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SOCIALLY SHARED REGULATION
IN COMPUTER-SUPPORTED COLLABORATIVE LEARNING

By

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ABSTRACT OF THE DISSERTATION

Socially Shared Regulation in Computer-Supported Collaborative Learning

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This dissertation examined how groups in CSCL developed and sustained socially shared regulation, defined as multiple members' regulation of their collective learning by developing shared goals, shared plans, shared monitoring, and shared evaluation through mutual agreement and other-regulation, referring to a dominant member temporarily facilitating group members' learning by taking an instructive role to guide the joint activity and others' understanding in collaborative learning environments (Hadwin & Oshige, 2011; Järvelä & Hadwin, 2013; Rogat & Linnenbrink-Garcia, 2013).

The first part of the study used content analysis and adopted a social constructionist lens, revealing the occurrence of socially shared regulatory processes in

CSCL. Log files from three sessions of 13 undergraduate student groups were analyzed. The first key finding of this study was the identification of seven socially shared regulatory processes (planning and goal setting, scheduling, role assignment, task monitoring, content monitoring, task evaluation, and content evaluation) emerging in CSCL, suggesting that an analytical framework of cognitive regulatory processes in individual self-regulated learning can be applied to collective regulation in CSCL. Second, high quality regulation can be called socially shared regulation in the true sense of the word because multiple members successfully involved their shared regulation by establishing shared plans, shared goals, shared monitoring, and shared meaning of their learning.

The second part of the study was a case study using content analysis, social network analysis, and quantitative analysis of group members' self-report questionnaires. Three group regulation patterns were identified: a socially shared regulation group, a mixed regulation group and an other-regulation group. The key finding was that the socially shared regulation group showed more dynamic social interaction and high quality regulation than the other two groups. The mixed regulation group also demonstrated dynamic social interaction but with the existence of a dominant member. The other-regulation group revealed dyadic social interaction between a dominant member and the rest of the members. This study hopes to provide educators with tangible and practical knowledge of online course design and the implementation of online group discussion.

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Chapter One

Introduction

Background of the Problem

Online learning

Online learning is derived from computer-based learning and training (Graziadei, Gallagher, Brown, & Sasiadek, 1997). Computer-based learning refers to the educational environments in which teachers use computers for educational purposes. Computer-based training refers to the educational environments in which a learner performs self-directed learning via a computer (Graziadei et al., 1997). In the early 1960s, Stanford University professors studied teaching using computers in mathematics and reading (Graziadei et al., 1997). At that time, a computer was considered a tool to support learning. Today, the rapid development of modern information and communication technology changed the form of computer-based learning. Now, computer-based learning is no longer restricted to learning using a computer but can also include other forms of electronically supported learning and teaching. Currently, teachers and students are able to engage in discussions in online spaces by exchanging their knowledge and building a learning community. Online learning means, in a broad sense, all types of computer supported learning (e. g., computer-based learning, computer-based training, computer supported collaborative learning, technology-enhanced learning).

The use of online learning is rapidly expanding in higher education. By 2007, 3.94 million students had taken at least one online course, as reported by the Sloan Consortium, and this trend is anticipated to continue (Allen & Seaman, 2008). Similarly, Ambient Insight Research (2009) reported that around 44% of post-secondary U.S.

students have enrolled in an online course. These reports indicate that online learning is taking a predominant place in higher education.

Computer-supported collaborative learning (CSCL)

Among the various forms of online learning, computer-supported collaborative learