an outline of the study, the crystal methamphetamine text, and the various instruments.

Information on the study was distributed to students in 1 of 2 ways: (a) At ILC teachers disseminated the information package, including a parent/student consent form (Appendix J) electronically; (b) at Parkland, teachers disseminated a paper version of the parent/student consent forms. The consent form clearly explained that the student's participation in this research study was voluntary and that data would only be collected and analyzed if consent was provided; however, students were informed they may be asked to participate in the instructional intervention as part of their classroom curriculum activities (without data being collected or made available to the researchers). Through the consent letter, the parents were informed about the goal of the study, the process, and why it was important and applicable to the school curriculum. Contact information was provided and clearly stated that participants may withdraw from the study at any point in time. The consent form indicated, however, that the chat log data gathered prior to their child's withdrawal would be used due to the nature of the software tools. For the students who agreed to participate, they were informed that they may withdraw at any point.

Assignment to groups. Although random assignment of students to groups is preferable, it was determined it was only possible at Parkland Secondary. For both SIDES and ILC, group assignment would be determined by (a) student availability and (b) at Parkland, the time of the instructional class. For the collaborative session, consenting students at ILC were asked to sign up for a block of time on a set day at their respective schools. Due to lack of numbers at SIDES and ILC, the SIDES subjects were dropped and the ILC groups were used to pilot procedures and instruments (2 groups of 4).

At Parkland Secondary, as all students within a class participated in the intervention, students with signed consent forms were distinguished from those without consent. Those with consent were assigned randomly to groups of 4 within the time block that their class was scheduled, to ensure all students within the group had consented. Furthermore, teachers divided their class in half, to indicate the top and bottom readers (1 = top readers, 2 = bottom readers). Quadrads were randomly assigned to 2 conditions: (a) structured peer text chat, or (b) regular peer text chat. To ensure that no group was overly advantaged or disadvantaged, in regards to reading comprehension levels, I reported TORC-3 scores for each participant in each group as part of the statistical descriptives for this study and groups were examined to ensure there were fairly even numbers of strong and poor readers, as indicated by the teacher.

All of the computer-administered tasks were password protected on a secure server (located at Simon Fraser University) that is part of the Learning Kit Project. Participants were assigned user names and a login ID; however, only the data from those consenting were collected. Login IDs were pseudonyms (e.g., PersonA1A) where the first letter represents the school the individual attends, the number represents placement in structured chat or regular chat groups (for easier coding, the structured group had even numbers whereas the unstructured group were assigned odd numbers), and the third letter represents role assignment. This coding enabled researchers to create user accounts where half the participants received a structured kit and chat tool, while the rest only had access to the regular kit and chat tool.

The study consisted of 2 sessions of approximately 80 minutes, consistent with timetabling at the school. Prior to these sessions: (a) students and teachers were introduced to the study; (b) parent/student consent forms were signed and collected; (c) collaborative groups were created; (d) groups were assigned to conditions and roles (where appropriate); (e) school technicians were consulted; and (f) *gStudy* was downloaded and tested on school computers. (For an overview of the two sessions, please see Table 5).

Experimental Session One:

For the first session, all the activities were individually administered. At least 2 members of the research team were in attendance during the sessions, with a *gStudy* technician on standby at the server's location at Simon Fraser University. One teacher from each class was asked to attend, but not participate in the session. Members of the research team directed and instructed all activities. (For an overview of the two sessions, please see Table 5).

This session began with students being asked to sit at a designated computer, from which they heard a brief overview of the session with details and instructions visually clarified with a computer projector and screen (5 minutes). Students were then directed to login to WebQuestionnaire using the individual participant number handed to them on paper by the researchers, and answer the 10 questions in the *Prior Knowledge* Test. Students were asked to quietly wait once they had completed the test and members of the research team observed when students completed the task. This tool took approximately 5 minutes to complete.

Students were directed to open *gStudy*, with the same provided password and username, used to access webQuestionnaire. Students received an overview of *gStudy*, including how to find the table of contents and instructions for tasks, which tools were important, and how to open text sections. Students were asked to open the introduction of the Crystal Methamphetamine text and were shown how to use the highlighting tool in *gStudy*. A brief explanation on effective highlighting was discussed and shown using the computer projector and screen. In particular, participants were shown how to select and label text as either "important" or "don't understand". Students were informed that all of the sections of text would be difficult to read, which is why they would be working in a group during the next session. As the introductory text contained specific signals such as [LABEL THE NEXT SENTENCE AS IMPORTANT], students were asked to carry out these instructions so that researchers knew all students could correctly label. Students were asked to stop practicing highlighting after 5 minutes. This entire process took around 10 minutes to complete.

Students were informed that they were going to read 2 texts, accompanied by 2 sets of questions (The Task Specific Reading Comprehension Pretest). They were asked to read the first section of text through once, and then go back and use the highlighter as shown previously in preparation for their collaborative discussion in the next session. They were told that all highlights would be saved and accessible for the next session. They were instructed to open webQuestionnaire when they were ready to answer the first set of *Task Specific Reading Comprehension Pretest* questions. They were reminded that they could look at the text when answering the questions and that the test was not timed. Reading and highlighting the 2 texts, and answering the 2 sets of questions took approximately 50 minutes in total to complete (For times for each task, see Table 5). Students were told they had 15 minutes to read and highlight the text. After that time, they were directed to start the *Task Specific Reading Comprehension Pretest* (approximately 10 minutes). As before, students were instructed to wait quietly until everyone completed this task. Students moved on to the second text and set of questions.

For the final task of the day, students were asked to complete the Pre-efficacy tests in WebQuestionnaire. This took approximately 10 minutes to complete all three measures.

Experimental Session Two:

The second session occurred exactly 1 week after the first session. Students were assigned a different lab room depending on which condition they had been assigned to: (a) regular peer text chat or (b) structured peer text chat.

Again, two members of the research team were in attendance during the sessions, with a *gStudy* technician on standby at the server's location at Simon Fraser University. One teacher from each class was asked to attend, but not participate in the session. Members of the research team directed and instructed all activities.

This session began with students being asked to sit at a designated computer, from which they heard a brief overview of the session with details and instructions visually clarified with a computer projector and screen (5 minutes). The TORC-3 was administered individually, as described previously. This took approximately 20 minutes. Students were instructed to read each of the 6 paragraphs in the TORC-3, which were provided on paper, and then directed to answer the 25 multiple-choice questions. Students were informed that the test was not timed, that that they would have access to the text during the test, and that all questions should be answered. Students were asked to remain quietly in their seats once they had finished, until further directed. Members of the research team observed the student's progress, so that they were aware when all students were ready to advance to the next step.

Next, the procedures for regular peer text chat and structured peer chat were discussed (15 minutes). Which group the students were assigned to (regular peer text chat or structured peer text chat), determined the specific instructions they received. For both groups, students were shown where in *gStudy* they could find: (a) directions for the tasks, (b) the two text sections, and (c) *gChat*. All students were shown the generic prompts and questions stems available in *gChat* (see Figure 4) and advised on how to use them. Both groups were instructed that they would collaboratively discuss the same texts they individually read the previous week in order to aid comprehension scores for the posttests.

Regular peer text chat condition. This group was instructed that they should use their highlights (which were saved in their learning kit from the previous week) and the generic prompts. Students were directed to contribute evenly to the group chat by asking and responding to questions in their group (see Appendix D for instructions). A model chat using basic prompts and highlights, based on the introduction, was shown on the overhead projector. Students were advised that they had 20 minutes per section to chat as a group about the text and that all text chat would be examined by the researchers.

Structured peer text chat group. This group received the same instructions as the group above, but they were told they would be given a role, which they would fulfill for both sections of text, in order to help the group understand each section (see Appendix A). Students were provided with a piece of paper that informed them which role they were assigned to. Instructions for each role (scripts) were discussed and students were directed to where they could find written details in *gStudy* on the various roles (see Appendix D). Students were also shown the specific prompts in *gChat* that accompanied the roles. Attention was drawn to the part of the script that indicated the order that students should fulfill their roles and respond to questions. Students were reminded to use the generic and role-specific prompts (see Appendix D for instructions). A model chat using basic and specific prompts, based on the introduction, was shown on the overhead projector. Students were advised they had 20 minutes per section to chat as a group about the text and that all text chat would be examined by the researchers.

Students in both conditions were shown how to log into their *gChat* groups and were provided with 5 minutes to practice composing questions and statements using the generic and/or specific prompts. They were directed to collaboratively discuss the text, in order to help the group understand the text. (20 minutes) At the end of the first session, students individually answered the set of questions, before commencing with the second text and corresponding questions (20 minutes). Students answered the Efficacy Posttest questions at the end of the session (10 minutes).

Unfortunately, due to time constraints, only some groups were able to discuss the second text. Thus, data from the second text could not be used.

Table 5.

Procedures for all Data Collection (procedures for other study in italics

	Session 1	Session 2
General Information	All activities are individually administered Overall time: 80 minutes	Students are in groups reading counter-balanced text sections Overall time: 80 minutes
Order of Administration	Explain study to all students (5 minutes)	Discuss procedures for the structured and regular chat collaborative groups (20 minutes)
	Prior knowledge test (5 minutes)	Discuss text 1- Post test 1 (20 minutes)
	Computer Efficacy test (5 minutes)	*Reading comprehension questions text 1 (10 minutes)*
	Administer the TORQ (15 minutes)	Post self-efficacy measure (5 minutes)
	Introduction to *gStudy* (10 minutes)	Post collective efficacy measure (5 minutes)
	Read text 1- Pre test 1 (10 minutes)	Post computer efficacy measure (5 minutes)
	Reading comprehension questions text 1 (5 minutes)	
	Read text 2- Pre test 2 (10 minutes)	
	Reading comprehension questions text 2 (5 minutes)	
	Self-efficacy measure (5 minutes)	*Individual gStudy log files*
	Collective efficacy (5 minutes)	Chat logs of discussion
Other Data Collected	*Individual gStudy log files*	

Note. Post research/complementary instruction: group brochure based on instructional activity.

Chapter 5

Findings

Overview

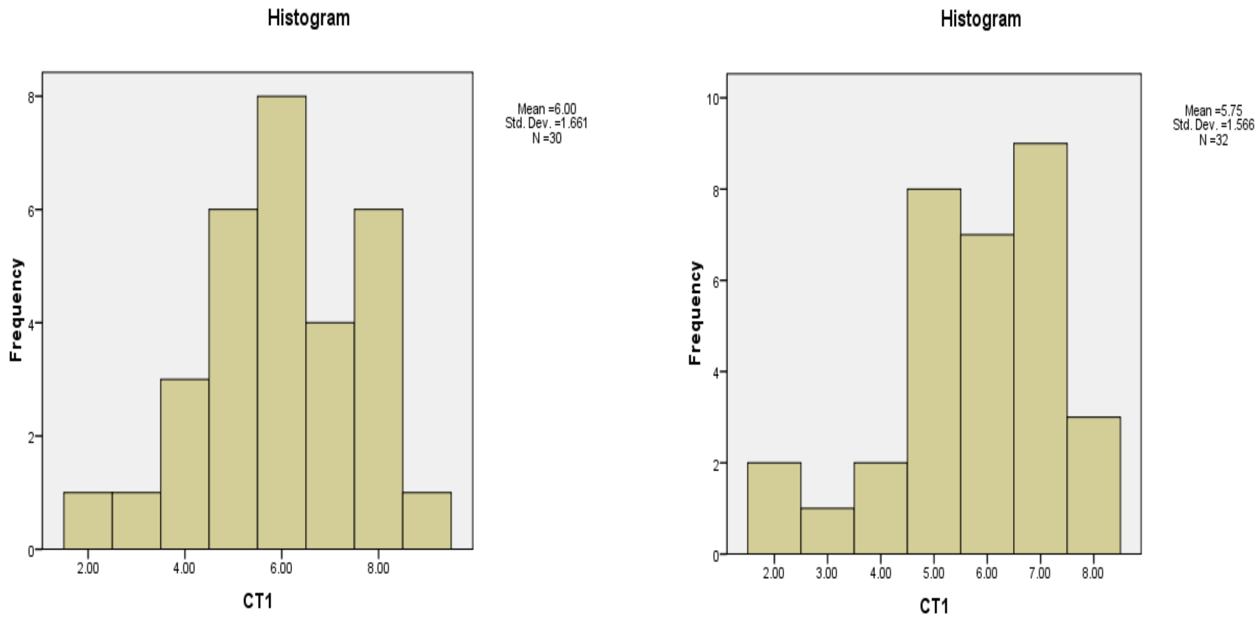
SPSS for Windows (Version 16.0) was used for the analyses of the quantitative data. Descriptive statistical data were examined to determine the importance and relevance of items. Independent samples t-tests were run to ensure there were no significant differences between the structured and unstructured conditions prior to collaboration. Then, correlation analysis were run to determine the relationship between the variables. Specifically correlations between the outcome variable (reading comprehension improvement or TSRC Posttest) and the predictor variables (TORC-3 and *TSRC* Pretest) were examined. Second, correlations between the two predictor variables were examined to ensure that they were not so strongly correlated that they could not independently account for variability in the outcome variable.

Finally, a mixed-model, repeated measures ANCOVA was conducted to see if means differed significantly according to group assignment and to answer the two main research questions: (a) do students who participate in structured collaboration demonstrate greater improvements in the pre-post *TSRC* test than students who participate in unstructured collaboration? (b) Is there an interaction between the structured/unstructured support conditions on the pre-post *TSRC* test? It was hypothesized that: (a) students who participate in structured collaboration will demonstrate greater improvements in the pre-post *TSRC* test than students who participate in unstructured collaboration. and (b) there will be an interaction between the structured/unstructured support condition on the pre-post *TSRC* test. There were two variables with two levels each: structure (unstructured and structured) and TSRC test (pre and post tests).

Data Screening and Testing Assumptions

Variables were screened for accuracy of data entry, missing values, and fit between distributions and assumptions of the univariate analysis. Predictor variables included the *TORC-3* and *TSRC Pretest*. The outcome variable was the *TSRC Posttest*. The independent variable (between subjects) for the Repeated Measures ANCOVA was amount of structure (unstructured, or structured) and the dependent variable (within subjects) consisted of the *TSRC* test (pre and post). To ensure statistical tests were valid a number of assumptions needed to be met. The following tests were conducted for each assumption: (a) normality (descriptive statistics, independent t-tests, Pearson product correlation and Mixed-Model Repeated Measures ANCOVA (b) homogeneity of variances (independent t-tests), (c) independence (independent t-tests), (d) homoscedasticity (bivariate scatter plots and Pearson product correlation), and (e) Sphericity (Mauchly's test for Sphericity).

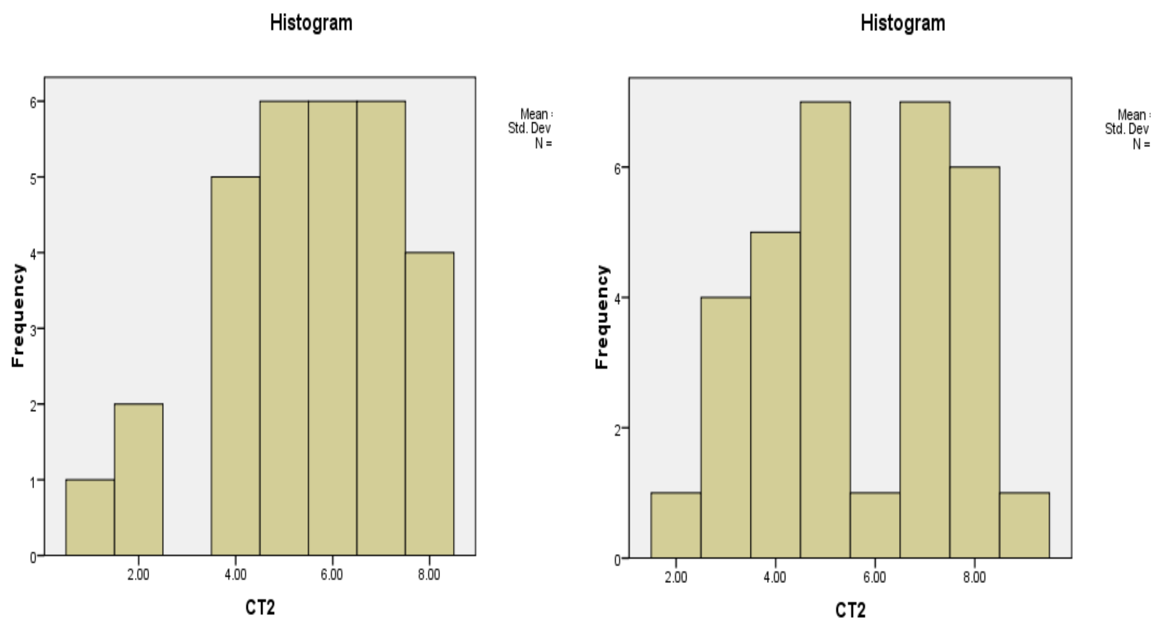
Normality was assessed by examining skewness and kurtosis for the *TSRC* Pretest and Posttest, (skew= -.546, kurtosis= -.072; skew= -.309, kurtosis= -.602) and the *TORC-3* (skew= -.583, kurtosis= -.624) were negatively skewed but close to 0 indicating a normal distribution (Tabachnick & Fidell, 2001). Box plots and histograms were also examined for normality (see Figure 6a, Figure 6b and Figure 6c). Of interest, the *TSRC* posttest, structured condition appears to have a bimodal distribution (see Figure 6b).



a. Histograms of TSRC pretest for session 1

Note: In figures 6a, 6b and 6c, unstructured condition is left and structured is right

b. Histograms of *TSRC post test* for session 2



c. Boxplots for *TORC-3*

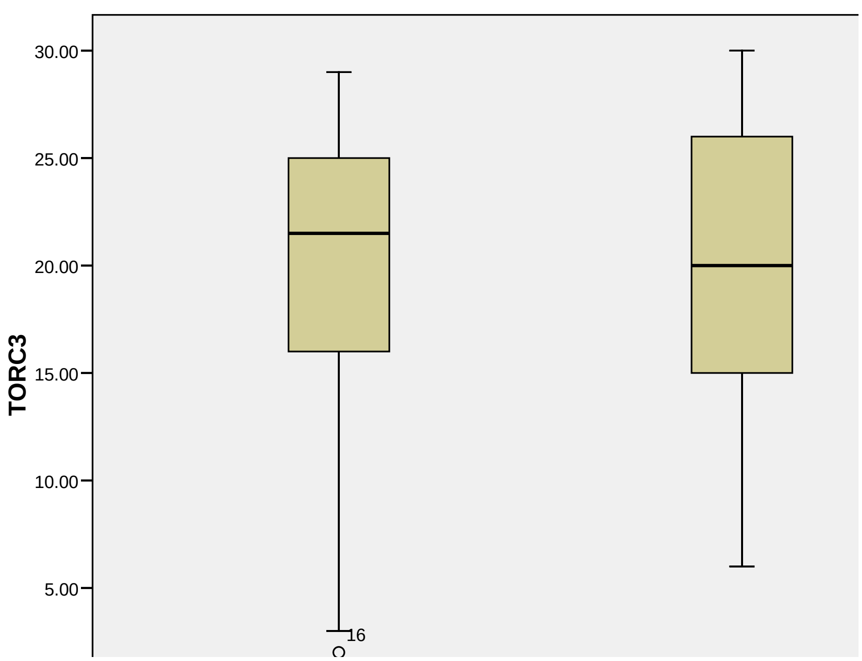


Figure 6. Histograms for TSRC Pre/post test (a and B) and boxplot for TORC-3 (c)

Equal variances assume that the variances of two samples are equal. Levene's test for equal variances assesses this assumption. Significance was not obtained for either the *TSRC* pretest (p=.544) or the *TORC-3* (p=.648); therefore, equal variances are assumed.

Independence assumes that the scores of one participant are not related to scores of the other participants. The conditions for the *TORC-3* and the *TSRC* pretest were not matched and there is no reason to believe that one participant's score may have had an influence on another.

Homoscedasticity is related to the assumption of normality where one variable is not related to some transformation of another (Tabachnick & Fidell, 2001). In order to test this assumption, bivariate scatter plots were examined to determine if there was homoscedasticity between the *TORC-3* and the *TSRC* posttest and the *TSRC* pretest with the posttest. These scatter plots were also conducted on the two structured conditions and the above variables. The bivariate scatter plots between each of the two variables appear to be random and therefore unrelated. Thus, homoscedasticity has been achieved.

Sphericity relates to the equality of the variances of the differences between levels of the repeated measures factor in an ANCOVA (Howell, 2004). Assumptions for sphericity were not met (Mauchly's test of Sphericity resulted in $p. < 0.05$), thus the Greenhouse-Geisser correction was used.

Descriptive Statistics

There were no missing data, apart from one student who did not complete the TORC-3. The TSRC pretest and posttest for this participant were used for statistical analysis. Results of evaluations of assumptions of normality and linearity were satisfactory. Means, standard deviations, variance, skewness and kurtosis are reported in table 6a and b below for each group.

Table 6a.

Summary Table of Descriptive Statistics for TORC-3, TSRC pretest, and TSRC posttest across both Experimental Conditions

	Median	Variance	Skewness	Kurtosis
TORC-3	19.2769	56.214	-.309	-.602
TSRC pretest	6.0000	2.603	-.546	.072
TSRC posttest	5.0000	3.452	-.309	-.602

Note. *N* = 62

Table 6b.

Summary Table of Descriptive Statistics of TORC-3, TSRC pretest, and TSRC posttest Between the Two Conditions and for Both Groups

	Collaborative Condition					
	Unstructured		Structured		All groups	
	Mean	S.D	Mean	SD	Mean	SD
TORC-3 (30)	18.50	7.91	19.39	7.18	18.95	7.50
TSRC pretest (9)	6.00	1.66	5.75	1.57	5.88	1.61
TSRC posttest (9)	5.50	1.83	5.66	1.93	5.54	1.86

Note. *N* = 62, Unstructured (*n* = 31), Structured (*n* = 31)

Comparing Equivalence of the Conditions T-test

Based on Levene's test for equality of variances, there were no statistically significant differences between conditions (structured and unstructured collaboration) for the *TSRC* pretest ($t(60)= .610$, $p>.544$, d=.16, ns), or for the *TORC-3* ($t(59)= -.459$, $p>.688$, d=.13, ns).

Correlation Analyses

A one-tailed Pearson product-moment correlation was performed to examine the relationships between the *TSRC* pretest, the *TSRC* posttest, and the *TORC-3.* These tests were conducted for all participants, and then separately for each condition (structured and unstructured) (see Table 7). Preliminary analyses revealed no violations of the assumptions of normality and homoscedasticity.

Table 7.

Bivariate Correlations among the Overall Conditions for the Variables

	TSRC pretest	*TSRC* posttest	*TORC-3*	N
<u>Combined</u>				
TSRC pretest	_	.452*	.298*	62
TSRC posttest		_	.077	62
TORC-3			_	62
<u>Unstructured</u>				
TSRC pretest	_	.260	.231	31
TSRC posttest		_	-.125	31
TORC-3			_	31
<u>Structured</u>				
TSRC pretest	_	.644*	.386*	31
TSRC posttest		_	.282	31
TORC-3			_	31

*$p < .05$

Overall, the *TORC-3* was statistically significantly correlated with the *TSRC* pretest (see Table 8) $r(62)=.298$, $p<.05$. The *TSRC* posttest was not significantly correlated with the *TORC-3*. However, when the two conditions were examined independently, there were no significant correlations for the unstructured group only (see Table 8).

Mixed-Model Repeated Measures ANCOVA

To test the hypothesis that students who participate in structured collaboration demonstrate greater improvements in the pre-post *TSRC* test than students who participate in unstructured collaboration and to see if there was an interaction between the structured/unstructured support condition on the pre-post *TSRC* test, a mixed-model, repeated measures ANCOVA was conducted. *TORC* scores were used as the co-variate. Main effects and interactions between the within (*TSRC* test results over the two sessions) and between subjects (amount of structure) variables were examined. Preliminary analyses revealed no violations of the assumptions of normality, and homoscedasticity; although, assumptions of sphericity were not met.

Using Wilks' criterion (Table 8), results indicate there was not a within subjects main effect (*TSRC* test results over session 1 and 2) with time as these test results were not significantly impacted over the two sessions, indicating that when plotted, the slope of this line was flat (F = 1.62, p>.05, η^2= .026). There was also not a between subjects main effect (table 8) with the structured group (F = .015, p>.05, η^2= .068.), indicating that differences in the *TSRC* tests were not significantly influenced by the amount of structure students were exposed to.

The profiles of the variables did not deviate significantly from parallelism as there was no interaction between TSRC test scores during session 1 and 2 (table 8) and treatment group in terms of amount of structure (F = .758, p>.05, η^2= .012) Therefore over the two sessions, the different treatments did not influence *TSRC* test scores significantly.

Table 8.

Summary of Main Effects and Interactions for TSRC test and Amount of Structure Over Two Sessions

Effect	Wilks' Lambda	F value	*p* value	η^2
TSRC test scores	.974	1.62	.208	.026
Structure	-	.015	.902	.068
TSRC * Structure	.988	.758	.387	.012

Further Analysis

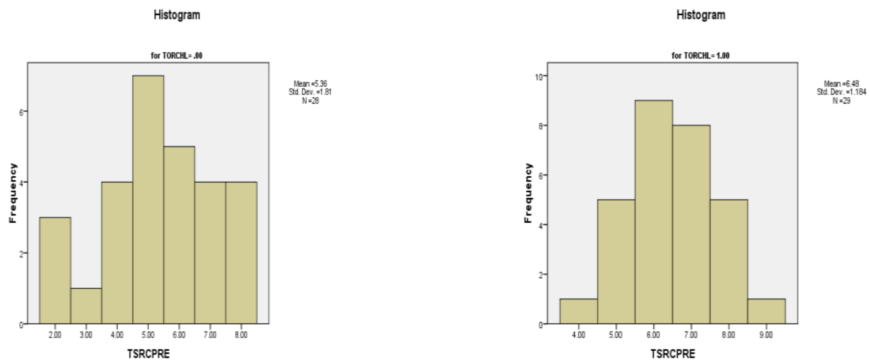
Since the hypotheses were rejected, additional examination of the data was conducted to help explore and understand findings. Data were reexamined to compare participants who scored lower in the TORC-3 to those who scored higher to determine if there were differences in the pre/post TSRC tests.

In order to distinguish between students who scored high versus low on the TORC-3 a median split was used. The median for the entire group was 20 (maximum score = 30); therefore, data from students who achieved a score of 20 were discarded. This created two groups, with the first group achieving scores on the *TORC-3* of less than 20 (*TORC-3* Low) and the second group attaining scores greater than 20 (*TORC-3* High). It is recognized that this is an artificial cut-off that does not meet the rigorous standards for group placement normally utilized in this field. However, since the data appear to be normally distributed and equal sized groups are desirable for the purposes of analysis, this method was deemed adequate by the researcher.

A repeated-measures ANOVA was conducted on these two new groups to determine if those in the *TORC-3 Low* group demonstrated greater improvements in the pre-post *TSRC* test than students in the *TORC-3 High* group and if there was an interaction between variables.

As mentioned previously, preliminary analyses revealed no violations of the assumptions of normality, or homoscedasticity for the entire group. For the *TORC-3 Low* and *High* groups, these assumptions were revisited. For these groups combined (TORC-3 low = 28; TORC-3 high = 29; N = 57) the data appeared to be normally distributed. On the *TSRC* pre-test, the *TORC-3 Low* group was negatively skewed (skew= -.296, kurtosis= -.588) whereas the *TORC-3 high* group was slightly positively skewed (skew= .044, kurtosis= -.424). These results are considered to be within normal range for the data.

Histograms were also examined for normality and were found to be normally distributed (see Figure 7).



Note. TORC-3 low is left and high is right

Figure 7. Histograms of TORC-3 Low/High for session 1

Bivariate scatter plots were studied to determine homoscedasticity. The bivariate scatter plots between each of the two variables appear to be random and therefore unrelated, thus, homoscedasticity has been achieved.

Descriptive statistics have been summarized in the table below and appear to meet assumptions for normality and linearity (Table 9).

Table 9.

Summary Table of Descriptive Statistics of TORC-3 low and high on the TSRC tests

	TSRC Tests			
	TSRC Pretest		*TSRC* Posttest	
	Mean	S.D	Mean	SD
TORC-3 Low	5.3571	1.80973	5.5000	1.85592
TORC-3 High	6.4828	1.18384	5.6552	1.93235

Note. N = 57

Assumptions for sphericity were not met (Mauchly's test of Sphericity resulted in $p. < 0.05$), thus the Greenhouse-Geisser correction was used.

Comparing Equivalence of the Conditions T-test

The results from the mean scores between the collaborative conditions were similar on both the *TSRC* pretest and the *TORC-3 Low and High* prior to the intervention (see Table 9). Based on Levene's test for equality of variances, there was a statistically significant difference between means for the TORC-3 Low/High on the *TSRC* pretest ($t(57)= -2.788$, $p>..043$, d=.62), but not on the *TSRC posttest* ($t(57)= -.309$, $p>.984$, d=.07, ns). These results indicate that the original differences of means between the two groups became less after the *TSRC* posttest.

Correlation Analyses

Correlations were then conducted to determine if the *TORC-3 Low* and *High* were correlated with the *TSRC* pre-test or post test (Table 10 a and b). When examining the

TORC-3 Low and High group, there was a significant correlation between the *TSRC* pre test and post test for the *TORC*-Low group. There was also a significant correlation between the *TORC*-High and the *TSRC* post test.

Table 10a.

Bivariate Correlations among the Overall Conditions for the Variables for TORC-Low

TORC-Low			
	TORC-3 Low	*TSRC pretest*	*TSRC posttest*
TORC-3 Low	_	.054	-.070
TSRC pretest		_	.651*
TSRC posttest			_

Note. *N*=57

*$p< .05$

Table 10b.

Bivariate Correlations among the Overall Conditions for the Variables for TORC-High

TORC-High			
	TORC-3 High	*TSRC pretest*	*TSRC posttest*
TORC-3 High	_	-.078	.425*
TSRC pretest		_	.310
TSRC posttest			_

Note. *N*=57

*$p< .05$

Mixed-Model Repeated Measures ANOVA

Finally, a mixed-model Repeated Measures ANOVA was run to see if a) students in the *TORC-3* Low group demonstrated greater improvements in the pre-post *TSRC* test than students in the *TORC-3 High* and b) to see if there was an interaction between the *TORC-3 High/Low* group on the pre-post *TSRC* test. Main effects and interactions between the within (*TSRC* test results over the two sessions =comp) and between subjects (score on TORC-3 = TORCHL) variables were examined. Preliminary analyses revealed no violations of the assumptions of normality, and homoscedasticity; although, assumptions of sphericity were not met.

Using Wilks' criterion (Table 11), results indicate there was not a within subjects main effect (*TSRC* test results over session 1 and 2) with time as these test results were not significantly impacted over the two sessions, indicating that when plotted, the slope of this line was flat ($\underline{F} = 2.192$, $\underline{p} > .05$, $\eta^2 = .038$). There was also not a between subjects main effect (table 13) with the structured group ($\underline{F} = 2.662$, $\underline{p} > .05$, $\eta^2 = .046$), indicating that differences in the *TSRC* tests were not significantly influenced by the score students achieved on the *TORC-3*.

The profiles of the variables did, however, deviate significantly from parallelism as there was an interaction between *TSRC* test scores during session 1 and 2 and treatment group in terms of *TORC-3* score ($\underline{F} = 4.403$, $\underline{p} < .05$, $\eta^2 = .074$) Therefore over the two sessions, student's scores on the TORC-3 (Low or High) influenced the *TSRC* test scores significantly.

Table 11.

Summary of Main Effects and Interactions for TSRC test and TORC-High and Low Over Two Sessions

	Wilks' Lambda	F value	*p* value	η^2
comp	.962	2.192	.144	.038
TORCHL	-	2.662	.109	.046
comp * TORCHL	.926	4.403	.040	.074

Conclusion

An examination of descriptive statistical data determined that in general, the data was normally distributed. Independent samples t-tests found there was a significant difference between means for the TORC-3 Low/High on the *TSRC* pretest. These results indicate that the original differences of means between the two groups became less after the *TSRC* posttest. Correlation analysis determined there were some relationships between the variables. When examining the TORC-3 Low and High group, there was a significant correlation between the *TSRC* pre test and post test for the *TORC*-Low group. There was also a significant correlation between the *TORC*-High and the *TSRC* post test. Again, all assumptions but Sphericity were met for the mixed-model repeated measures ANOVA. The Greenhouse-Geisser correction was used in order to conduct the ANOVA. There were no main effects; however, there was an interaction between the variables. Therefore over the two sessions, students who scored lower on the *TORC-3* had greater gains on the post test across conditions than students who scored higher on the *TORC-3*.

Chapter 6

Discussion

The purpose of this study was to examine the effectiveness of an intervention designed to support students with a vast array of comprehension skills, grapple with challenging text-based materials in a computer-supported collaborative environment. This study was interested in comparing the effectiveness of computer-supported collaboration using a modified reciprocal teaching structure versus no structure. This was done by measuring a pre-post Task Specific Reading Comprehension (*TSRC)* test on Saanich School District 63 secondary students in an online, collaborative learning activity that involved a reading task. The purpose of this study was to determine if students who participated in structured collaboration demonstrated greater improvements in the pre-post *TSRC* test than students who participated in unstructured collaboration and if there was an interaction between the structured/unstructured support conditions on the pre-post *TSRC* test.

Simply providing information to students and assuming they are learning is not adequate as many students are not strategic learners and lack the skills to learn successfully (King, 2003). Placing students in groups can help students acquire these skills. Thus, today, collaborative activities are commonly used in the class and in the online setting. Usually the purpose for collaboration is to improve individual understanding of text across the curriculum, although researchers do not always readily acknowledge this.

Collaboration, however, is not always effective and placing students in groups with no supports or scaffolding can negatively impact learning (Kester & Paas, 2005;

O'Donnell & Dansereau, 2000; Weinberger, Ertl, Fischer, & Mandl, 2005). In the online environment, collaboration may be even more ineffective as students often do not know how to collaborate online, are unsure how to interact, or need extensive help to manage learning and collaborative tasks (Weinberger, Ertl, Fischer, & Mandl, 2005).

The CSCL literature suggests that collaborative learning is improved when it becomes more structured as it guides learning (Weinberger et al., 2005). However, what is deemed as support often provides minimal guidance and does not scaffold cognition. Furthermore, too much support may actually negatively impact learning. Thus the optimal level of support is unknown. In addition, there are few CSCL studies that have examined reading comprehension and those that have appear to be methodologically flawed.

The present study draws on a form of O'Donnell and Palinscar and Brown's supports that aid collaboration, text processing and comprehension. These roles, scripts and prompts support collaboration and comprehension by guiding the collaborative process of how and when to collaborate and help students collaboratively discuss difficult text and co-construct meaning.

Key findings suggest that the *TSRC* test is a valid measure as the *TORC-3* standardized test was found to be correlated with the *TSRC* pre-test. This implies the latter was a valid measure of task-specific reading comprehension as scores on the *TORC-3*, correlated with scores on the *TSRC* pre-test. The *TSRC* tests, however, were not significantly influenced by the amount of structure students were exposed to, nor were there any interactions.

The research literature suggests a number of plausible reasons for this finding. First, too much structure may influence students' responses negatively by interfering with strategy acquisition by impacting motivation and the process of natural collaboration. Next, there may be a greater need to combine social supports with epistemic ones to better guide the collaborative process itself and not just cognition. Finally, delayed recall may have negatively impacted results. During the first session, students read, than answered questions; whereas, during the second session, students read, then discussed, then answered questions. It may be that the time in between reading and answering questions actually decayed students' comprehension.

To help explain the above findings, the data was further analyzed based on students' scores on the *TORC-3* (*TORC-High or Low*). Although no main effects were found with the *TSRC* tests, there was an interaction. The literature suggests that for students with good comprehension skills, who already have effective strategy skills, learning a new strategy may initially have a negative impact on results. Consequently, students who may not possess such strategy skills may attain greater gains in comprehension since they do not already have strategies that may interfere with the attainment of new ones. Thus, it may be that supports are initially more effective for students with fewer skills.

Is There a Correlation Between the TORC-3 and the TSRC Test?

Adequately comprehending what you read is perhaps the most important skill a student can acquire. It is linked to both academic achievement and with one's ability to effectively collaborate (O'Donnell, 1996; Prinsen, Volman & Terwel, 2007). Thus, often a primary goal or purpose for structured collaboration is to aid text processing and comprehension across subject areas (O'Donnell, 1996).

Yet, few CSCL studies have determined that a student's comprehension level can influence the quality and quantity of collaborative contributions, impacting the individual and group's performance (Prinsen, Volman & Terwel, 2006; 2007). Despite this area's importance, the CSCL literature has few studies that have examined this topic sufficiently. With the CSCL literature that does address reading comprehension, there appear to be a major design flaw as gains in comprehension could not be sufficiently attributed to an intervention as standardized baseline reading scores were not attained. Thus, it is unclear if greater comprehension scores were due to a particular group's superior reading ability or if rates could be attributed to the intervention.

Specific measures that assess task-specific comprehension should therefore be correlated with a standardized measure to ensure results are not only due to a student's reading ability. For this study, the *TORC-3* paragraph subtest was used. This test is a standardized measure of reading comprehension with the paragraph subtest most closely related to the task. The *TSRC* test was created by the research team and used to determine if students understood the task. For it to be a reliable measure, a number of steps were taken including piloting the measure, having experts examine it for accuracy, aligning the types of questions with the English 10 provincial exam, and making sure the test correlated with the *TORC-3*. When statistical tests were used, it was found that the *TSRC* pre test was correlated with the *TORC-3*, indicating it was an appropriate measure for this study.

Does Structured Collaboration Impact Reading Comprehension?

The research literature has found that when texts are challenging and difficult to understand, collaborative discussion can support members of the group to share and construct better understandings of that text than might otherwise be possible (Jenkins & O'Connor, 2003). Through group discourse, learners co-construct new knowledge and ways of thinking (Vygotsky, 1978) to become self-regulated learners and to foster metacognitive strategies. Metacognitive strategies are especially effective when the text is challenging. Beck, McKeown, Hamilton, & Kucan's (1998) research has uncovered that many students' recall after reading challenging expository text, was at the surface level. Thus if students are made aware of their cognitive processes and how to best utilize them, their comprehension improves (Williams, 2003).

Supports that foster metacognition and collaboration have been found to improve comprehension. This is even more important in the online environment where students often do not know their peers, may not have adequate support from a teacher, or may be unfamiliar with the technology. Yet results from this study did not yield any significant findings. Reading comprehension results, measured by the *TSRC* test were not significantly influenced by the amount of structure students were exposed to. Yet despite positive findings in the literature, there are a number of other studies that have found different variables that may influence collaboration and comprehension outcomes. Too much structure may impact responses and motivation; whereas, not enough social supports guiding the collaborative process may negatively impact cognition. The intervention itself can also interfere with comprehension by delaying recall.

Issues with Too Much Structure

Despite the accolades in the literature supporting collaborative structures in the online environment, there are many other studies that have found the opposite. A study by Beers et al. (2005) found that too much structure results in little freedom and constrained options participants may have. This may lead students in a less structured group to have more discourse contributions on a wider range of topics. Ge and Land (2004) also found that there were some limitations to structures when examining question prompts. They found that students sometimes ignored the question prompts, resulting in a lack of attention to important areas of the task. The prompts, they found, may also restrict participants from responding. Makitalo et al.'s (2005) research also uncovered issues with too much structure. They found that the unscripted group sought information in a direct and successful manner, while the scripted group sought information more indirectly and less successfully. It may be, according to Kester and Paas (2005), that if too scripted, a collaborative task can lead to a cognitive overload and hinder learning.

Students in the structured group in this study had a fairly scripted task, complete with access to specific prompts that accompanied their roles. They were given the same amount of time to go over instructions and their scripts as the unstructured group had to look over the instructions. It may be, like Kester and Paas (2005) suggested, this led to a cognitive overload where students had to try and fulfill their role, adhere to their scripts, correctly use the prompts and get their group members to fulfill a task. This multitude of tasks may have negatively impacted the discussion and test results. It was also found during this study, as Ge and Land (2004) discovered, students often ignored the prompts in the text chat or failed to use them appropriately. This may have resulted in off-task behaviour for many of the groups and negatively impacted results.

The Need for Social Supports to Guide Epistemic Supports

Some research suggests that it is not good enough to just supply cognitive supports, but instead, social supports that guide and facilitate the collaborative process are needed. Makitalo et al.'s (2005) examined epistemic scripts. Epistemic or cognitive scripts facilitate cognitive processes by providing strategies to solve tasks (O'Donnell & Dansereau, 1992). The researchers found those without epistemic scripts achieved better outcomes. Researchers do not know to what extent interaction should be structured on an epistemic level in order to support the way learners cope with an online setting. It may be that the epistemic script might have restricted the learners too much.

Weinberger et al.'s (2005) built on the above study by examining social scripts that guided the collaborative process. Social scripts help learners structure discourse and collaborative activities (Weinberger et al., 2005). They found these social scripts to be beneficial with respect to individual acquisition of knowledge, whereas as in the above study, epistemic scripts were not. Providing learners with an epistemic script may not always result in individual knowledge acquisition. Furthermore, epistemic scripts may need to be endorsed by social scripts and then faded out, as novices become experts.

In this study, there were only minimal social supports provided. Both groups were provided with instructions and both groups had access to a limited amount of generic prompts. The generic prompts consisted of five statements such as: "can we move on". These prompts only minimally guided the process and were only effective if students chose to use them. As these students had probably not completed an online, collaborative task in the past, they may have benefited from additional social supports, combined with the cognitive ones.

Delayed Recall

Previous research has shown that students do better on reading tests after the second or other subsequent times they read and then answer questions (Rawson, Dunlosky & Thiede, 2000). However, the majority of research has examined tasks where in each situation, the participant reads and then immediately answers questions, followed by an immediate rereading and then answering the same questions. Rawson and Kintsch's (2005; 2004) work has found that although rereading effects have only been explored using immediate tests, most students face delays between reading and the administration of the test and/or between re-readings. The researchers examined this delay to determine the effects on tests. The effects on rereading and then delaying the test, the researchers found, were not impacted by the type of text, the skill of the reader, or the type of test questions. The researchers did find, however, that a delay in re-reading leads to a decay in recall with the longer the delay, the greater the decay.

In this study, for session 1, students read the text and then immediately answered questions. Then, a week later, they re-read the text, discussed the text for a length of time, and finally answered questions. There were two delays with this rereading. First, students waited one week to re-read a very difficult and complicated text on crystal methamphetamine. Second, when they came back for the next session, they reread, discussed the text and then answered questions. Although one would expect that the second reading would result in increased test results, the week wait and the discussion in between reading and answering questions may have contributed to delayed recall where the student's recall decayed over time.

Interference of New Strategy Instruction

A number of researchers have found that metacognitive strategies, like the use of reciprocal supports, may impact learners in different ways. Students struggling with comprehension issues may benefit from strategy instruction more than stronger students since the latter group will often already possess efficient strategies (Dole, Brown and Trathen, 1996; Pintrich, Marx, & Boyle, 1993; Pressley, Goodchild, Fleet, Zajchowski, & Eillis, 1989). Learning new strategies, for this group, may initially impact performance as they struggle to learn a new strategy they are less efficient at or are less inclined to use.

Dole, Brown and Trathen (1996) found that lower achieving students were more inclined to use a new strategy that aided comprehension, and that this group often used it more successfully than higher achieving students. It appeared that the lower achieving strategy users were motivated to use the strategy which they perceived as helpful. Furthermore, as their ability to use the strategy increased, so did their comprehension. On the other hand, higher achieving students were not motivated to use the strategies. They perceived the strategies as unhelpful and preferred their own strategies. For these students, their comprehension actually declined as they were encouraged to use the strategy.

The above findings may partially explain why students' scores in the *TORC-3* High were more negatively impacted on the *TSRC* post test than students in the *TORC-3* Low. For the first group, they may have already had some effective metacognitive strategies and the old strategy may have interfered with the learning of the new one. On the other hand, students in the *TORC-3* Low group may have possessed few useful strategies and thus were more motivated and open to using the new one and had less to lose cognitively than the other group.

Summary:

This study examined the effectiveness of a CSCL intervention that used modified reciprocal teaching supports to aid a collaborative discussion on a challenging text. The purpose of the study was to determine if students who participated in structured collaboration demonstrated greater improvements in the pre-post TSRC test than students who participated in unstructured collaboration.

Key findings suggest that the *TSRC* tests were not significantly influenced by the amount of structure students were exposed to. This may be due to a number of things found in the literature. First, too much structure can negatively impact cognition where responses can be too restrained. Too much information can also cause cognitive overload. Students may ignore the supports, resulting in off-task behaviour. Next, cognitive supports may need to be offered in conjunction with social supports that not only guide metacognition, but also how to collaborate. The *gChat* for this study only used 5 generic social prompts that groups in both conditions had access to (structured and unstructured). Finally, there was a delay between test taking and question answering during the second session. The collaborative discussion that occurred between the above activities may have actually interfered with comprehension by delaying recall.

To help explain the above findings further analysis examined how students in the low *TORC-3* group did on the *TSRC Pre/Post* test compared to students in the high group. Students in the *TORC-3* High group experienced greater loses on the *TSRC* post test than students in the low group. The literature suggests this may be due to strategy interference, where stronger students who already use efficient strategies, have difficulty when having to implement a new one. In addition, these students have more to loose as they often obtain higher comprehension scores in general. Students with few skills, on the other hand, may not possess efficient strategies that will interfere when they learn a new one.

Theoretical Implications:

This study contributes to theory in two ways. First, this study adds an important piece to theories that surround reading instruction, specifically sociocultural models. Next, it examines structure in the CSCL environment, which is a newer area of research. It adds to this area, and in particular to "uncertainty" theory as it helps explain how structure impacts cognition in this environment.

Many theories of reading instruction assume competence resides within the individual. Yet, the sociocultural model looks to the role of social context in developing student competence (Vygotsky, 1978). This study has taken what we know about the sociocultural benefits of reciprocal teaching and applied that to a virtual setting to see if these benefits translate, thus, testing well-grounded theory in a modern context. This study, then, adds to the literature on instructional programs for reading comprehension and computer supported collaborative learning. When students are placed in groups, the research literature is clear that there needs to be some support. Results from this study indicate that supports in the CSCL environment did not help student's individual comprehension. In this study, supports were provided to guide cognition, but there were fewer supports to guide the social part of collaboration. Makitalo et al. (2005) suggests that there needs to be a combination of cognitive and social supports, in order to realize gains in cognition.

The literature is unclear on the types and the amount of support that is needed during computer-supported collaborative learning. More recent theories, including uncertainty theory (Weinberger et al., 2005), suggest that too much support in the CSCL environment may not be motivating, may constrain responses, or may lead to cognitive overload and thus negatively impact cognition. This study found that students did not benefit from being placed in the structured group in terms of gains in reading comprehension. This may be because of one of the above reasons, and thus this area should be further researched.

Research Implications:

This study adds to the body of research in three ways. First, it examines structure in the CSCL environment, next it examines specific strategies, and finally, findings within this study may spur future research. Results contained within this study suggest that students who scored higher on the *TORC-3* actually have lower gains on the *TSRC* pre/post test than those who scored lower.

Within the research literature, important work is being conducted today on computer-supported collaborative learning. Yet, there are several areas that need to be addressed in order to more clearly understand this field. The optimum amount and type of structure afforded during CSCL is unknown and deeply debated in the literature. By comparing supported and unsupported collaboration, this study contributed to current research by providing concrete evidence that these particular types of support do not significantly aid reading comprehension. In addition, reciprocal teaching roles have been examined extensively; however, this study looked at these supports, in a modified form, within a different context, and with older students. Although these altered reciprocal teaching roles were not useful in aiding reading comprehension and scaffolding the collaborative process, it may be because social supports needed to be combined with cognitive ones. Future research should concentrate on this area.

The research literature suggests that students who already have efficient strategies may actual find that they initially do poorly when applying a new strategy. Certainly students in the *TORC-3* High had greater losses on the *TSRC* posttest than the *TORC-3* low group. This study adds an important piece to the puzzle in terms of strategy usefulness and ability. Further research should examine the impact of specific structures on these groups.

Practical Implications:

As course funding has changed in British Columbia for high school students, many now find themselves enrolled in one or two distributed learning courses, in addition to taking courses at their neighbourhood school. There are expectations in these courses for peer collaboration and levels of comprehension in this text-based world. This research will guide educators and software developers to help create practical structures that will both aid collaboration and reading comprehension. Educators and software developers must be aware that supports with too much structure, may lead to a lack of motivation, cognitive overload, and off task behaviour. However, there may be a need for social supports to be combined with cognitive ones. In addition, educators need to be aware that students who possess efficient strategies, may actually do more poorly on tasks than those who do not use any strategies. Finally, educators need to be attentive to the fact that collaborative discussion that occurs between reading and answering questions, may negatively impact results due to delayed recall.

Limitations:

There are seven main areas of limitations within this study which may have impacted findings and therefore results should be interpreted with caution. These include: (a) time constraints, (b) the number of sections of text read and questions answered, (c) the lack of counterbalancing of text, (d) grouping, (e) time on task, (f) practice effect, (g) level of text difficulty, and (h) groupings for the Low/High TORC-3.

(a) *Time*. This study was conducted in June, and as that was the last instructional month in the school year, it was not an ideal time to conduct research. Students are often distracted with various year-end school events and teachers are not inclined to mark instruction as end of term report cards are usually completed by that time. Thus while the instructional component of this study fit the PLOs for both English and Planning 10, the activity and completion of tests did not count towards the students' grades. This may have limited the degree to which students fully engaged or invested in the learning activity. The English provincial, however, did take place after the data collection and that may have been a motivating factor for some students.

It must be noted that it was difficult to fit in the completion of all instruments and the intervention activities into two sessions. Ideally, more sessions would have allowed for a group assignment (the creation of a brochure on drug awareness) and more extensive practice using the software and computer supports. In addition, including only two sessions for an intervention, does not meet the standard for intervention research. Ideally, the intervention should last a number of weeks or sessions.

(b) *Sections of text.* The original crystal methamphetamine text was designed with four sections and corresponding questions. After pilot testing, it was clear that the two – 80 minute sessions would not provide ample time to read and complete the questions. Hence, the text was cut down to two sections with the realization that there may not be time for even both of these sections. In the end, due to time constraints only questions from one section during session 2 were completed. As a reliable and valid measure of reading comprehension, an appropriate amount of questions, corresponding to text should be offered. As fewer sections were anticipated being read, additional questions for each section were created. Thus, instead of four questions per section, there were 9 questions.

(c) *Counterbalancing.* When individuals read various sections of text in the same order, results may be impacted. Participants may be more tired reading later sections, or earlier sections may aid or hinder reading or responding to later questions. Thus, counterbalancing text is advisable. In order to maintain clarity in the instructions and procedures for students resulted in counterbalancing the text to be dropped.

(d) *Grouping.* It is recognized that random assignment to groups is preferable; however complete random assignment was not possible. To deal with separate schools, classrooms, consenting and non-consenting individuals, and differing reading abilities meant that groups were sometimes formed out of convenience and the need to keep groups homogeneous. Where possible, groups were assigned randomly within the above constraints and role assignment within groups was initially randomly assigned; however, due large amounts of absenteeism, roles assignments did change to ensure there were adequate groups and roles within groups.

(e) *Time on task.* It is recognized that reading comprehension scores may be influenced by time on task. Students who spend more time reading and discussing text will likely have higher comprehension scores. Structured, scripted discussions will probably lead to increased time on task and therefore may influence the results of the structured peer text chat. Although there is no way to ensure individuals have the same amount of time on task, the same amount of time for discussion was afforded for both structured and unstructured groups and suggestions were made for individuals to contribute evenly to the discussion. That being said, it was noted that some students did not respond nearly as often as other students and some students finished their reading and questions before the end of the allotted time.

(f) *Practice effect.* When the same test is completed more than once, a practice effect is expected to occur. As students participating in this study completed the same test twice, practice effects were expected; however, since I compared means from the two groups, variances in means between the two groups could not be attributed to the intervention.

(g) *Level of text difficulty.* The text on crystal methamphetamine was created to match a level 13 using Fry's readability test. This level of difficulty was deemed necessary in order to give students a reason to collaboratively discuss the text. It is recognized that since the level of text was three years above the students' grade level, many students may have been frustrated by the difficulty of the text. Future researchers should perhaps have students learn the software and roles, scripts and prompts using text at a more appropriate reading level before group collaboration begins using text at a more difficult level.

(h) *Groupings for the Low/High TORC-3.* The median score in the TORC-3 was used as a cut-off point in order to carry out statistical tests to compare those who scored higher on the TORC and those that scored lower. It is recognized that this is an artificial cut-off that does not meet the rigorous standards for group placement normally utilized in this field. There may be students who did poorly on the comprehension test in the high group or there may be strong students in the low group. However, since the data appear to be normally distributed and equal sized groups are desirable for the purposes of analysis, this method was deemed adequate, although findings must be interpreted with caution.

Suggestions for Future Research:

This research may have answered a number of questions; however, it has also opened other doors to be explored. This study found that cognitive supports did not enhance comprehension, yet this could be due to a number of factors that should be explored in future research. Other research (Weinberger et al., 2005) has shown that social scripts (scripts that specify and sequence interactions of learners) can be more effective than cognitive scripts (scripts that specify and sequence knowledge construction). Future research, therefore, may want to explore providing a combination of these types of supports. Furthermore, less support may have led to fewer constraints, increased motivation and higher on-task behaviour. Therefore it would be beneficial to repeat this study with varying degrees of support. Findings showed that students who did better on the *TORC-3* had a greater drop on the TSRC post test than those who did not do as well. Future research should further examine these groups in regards to the impact of structure.

In addition, it would be beneficial if future research could examine a group product created out of collaborative discussion. As these structures are meant to be scaffolds, future research may want to examine if students internalize the cognitive roles when scaffolds are dropped. Next, research with students at a distance who do not know each other, would provide a more authentic setting. When students collaborate online, they generally do so from remote locations and often, they do not know their online peers. By replicating what generally occurs, may change the group dynamics and make structure even more important. Finally this research should be conducted on younger students to see if age-related constraints have an impact.

Conclusion

Research on computer supported collaborative learning is gaining in importance as students flock to alternative distributive learning options. Yet what works in the regular classroom may not translate to the virtual setting. Research needs to examine classroom practices to see how they complement and fit into the online environment. What is clear is that advances in software and pedagogy in this area need to be based on sound theory and research if practical applications are to be made. Students do not learn in an isolated vacuum, and thus the antiquated, individual correspondence courses of yesterday no longer apply. Instead, it is necessary and expected that students interact and learn from their peers, even in an online setting.

Reading comprehension is one of the necessary skills needed in all academic areas. Structures and supports that aid comprehension and facilitate the online collaborative process are imperative. Educators and software developers' increased understanding of how certain supports impact performance will help students in the online world reach their potential.

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Appendix A

Structured Directions for the Task

You have currently been asked to take part in a collaborative learning activity as part of your school curriculum in agreement with your teacher. This page will outline what this software is to be used for, your task for this project and any additional frequently asked questions you may have. If at any time during our demonstration, or after reading this introduction section, you do not understand something then please do not hesitate to ask one of us learning assistants.

What is *gStudy*?

The program you are currently using for this collaborative learning activity is called *gStudy*. *gStudy* is a software application that has learning kits embedded that act as a collection of digital learning materials. *gStudy* supports learners' interactive engagement with multimedia information in the learning kit to learn, apply and transfer that information to new situations (learning kit website).

The Chat Tool

The tool in *gStudy* you are primarily concerned with is called "*gChat*". This is the smiley face button in the tool bar labeled chat. When clicking on this button, you will be connected to 3 other chat members. Choosing multiuser chat with these individuals is how the 4 of you will work together to complete this educational task.

The Chat

Within the chat you will be asked to select your role (summarizer, clarifier, predictor, and questioner) from a drop down menu. Once in your role, you will see pre-stocked prompts that you can use to facilitate the chat interaction.

The Main Goal

This is a collaborative learning task. You will be asked to read a piece of challenging text warning against crystal methamphetamine use. At the completion of this, you and 3 other individuals will work together in an online chat tool to figure out the text (what is important and what does not make sense to some of you). You will do this by using the collaborative role (clarifier, questioner, predictor, and summarizer) that you were assigned at the beginning of this session. A detailed outline of what each role is and the accompanying script and prompts are found to the left in the tool bar or can be found at these links here.

You will also be asked to complete a few multiple choice questionnaire questions along with a few comprehension questions on the text. Please note that at all times scientists will be recording your online moves, so please refrain from discussing topics outside of the text material with your partners.

Your Task

Your task for this study is…

Session 1:

Step 1: After our presentation, we will ask you to complete a questionnaire through WebQuestionnaire. We would like you to complete the tests titled “TORC-3” and “Prior knowledge”. This link can be found on the page titled “WebQuestionnaire”.

Step 2: You will then be asked to read a text warning against the risks of crystal methamphetamine use. This text is meant to be challenging and you will later work with your group to figure it out. After reading each section, please return to WebQuestionnaire to answering reading comprehension questions.

Step 3: You will then be asked to return to WebQuestionnaire and fill out 3 tests of Efficacy. Please answer as honestly as you can.

Session 2:

Step 4: You will now work with your 4 classmates in *gChat* to try and figure out the text by using your collaborative role. This is challenging text, and it will take the 4 of you talking together about it and using your roles, scripts and prompts. Remember, our scientists are recoding your chat so please try to resist the urge to discuss topics outside of the text material. After you read the test, you will individually answer questions on reading comprehension in WebQuestionnaire.

Appendix B

Unstructured Chat Directions for the Text

You have currently been asked to take part in a collaborative learning activity as part of your school curriculum in agreement with your teacher. This page will outline what this software is to be used for, your task for this project and any additional frequently asked questions you may have. If at any time during our demonstration, or after reading this introduction section, you do not understand something then please do not hesitate to ask one of us learning assistants.

What is *gStudy*?

The program you are currently using for this collaborative learning activity is called *gStudy*. *gStudy* is a software application that has learning kits embedded that act as a collection of digital learning materials. *gStudy* supports learners' interactive engagement with multimedia information in the learning kit to learn, apply and transfer that information to new situations (learning kit website).

The Chat Tool

The tool in *gStudy* you are primarily concerned with is called "*gChat*". This is the smiley face button in the tool bar labeled chat. When clicking on this button, you will be connected to 3 other chat members. Choosing multiuser chat with these individuals is how the 4 of you will work together to complete this educational task.

The Main Goal

This is a collaborative learning task. You will be asked to read a piece of challenging text warning against crystal methamphetamine use. At the completion of this, you and 3 other individuals will work together in an online chat tool to figure out the text (what is important and what does not make sense to some of you).

You will also be asked to complete a few multiple choice questionnaire questions along with a few comprehension questions on the text. Please note that at all times scientists will be recording your online moves, so please refrain from discussing topics outside of the text material with your partners.

Your Task

Your task for this study is…

<u>Session 1:</u>

<u>Step 1:</u> After our presentation, we will ask you to complete a questionnaire through WebQuestionnaire. We would like you to complete the tests titled "TORC-3" and "Prior knowledge". This link can be found on the page titled "WebQuestionnaire".

<u>Step 2:</u> You will then be asked to read a text warning against the risks of crystal methamphetamine use. This text is meant to be challenging and you will later work with

your group to figure it out. After reading each section, please return to WebQuestionnaire to answering reading comprehension questions.

Step 3: You will then be asked to return to WebQuestionnaire and fill out 3 tests of Efficacy. Please answer as honestly as you can.

Session 2:

Step 4: You will now work with your 4 classmates in *gChat* to try and figure out the text by using your collaborative role. This is challenging text, and it will take the 4 of you talking together about it. Remember, our scientists are recoding your chat so please try to resist the urge to discuss topics outside of the text material. After you read the test, you will individually answer questions on reading comprehension in WebQuestionnaire.

Appendix C

Crystal Methamphetamine Use

Heather Church, Meghann Fior & Rachel Morris

Introduction *(To be used when training subjects to use g-study)*

For several years, raves have been a popular trend among adolescents and young adults. In fact, they have been actively attended in Canada since the late 1980's (Weir, 2000). A rave is an all-night dance party, consisting of large numbers of young people, typically taking place in secret locations, removed from public surveillance (Weir, 2000). These parties include trance-inducing electronic music, as well as the use of several drugs, such as ecstasy and crystal methamphetamine. In the past decade, there have been several deaths at raves. Frequently, these deaths are the result of: heat exhaustion, dehydration and adverse physiological reactions to drugs (Weir, 2000). The crowded, often-closed environment of the rave can result in heat exhaustion and dehydration. Water is often unavailable or scarce at these events. Seasoned ravers often bring a supply of their own beverages. However, as these parties tend to take place in covert locations and are in and of themselves an underground culture, there are no restrictions on who attends. Thus, there are no age limits, often resulting in very young attendees being exposed to and experimenting with very dangerous chemicals.

In addition to neurological effects, the drugs typically used by ravers significantly raise heartbeats per minute, while also causing the user to feel invincible and unaware of such physiological symptoms as thirst and sweating. There have been such a sufficient number of deaths in Canada resulting from raves and the use of the drugs commonly found at raves, that the health community has grown alarmed about this phenomenon and proposed sanctions against such events as raves (Weir, 2000). Consequently, the rave community has reacted by implementing drug awareness programs at these events, where volunteers will provide water, information on the effects of the drugs, warning signs of adverse reactions, long term effects and harm reduction strategies. While these measures are helpful in reducing the magnitude of the dangers associated with the rave culture, only those who seek out the information about the drugs and who are lucid enough to retain this information will benefit.

Due to the nature of the drugs commonly consumed at raves, there are long term impacts and neurological damage which can result upon first exposure to them These drugs are becoming more and more common and are no longer solely associated with raves. There are several drugs popular among ravers, such as: ecstasy, cocaine, D-lysergic acid diethylamide (LSD), phencyclidine (PCP) and crystal methamphetamines (speed) (Weir, 2000). Though the latter four drugs are often used, crystal methamphetamines are becoming increasingly popular.

Commonly known as crystal meth, this drug is no longer solely associated with the rave scene. It has become a common drug of choice among British Columbians and is rapidly gaining popularity across Canada. Unfortunately, this very addictive drug has serious, irreversible side effects and social implications.

Neurological Effects

Crystal meth is a drug which works by interacting with the receptors in the sympathetic nervous system (Logan, 2002), which is responsible for emotions and thought processes. Specifically, its structure resembles neurotransmitters, such as dopamine, norepinephrine and epinephrine, which the brain requires to maintain normal emotions, thought processes and functioning. Due to the fact that its structure is similar to these neurotransmitters, it interacts with the receptors in the brain to elicit the sensations and 'highs' drug users seek. However, it must first overpower the normal neurotransmitters in order to gain access to the receptors in the brain. In response to failure to detect the neurotransmitters, the body produces higher rates of norepinephrine, which is what causes the high rates of arousal experienced by crystal meth users. The behaviours exhibited by users, such as repetitive movements and twitching, are caused by increased dopamine release, which is a result of the failure of neurotransmitters to connect with the appropriate receptor cells. The higher rate of dopamine production is also responsible for producing the disturbances in perception, as well as psychotic behaviour (Logan, 2002).

Despite the initial increase in production of neurotransmitters, prolonged use of crystal meth causes the body to reduce the levels of neurotransmitters it produces (Logan, 2002). This is not only limited to dopamine, norepinephrine and epinephrine, but to serotonin, as well. Serotonin is the drug responsible for maintaining healthy emotional functioning. Low rates of serotonin production results in depression and other mood disorders. Apparently, crystal meth remains active in the body for 24 hours after administration (Logan, 2002). However, the naturally occurring neurotransmitters reclaim normal functioning only briefly after crystal meth has ceased to be active. Eight days after exposure to the drug, neurotransmitter activity declines, which suggests that neurotoxicity and terminal degeneration. Briefly, neurotoxicity is when the brain has been exposed to a toxin which prevents it from producing the neurotransmitters it needs to function properly. Terminal degeneration is when the receptor cells in the brain die off as a result of poisoning.

What makes crystal meth use so dangerous to the brain is that each person's metabolism response to the drug is unpredictable. Because it interferes with the ability of neurotransmitters to interact with the brain's receptors and causes an over production of neurotransmitters, varying concentrations of the drugs will have different effects on the same individual, depending upon: a) when he/she last took the drug, b) his/her body's response to the drug, c) the concentration of the initial dose he/she ever took and d) the body's current stage of flushing the drug from the body. As a result of the brain's fluctuating response to the drug, multiple exposures to it can produce symptoms commonly known as 'flashbacks'. This is when the brain produces neurotransmitters in such high concentration, that it produces psychotic sensations in the user. The brain's disrupted ability to produce and receive neurotransmitters results in lowered thresholds, or limits, of neurotransmitter (or in the absence thereof, crystal meth) required to elicit psychotic episodes. This is, in effect, what causes the mental degradation, increased psychosis and stereotyped movements and behaviour (e.g., twitching, incoherent verbalizations, etc.) of regular users of crystal meth.

Social Issues

Production of crystal meth ought to have been made more difficult by controlling access to the chemicals needed to manufacture it (Meredith, Jaffe, Ang-Lee, & Saxon, 2005). However, the chemicals required can be harvested from readily available products such as, battery acid, over the counter cold medications, cleaning products, etc. Consequently, lawmakers have tried to limit the volume of these products people can have access to. Despite these attempts, illegal crystal meth labs exist across North America (Meredith et. al, 2005). In fact, in the United States (USA), 8 129 labs were seized and shut down in 2002. Furthermore, a total of 1231 children have been found in labs which were seized in the same year. This is of concern because these children are found to have high levels of toxins and by-products of the manufacturing of crystal meth in their bloodstream. Furthermore, in children who live in homes which have such labs, it is common for them to experience significant burn, which are sometimes fatal, as well as inadvertent poisoning. Another way which the manufacturing of crystal meth can impact children who are present in the lab location is through lead poisoning, which can cause, among other things, severe mental retardation, resulting from the use of lead acetate in the production of crystal meth (Meredith et al., 2005). The consequences to children present in crystal meth labs, is only one minor consideration in terms of the impact of crystal meth on society.

There are several side-effects caused by crystal meth which result in violence against others. For instance, the intense cravings users experience can compel them to engage in desperate measures, such as robbery, in order to attain the drug. Paranoia and aggression are also common side-effects, as is suicidal behaviour (Meredith et al., 2005). Finally, users themselves are often the victims of violent crime. In fact, in a study of the deaths associated with crystal meth, Logan, Fligner and Haddix (1998; as cited in Logan, 2002) found that there were a high number of users who had died violent deaths. The authors examined 146 deaths in which crystal meth had been detected in the individual's blood stream during autopsy. Of these deaths, 18 had been suicides, while 40 had been homicides, 31 one of which resulted from gunshot wounds, 7 from stabbing deaths, 1 case of strangulation, while 17 individuals had died as a result of fatal driving. In all cases of fatal car accidents, the crystal meth user had been the driver. The remaining causes of death were undetermined. Because of the fluctuating and unpredictable responses one can have to crystal meth from dose to dose, it is impossible to determine whether overdose is solely to blame for these deaths, though it is quite likely (Logan, 2002). There is also an argument that those who use crystal meth have a tendency to be victimized more often than does the general, non-crystal meth using population.

Interestingly, Logan (2002) suggests that teenager crystal meth users tend to get into fights more often than do their non-using peers, and took more risks which resulted in assault more often than did their non-using peers. For those teenager users who dated other users, there are also higher rates of violence in dating situations. Logan (2002) suggests that part of this predisposition toward violent behaviour may be due to self-esteem issues, anxiety, and depression, which may also have led to the initial use of drugs. Frighteningly, those who tend to use crystal meth are also more likely to use other drugs, and/or combine drug use with alcohol, which can have dire consequences.

Taking into consideration the effects of crystal meth, as well as the social factors associated with it, it becomes apparent that teenagers who are tempted to try and/or use crystal meth are risk both as a physical result of the drug, as well as due to the social implications associated with drug use and risk taking behaviour. It would, therefore, be in the best interests of those attending to raves to ensure they are well informed about the substances they are being exposed to, so that they can make informed decisions about what they choose to ingest, inject or inhale. Furthermore, they need to be aware of the drugs that are out there, so that they can watch out for symptoms and/or reactions in their friends. In this way, teenagers can equip themselves to make decisions which could affect the rest of their lives, as well as the enjoyment, satisfaction with and quality of their lives.

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Appendix D

Roles, Scripts and Prompts Instructions

A. Summarizer

What will I be doing?

You have already read a very difficult text on crystal methamphetamine. To assist your group in understanding that text, you will be discussing it collaboratively. To help you do this, each person in your group has been assigned a different role (summarizer, questioner, clarifier, and predictor). Please do the following things:

1. Read about your role below
2. In your group, take turns (explained below) using your assigned roles to guide the group discussion.
3. Use the prompts that you were shown in *gChat* (listed below) to help you with this task.
4. Try to answer any questions other group members ask.

What is my role?

You are the ***Summarizer***: As the summarizer, you will ask your group questions to help them sum up the information in the text. The article can be summarized across sentences, across paragraphs, and across the article as a whole. Stop after each paragraph or major section of the passage. Ask your group to construct a sentence that sums up only the most important idea(s) that appear in that part. Good summary sentences include key concepts or events but leave out less important details.

When do I ask questions?

Section 1: neurological effects

- As the summarizer you will ask the first question in your group.
- You will start your group's discussion by asking a question that will help your group summarize the first paragraph. You may want to use one of the prompts in *gChat* to help you get started.
- After your question has been answered, the rest of your group will take turns asking their questions that relate to the first paragraph. Try to answer at least one of those questions.
- When each of you has had a turn asking a question, move on to the second paragraph and start your group's discussion by asking another question that gets your group to summarize the paragraph.
- Repeat this process for the last paragraph.

Section 2: social issues

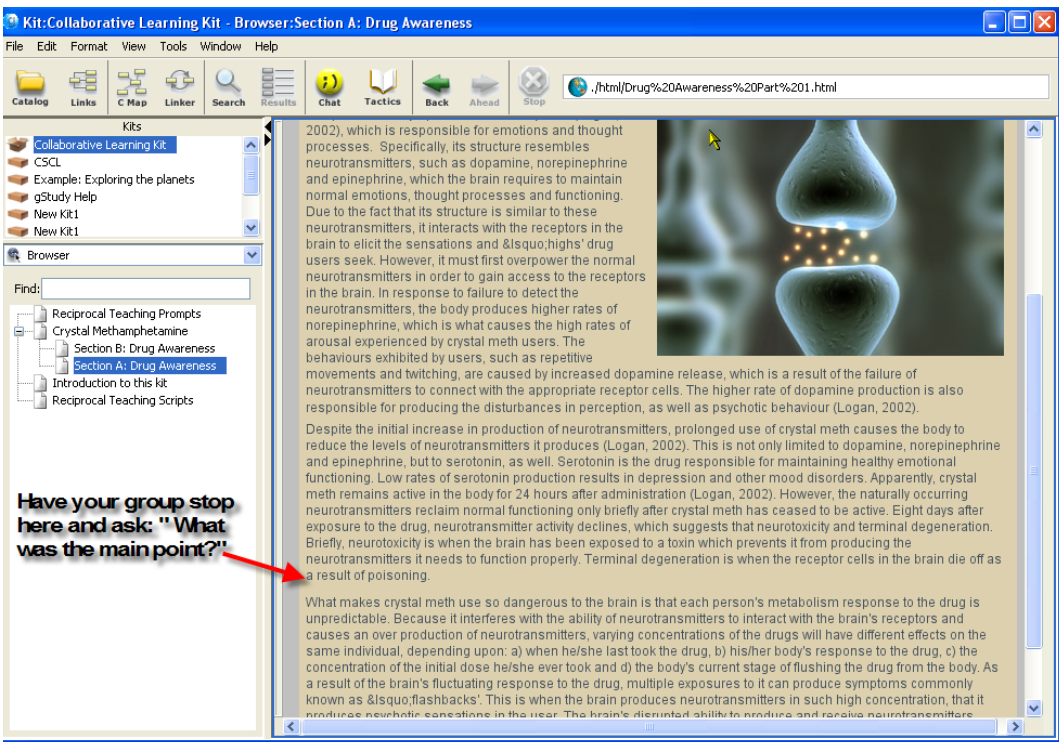
- Now that you have some experience helping your group summarize, decide when it makes sense to get your group to summarize.
- Don't forget to answer questions and use the prompts provided.

How do I ask questions?

Use the **Prompts** in *gChat*:

- What is this part about?
- What was the main point?
- What did you get from this?
- Can you put that in your own words?
- Can you give a general summary of……?

Example:



B. Questioner

What will I be doing?

You have already read a very difficult text on crystal methamphetamine. To assist your group in understanding that text, you will be discussing it collaboratively. To help you do this, each person in your group has been assigned a different role (summarizer, questioner, clarifier, and predictor). Please do the following things:

1. Read about your role below
2. In your group, take turns (explained below) using your assigned roles to guide the group discussion.
3. Use the prompts that you were shown in *gChat* (listed below) to help you with this task.
4. Try to answer any questions other group members ask.

What is my role?

You are the ***Questioner*****:** As the questioner, you will get your group to generate questions. For the main ideas that you read, have your group write down a question that the main idea will answer. Good questions should include words like "who, "where", "when", "why", and "what". For example, if you are reading an article about the extinction of the dinosaurs, you might find the following main idea: "Most scientists now believe that the extinction of dinosaurs was caused by a large meteor striking the earth." You could then write this question: "What event do most scientists now believe caused the mass extinction of the dinosaurs?" Also, have your group think about the types of questions other people (including themselves) may have about the text.

When do I ask questions?

Section 1: neurological effects

- As the questioner you will ask your question, after the summarizer's question has been answered.
- You will continue your group's discussion by getting your group to create a question that relates to the first paragraph. You may want to use one of the prompts in *gChat* to help you get started.
- After the question has been created, the clarifier and predictor will take turns asking their questions that relate to the first paragraph. Try to answer at least one of the questions your group asks.
- When each of you has had a turn asking a question, move on to the second paragraph and after the summarizer's question has been answered, continue your group's discussion by getting them to create another question that relates to the second paragraph.
- Repeat this process for the last paragraph.

Section 2: social issues

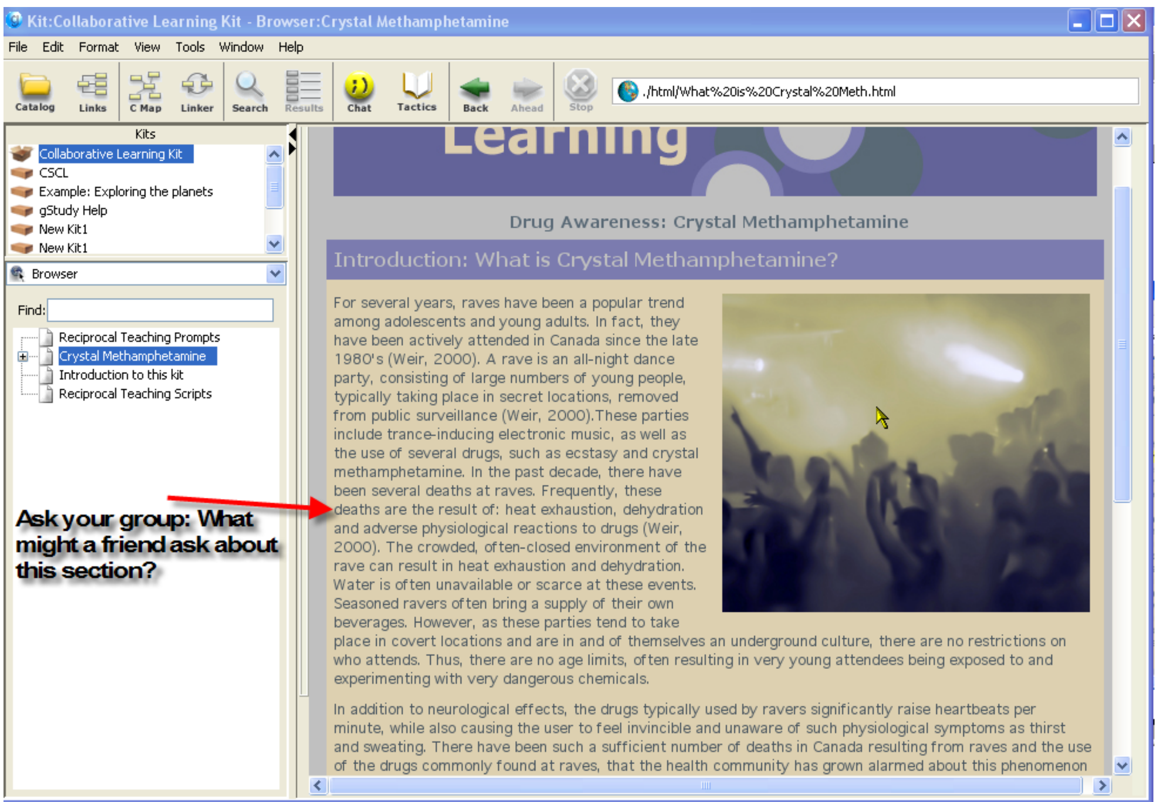
- Now that you have some experience helping your group create questions, decide when it makes sense to do this for the *social issues* text.
- Don't forget to answer questions and use the prompts provided.

How do I ask questions?

Use the **Prompts** in *gChat*:

- Did you have any questions about...
- What are you curious about?
- What might your mom or dad ask about this?
- What might a friend ask about this?
- What question will the main idea answer?

Example:



C. Clarifier

What will I be doing?

You have already read a very difficult text on crystal methamphetamine. To assist your group in understanding that text, you will be discussing it collaboratively. To help you do this, each person in your group has been assigned a different role (summarizer, questioner, clarifier, and predictor). Please do the following things:

1. Read about your role below

2. In your group, take turns (explained below) using your assigned roles to guide the group discussion.
3. Use the prompts that you were shown in *gChat* (listed below) to help you with this task.
4. Try to answer any questions other group members ask.

What is my role?

You are the ***Clarifier*:** As the clarifier, your role will be to get your group to clarify anything that is unclear. Sometimes in your reading you will run into words, phrases, or whole sentences that really don't make sense. Here are some ways that you can get your group to *clarify* the meaning:

- *Unknown words.* If your group comes across a word whose meaning they do not know, suggest they read the sentences before and after to see if they give clues to the word's meaning.
- *Unclear phrases or sentences.* Suggest your group rereads the phrase or sentence carefully and try to understand it. Get them to think of other interpretations or examples.

When do I ask questions?

Section 1: neurological effects

- As the clarifier you will ask your question, after the summarizer and questioner's questions has been answered.
- You will continue your group's discussion by asking a question that will help your group clarify something that is unclear in the first paragraph. You may want to use one of the prompts in *gChat* to help you get started.
- After your question has been answered, the predictor will take a turn asking their question that relates to the first paragraph. Try to answer at least one of the questions your group asks.
- When each of you has had a turn asking a question, move on to the second paragraph and after the summarizer and questioner's question has been answered, continue your group's discussion by getting them to clarify something that is unclear in the second paragraph.
- Repeat this process for the last paragraph.

Section 2: social issues

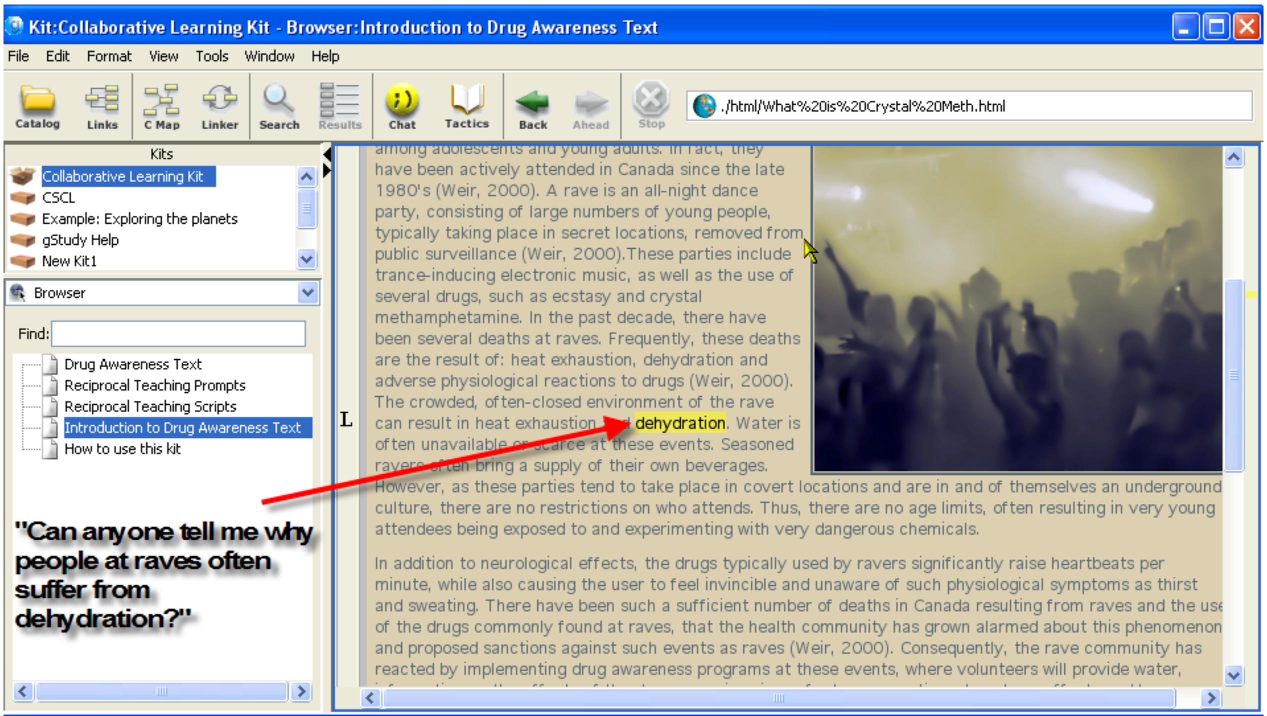
- Now that you have some experience helping your group clarify, decide when it makes sense to do this for the *social issues* text.
- Don't forget to answer questions and use the prompts provided.

How do I ask questions?

Use the **Prompts** in *gChat*:

- Can anyone explain...
- What do you think that means?
- Are there any other interpretations?
- Can you think of an example?
- How can we make sense of that?

Example:



D. Predictor

What will I be doing?

You have already read a very difficult text on crystal methamphetamine. To assist your group in understanding that text, you will be discussing it collaboratively. To help you do this, each person in your group has been assigned a different role (summarizer, questioner, clarifier, and predictor). Please do the following things:

1. Read about your role below
2. In your group, take turns (explained below) using your assigned roles to guide the group discussion.
3. Use the prompts that you were shown in *gChat* (listed below) to help you with this task.
4. Try to answer any questions other group members ask.

What is my role?

You are the ***Predictor*:** As the predictor, your role will be to help your group see how one part of the text is related to or predicts other parts of the text. You will also help your group hypothesize what the consequences may be for an action or event described in the text. For instance, if you read about the introduction of a foreign species to a fragile ecosystem, you may want to ask your group about the consequences of that action.

When do I ask questions?

Section 1: neurological effects

- As the predictor you will ask your question after the summarizer, questioner and clarifier's questions has been answered.
- Try to answer at least one of the questions your group asks.
- You will continue your group's discussion of the first paragraph by asking a question that will help your group predict or hypothesize. You may want to use one of the prompts in *gChat* to help you get started.
- After your question has been answered, your group will start to discuss the second paragraph. After the summarizer, questioner and clarifier's questions have been answered, continue your group's discussion of this paragraph by getting them to predict or hypothesize.
- Repeat this process for the last paragraph.

Section 2: social issues

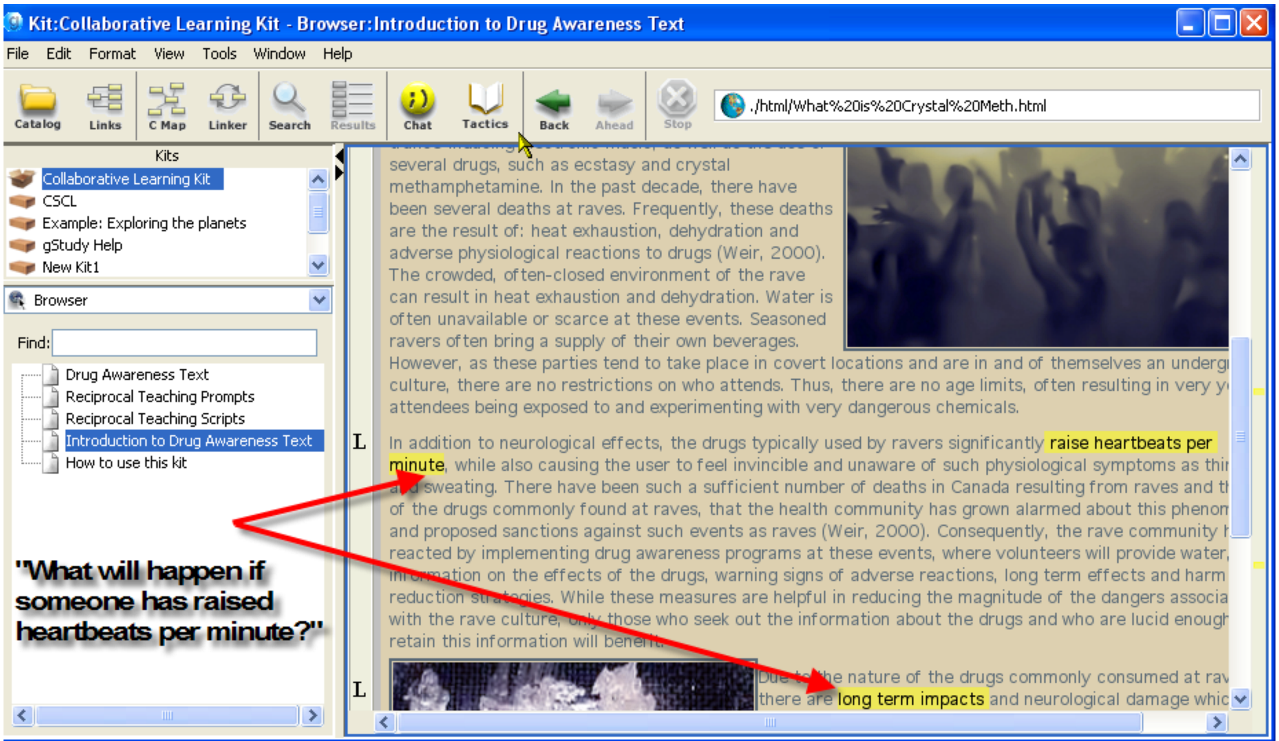
- Now that you have some experience helping your group predict, decide when it makes sense to do this for the *social issues* text.
- Don't forget to answer questions and use the prompts provided.

How do I ask questions?

Use the **Prompts** in *gChat*:

- What might we need to know?
- What might happen if...
- How might that affect...
- How might that relate to...
- Are there consequences to...

Example:


Kit:Collaborative Learning Kit - Browser:Introduction to Drug Awareness Text
File Edit Format View Tools Window Help
Catalog
Links
C Map
Linker
Search
Results
Chat
Tactics
Back
Ahead
Stop
./html/What%20is%20Crystal%20Meth.html
Kits
Collaborative Learning Kit
CSCL
Example: Exploring the planets
gStudy Help
New Kit1
Browser
Find:
Drug Awareness Text
Reciprocal Teaching Prompts
Reciprocal Teaching Scripts
Introduction to Drug Awareness Text
How to use this kit
"What will happen if someone has raised heartbeats per minute?"
several drugs, such as ecstasy and crystal methamphetamine. In the past decade, there have been several deaths at raves. Frequently, these deaths are the result of: heat exhaustion, dehydration and adverse physiological reactions to drugs (Weir, 2000). The crowded, often-closed environment of the rave can result in heat exhaustion and dehydration. Water is often unavailable or scarce at these events. Seasoned ravers often bring a supply of their own beverages.
However, as these parties tend to take place in covert locations and are in and of themselves an underg
culture, there are no restrictions on who attends. Thus, there are no age limits, often resulting in very y
attendees being exposed to and experimenting with very dangerous chemicals.
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sweating. There have been such a sufficient number of deaths in Canada resulting from raves and t
of the drugs commonly found at raves, that the health community has grown alarmed about this phenon
and proposed sanctions against such events as raves (Weir, 2000). Consequently, the rave community h
reacted by implementing drug awareness programs at these events, where volunteers will provide water,
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reduction strategies. While these measures are helpful in reducing the magnitude of the dangers associa
with the rave culture, only those who seek out the information about the drugs and who are lucid enough
retain this information will benefit.
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there are long term impacts and neurological damage whic

Appendix E

English 10 Provincial Exam Categories and BC Performance Standards

Reading Categories	BC Performance Standards	IRP Outcomes
Retrieve Information The reader locates information that is found in the text. No inferences or interpretations are required. The information is usually contained within a phrase or sentence.	• uses text features to preview and locate information • provides specific, relevant detail as needed	Learning outcomes for this category are not included in the IRP as these outcomes are considered appropriate for lower grade levels. As Figure 1 (p. 4) illustrates, lower level categories are subsumed in higher level categories.
Recognize Meaning The reader uses information provided in the text and understands an equivalent statement or reformulates it in her/his own words. The reader comprehends the use of literary and stylistic terms and devices. The information is usually contained within a phrase or sentence.	• accurately identifies main ideas and restates them in own words • deals effectively with obvious themes	Learning outcomes for this category are not included in the IRP as these outcomes are considered appropriate for lower grade levels. As Figure 1 (p. 4) illustrates, lower level categories are subsumed in higher level categories.
Interpret Texts The reader integrates ideas and information to show an understanding or interpretation. The information may be implicit and open to interpretation. Information may need to be	• offers logical predictions and speculations • uses subtle clues in the text to build inferences and interpretations	• interpret the main ideas, events or themes of a variety of novels, stories, poetry, other print material, and electronic media • interpret details and draw conclusions about the information presented in a

inferred, "filled-in" or linked across parts of a text. The information is generally derived across the text, but may sometimes be found in a word or sentence.		variety of illustrations, maps, charts, graphs, and other graphic forms
Analyze Texts The reader takes a stance, evaluating and making judgments about aspects of the text or the author's purpose, perspective, craft and effectiveness. The evaluation may focus on personal reactions and opinions, or on critical analysis. The evaluation may require information to be integrated or transformed. The reader may make connections with other texts, or synthesize information from multiple texts.	• logically describes and analyzes elements and key features, offering an interpretation that goes beyond retelling • explains relationships among ideas; offers logical predictions, speculations, and conclusions based on specific evidence from the text	• demonstrate their awareness of how the artful use of language can affect and influence others • interpret and report on information from more than one source that they have read, heard, or viewed to develop and support positions on a variety of topics • analyze and assess the impact of specific techniques and designs used by the media

Appendix F

Task Specific Reading Comprehension Pretest/Posttest: Crystal Methamphetamine

Section 1: Neurological Effects

DIRECTIONS:

1. Read the section to yourself.
2. Indicate how well you understood the section
3. Answer the nine questions that follow the section.
4. For each question, put an X over the one letter, A, B, C, or D, that best answers that question

How well did you understand the section you just read?

Very Comprehensible						Very Incomprehensible
1	2	3	4	5	6	7
○	○	○	○	○	○	○

1. Why do people who take crystal methamphetamine have repetitive movements and twitching?
   a. The simple molecular structure of crystal methamphetamine allows it to penetrate the barrier of the liver
   b. There is a failure of neurotransmitters to connect with the appropriate receptor cells*
   c. Your body must borrow vital nutrients from healthy cells to metabolize the drug
   d. Taking the drug leads to exhaustion

2. Why will varying concentrations of crystal methamphetamine have different effects on the individual?
   a. It depends on when someone last took the drug*
   b. It depends on how the drug was administered
   c. It depends on if the drug is mixed with another substance
   d. None of the above

3. Why is serotonin important to the brain?
   a. It is responsible for healthy cell division
   b. It is responsible for regulating dopamine in the brain
   c. It is responsible for maintaining healthy cognitive functioning
   d. It is responsible for maintaining healthy emotional functioning*

4. Why do people who take crystal methamphetamine behave in difficult ways?
   a. The drug impacts your feelings and your ability to think*

b. The drug effects the Occipital Lobe, which leads to depression
c. Various nutrients are taken from the body, which depletes the brain
d. People often end up homeless, which makes it difficult to cope

5. What causes strange movements in crystal methamphetamine users?
a. A bad “batch” of crystal methamphetamine
b. Severe changes to gastrointestinal system
c. Fluctuations in neurotransmitters*
d. Prolonged high levels of dopamine

6. Why are there prolonged effects from crystal methamphetamine if it only remains active in the body for 24 hours?
a. Neurotransmitters are greatly impacted and receptor cells are destroyed. *
b. Crystal methamphetamine is stored at the cell level
c. Crystal methamphetamine travels through the endocrine system
d. It is so addictive, most users of this drug use it several times a day

7. What can repeated use of crystal methamphetamine do?
a. Using this drug may lead to using more serious drugs
b. Give the user more energy
c. Deplete calcium in the bones and lead to breakages
d. Using this drug may lead to chronic mental health problems*

8. Why is crystal methamphetamine considered a dangerous drug?
a. It makes the user act in strange ways
b. It destroys the brain*
c. It is highly addictive
d. It is found everywhere in North America

9. How does crystal methamphetamine react in the body?
a. It travels quickly through the central nervous system
b. It reacts with dopamine and serotonin
c. It mimics other important chemicals in the brain. *
d. It concentrates in the brain

Section 2: Social Issues

DIRECTIONS:

5. Read the section to yourself.
6. Indicate how well you understood the section
7. Answer the nine questions that follow the section.
8. For each question, put an X over the one letter, A, B, C, or D, that best answers that question

How well did you understand the section you just read?

Very Comprehensible						Very Incomprehensible
1	2	3	4	5	6	7
○	○	○	○	○	○	○

1. What ingredients can make crystal methamphetamine?
   a. Sodium Chloride
   b. Complex mix of chemicals
   c. Crystal methamphetamine is a natural product that is grown
   d. Battery acid, over the counter cold medications, and cleaning products*

2. What happens to many who take crystal methamphetamine?
   a. They are more likely to be involved in illegal activities, and commit suicide. *
   b. They are more likely to be victims of crime and have increased rates of dementia.
   c. Neither a nor b
   d. Both a and b

3. Those who use crystal methamphetamine are also more likely to have which of the following traits?
   a. Over confidence, anger, and lack of self-control
   b. Low Self-esteem, anxiety, and depression*
   c. Low self-esteem and lack of self-control
   d. Depression and anger.

4. Why is it dangerous for children to live near crystal methamphetamine labs?
   a. Children might suffer from hormonal imbalances
   b. These labs are often isolated from society
   c. Children may get sick from the chemicals*
   d. Child labour is an issue

5. How can teenagers avoid the issues surrounding crystal methamphetamine?
   a. They can stay away from raves
   b. They can stay away from people who take this drug

   c. They can avoid leaving your drink unattended
   d. They can become educated about the drug*

6. How can society make it more difficult to manufacture crystal methamphetamine?
   a. Make it difficult to access the ingredients*
   b. Have stiffer penalties
   c. Make each of the ingredients illegal
   d. Increase police presence in known crystal methamphetamine territory

7. Why are crystal methamphetamine users more likely to be involved in a violent crime?
   a. Most meth users live in urban, violent places
   b. Their actions and lifestyle leads to violence against and by drug users*
   c. The drug makes them more violent
   d. Their lifestyle means they are more likely to be exposed to violence

8. How dangerous is it for children to be found near crystal methamphetamine labs?
   a. The situation is very dangerous and action should be taken immediately*
   b. The situation is dangerous; however, since the lab ingredients are household products the children are not in any eminent danger.
   c. The situation is somewhat dangerous as children could learn some bad habits.
   d. As long as the children stay away from the lab itself, it should be OK

9. What is the leading cause of death in crystal methamphetamine users?
   a. Murder
   b. Suicide
   c. Car accidents
   d. Undetermined*

Appendix G

Crystal Methamphetamine Prior Knowledge Questions

1. The technical term for crystal meth is…
a) Methamphetamine*
b) Crystaline Meth
c) None of the above

2. What causes the high rates of arousal in crystal meth users?
a) Higher rates of norepinephrine*
b) Lower rates of norepinephrine
c) Both a and c

3. How many hours does crystal meth remain active in the body for after administration?
a) 5 hours
b) 12 hours
c) 24 hours*

4. Crystal Meth triggers the release of what neurotransmitters?
a) Norepinephrine and dopamine*
b) Serotonin and dopamine
c) Epinephrine and dopamine

5. What year were laws implemented to combat the production of crystal meth?
a) 1981
b) 1989*
c) 2002

6. The maximum penalty for the production and distribution of crystal meth is…
a) Imprisonment for 5 years
b) Imprisonment for 10 years
c) Imprisonment for life

7. Most common side effects of crystal meth are…
a) Fatigue, depression and over eating
b) Loss of attention, decreased energy and depression
c) Increased energy, brain damage and panic attacks*

8. How is methamphetamine taken?
   a) Orally in capsules
   b) Intravenously
   c) All of the above*

9. Methamphetamine may have originated from which source?

a. Over the counter medication*
b. Other street drugs
c. None of the above as methamphetamine is a new substance

10. When Methamphetamine is taken long term, what happens?
    a. Users build up a tolerance to its effects*
    b. Users have less tolerance to its effects
    c. Over time, more of the drug can be found in the brain
    d. Over time, more of the drug can be found in the body

Appendix H

Letter to Principals

SIDES
4575 Wilkinson Rd
704-4979
February 4, 2007
Re: Permission to Conduct Research

Principal Mark Fraser
Claremont Secondary School
4980 Wesley Rd.
658-5221

Attention Mark Fraser

Dear Mr. Fraser:

Meghann Fior and I are currently enrolled at the University of Victoria and are working with Dr. Allyson Hadwin on a study entitled Measuring Online Collaboration Quality: Reciprocal Teaching in Learning and Mastering Text. The three of us are working under Dr. Hadwin's research grant, funded by SSHRC-INE. I am also a student services teacher at the South Island Distance Education School.

The purpose of this research project is to examine the quality of online group collaboration when using supports (roles, scripts and prompts) to guide and enhance group learning. In addition, we will be examining the impact of particular cognitive supports used during online collaboration, on students with reading difficulties. We are also interested in measuring computer and collective efficacy (student's belief that they can succeed at a task).

I believe this study will benefit both your school and your students. Research of this type is important because it will assist students to successfully collaborate in a group-learning environment, especially for those who may have difficulties in this setting. We are proposing to create a system to help students work effectively on group, or in-class projects/assignments that will facilitate equal work and understanding among all students.

Student collaboration is an important part of any course, and this is reflected in the curriculum with a number of prescribed learning outcomes. In English 10, it is prescribed that "students will interact and collaborate with others to explore ideas and to accomplish goals" (Ministry of Education website, appendix A). The subject matter of the article is also important and supported by the Ministry. The Planning 10 IRP states "students are to analyze strategies for preventing substance misuse" (Ministry of Education website, appendix A). Many collaborative tasks, however, require a level of proficiency in reading, which some students may not possess. That is why I am researching particular cognitive supports that will hopefully help students collaborate and will aid comprehension.

If you wish your school to participate, I would like permission to contact your grade 10 English and Planning 10 teachers and the students in these classes. I would also like to ask permission for us to possibly use your computer facilities to conduct part of our research. I will be asking teachers to distribute letters of consent to parents and to indicate to me, which participants are struggling with reading comprehension. All participation will be voluntary and will consist of grade 10 participants, attending two, 45-minute sessions at one of the five high schools in Saanich. Before the first session, I will be administering the Woodcock-Johnson Achievement Subtest on Reading – Passage Comprehension subtest to only those students with reading difficulties. In the first session, students will read a difficult passage and then answer comprehension questions and questions regarding collaborative and computer efficacy. Groups of four students will engage in collaborative group activity (reading text) with the assistance of a computer program (*gStudy*), after which they will complete a short reading comprehension test. Groups will either have a structured or unstructured collaborative environment. For the final session, groups will work collaboratively to create a brochure on drug awareness.

I have already received approval from our school district and from the University of Victoria Ethics department, to conduct research in this area. We hope to meet with teachers and students in April. For additional information, please see the attached letter to be sent to teachers and the letter of consent that will be distributed to parents. You may also contact us if you have further questions: Rachel Morris (rmorris@sides.ca), Meghann Fior (mnfior@uvic.ca), and Dr. Hadwin (Hadwin@uvic.ca).

Sincerely,

Rachel Morris
Teacher

Appendix I

Letter to Teachers

SIDES
4575 Wilkinson Rd
704-4979
February 4, 2007
Re: Permission to Conduct Research

Attention Grade 10 English and Planning 10 Teachers

To whom it may concern:

We are inviting you and your students to participate in a study conducted by Meghann Fior, Rachel Morris, and Dr. Allyson Hadwin. Meghann Fior and I are currently enrolled at the University of Victoria and are working with Dr. Allyson Hadwin on a study entitled Measuring Online Collaboration Quality: Reciprocal Teaching in Learning and Mastering Text. The three of us are working under Dr. Hadwin's research grant, funded by SSHRC-INE. Rachel Morris is also a student services teacher at the South Island Distance Education School.

The purpose of this research project is to examine the quality of online group collaboration when using supports (roles, scripts and prompts) to guide and enhance group learning. In addition, we will be examining the impact of particular cognitive supports used during online collaboration, on students with reading difficulties. We are also interested in measuring computer and collective efficacy (student's belief that they can succeed at a task).

If you agree to participate, we will administer a unit of instruction that is supported by the English 10 and Planning 10 prescribed learning outcomes and will culminate in a product you may assess if you wish. I would also like to ask permission to contact your students, by distributing a letter of consent to parents. From those that agree to participate, I request that you indicate which participants are struggling with reading comprehension. Before the first session, I will be administering the Woodcock-Johnson Achievement Subtest on Reading – Passage Comprehension subtest to only those students with reading difficulties. In the first session, students will read a difficult passage and then answer comprehension questions and questions regarding collaborative and computer efficacy. Groups of four students will engage in collaborative group activity (reading text) with the assistance of a computer program (*gStudy*), after which they will complete a short reading comprehension test. Groups will either have a structured or unstructured collaborative environment. For the final session, groups will work collaboratively to create a brochure on drug awareness.

I have already received approval from our school district and from the University of Victoria's Ethics department to conduct research in this area. I hope to meet with you and students in April. For further information, please see the attached letter of consent for parents or you may contact us if you have further questions: Rachel Morris (rmorris@sides.ca), Meghann Fior (mnfior@uvic.ca), and Dr. Hadwin (Hadwin@uvic.ca).

Appendix J

Ethics Form

[Your department letterhead]

Parent Consent Form

Measuring Online Collaboration Quality: Reciprocal Teaching in Learning and Mastering Text

Your son/daughter is invited to participate in a study entitled Measuring Online Collaboration Quality: Reciprocal Teaching in Learning and Mastering Text that is being conducted by Meghann Fior, Rachel Morris, and Dr. Allyson Hadwin.

Meghann Fior, and Rachel Morris are graduate students and Dr. Hadwin is a professor in the department of Educational Psychology and Leadership Studies at the University of Victoria. You may contact them if you have further questions by email: Meghann Fior (mnfior@uvic.ca), Rachel Morris (rmorris@sides.ca), and Allyson Hadwin (hadwin@uvic.ca).

This research is being funded by SSHRC-INE.

Purpose and Objectives
The purpose of this research project is to examine the effectiveness of online group collaboration on reading comprehension and participation rates when students use either: (a) an online chat tool to discuss the text, or (b) an enhanced chat tool that utilize to discuss the text. The enhanced chat will incorporate cognitive roles and prompts. We are also interested in measuring computer, self and collective efficacy (variations of students' beliefs that they can succeed at a task).

Importance of this Research
Research of this type is important because it has potential to uncover ways to assist students in successfully collaborating online. Findings will inform the development of computer software that supports collaboration and learning and inform teachers about instructional techniques for encouraging participation and collaboration of all students. The learning activity used in this research meets prescribed learning outcomes in English 10 and Planning 10.

Participants Selection
Your son/daughter is asked to participate in this study because we contacted his/her teacher requesting participation of interested students in their class/course. Although all students may be asked to participate in the learning activity as part of their course learning activities, only the data from the consenting individuals will be used for research purposes

What is involved
If you allow your son/daughter to voluntarily participate in this research, his/her involvement will consist of being asked to participate in two, weekly sessions of testing lasting approximately 45 minutes to an hour. During the first session, students will receive several short measures to provide information about: (a) prior knowledge of the testing material, (b) confidence in working

on a computer and working with a group, and (c) reading comprehension . Students will then each read a short passage based on awareness of drug use and answer comprehension questions. During the second session, your son/daughter and three other students will engage in a group activity (reading text) with the assistance of a computer program (*gStudy*). One group will direct their own discussions about the text. This group will be working under normal chat conditions, like they do when they chat about school work and readings in groups. The other group will have a structure for dialoging about the text. They are trying an alternative to chatting in their group that may or may not be more effective. If we find that the structured peer text chat is more effective than the peer text chat, then we will make that information available to students and teachers to make use of in the future. We would also like to assure you that the processes being used by the two groups are part of regular teaching and learning practices, and no student or group of students will be disadvantaged by participating in the research. They will end this session by completing the same comprehension measure and measures of their confidence working in groups and on a computer.

Inconvenience
The unit of instruction that students will be completing for this research experiment follows the BC curriculum. Participating teachers will dedicate 2 hours of instructional time to incorporate this instructional activity/research into their classroom activities. .

Risks
There are no known or anticipated risks to you or your son/daughter by participating in this research.

Benefits and Compensation
The potential benefits of your son/daughter's participation in this research include gaining knowledge and skills to work more efficiently in a group and improve their reading comprehension. Your son/daughter will also receive an instructional package of on strategies for collaborating effectively upon completion of the testing sessions. Students will also have access to the learning material and software for use after the study. If you agree to allow your son/daughter to participate in this study, this form of compensation must not seem coercive. It is unethical to provide undue compensation or inducements to research participants. If you would not allow your son/daughter to participate if the compensation was not offered, then you should decline.

Voluntary Participation
Your son/daughter's participation in this research must be completely voluntary. If you do decide to allow him/her to participate, they may withdraw at any time without any consequences or any explanation. If he/she withdraws from the study, when the researchers access the electronic data at the end of the study, data from each measure and computer traces of studying activities will be destroyed. However, chat log data cannot be destroyed without destroying data and resource materials shared with other participant's data. In this case, researchers will make every attempt to exclude the sole non-participant's data during analysis. Since collaborators will be assigned a pseudonym for their chat discussions (person 1, person 2, etc) all chat logs will be completely anonymous in their electronic form. Participants who withdraw will still receive the collaboration package.

Researcher's Relationship with Participants
One researcher is a teacher at The South Island Distance Education School (SIDES). Participants over whom the researcher has a direct power-over relationship (e.g., her own students) will be

excluded from the study. Other researchers will introduce the study, conduct recruitment, and collect consent forms from the school. Data will not be analyzed by the participating teacher until grades have been submitted. All identifying information will be removed from the data before the teacher works with the data so she will not know the identities of the participants at SIDES.

On-going Consent
To make sure that your son/daughter continues to consent to participate in this research, you will be asked to initially sign for consent for all two sessions. We will take your child's presence and participation in each of the two sessions as your on-going consent after the signing of this form. Your son/daughter is free to withdraw at any time; however, the data from the chat logs up until that point will be saved and used by the researchers.

Anonymity
In terms of protecting your son/daughter's anonymity, he/she will be anonymous in that they will receive a user name for the computer project so that the researchers will not know which data is theirs; however, they may recognize other students in the testing situation as having had other classes with them. Their teacher will have no indication of who is/is not participating in the research study.

Confidentiality
Participants' confidentiality and the confidentiality of the data will be protected by being given a user name and by not signing a name on the testing sheets we administer; however, participants may recognize other students in the same testing situation as them.

Dissemination of Results
It is anticipated that the results of this study will be shared with others in the following ways: directly to the participants, published articles and presentations/papers at scholarly meetings. The data analysis will be used as part of the SSHRC-INE project. Ongoing analysis of the data will be conducted as part of an over-arching, ongoing research study. The data collected from this research study will be presented in the form of theses for two masters' students. Identities of participants will remain anonymous throughout information dissemination.

Commercial Use of Results
This research will not lead to a commercial product or service.

Disposal of Data
Data from this study will be stored on a password protected server as part of a study at Simon Fraser University for a minimum of 5 years to a maximum of 10 years, at which point, it will be deleted from the server. If a student withdraws from the study after it has started, all individual data will be destroyed when researcher access the data files at the end of the study; HOWEVER, data that is part of a collaborative discussion cannot be destroyed because it contains data from all other consenting group members.

Contacts
Individuals that may be contacted regarding this study are listed with contact information at the beginning of this form.

In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Associate Vice-President, Research at the University of Victoria (250-472-4545).

Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.

Name of Participant (student)	*Signature*	*Date*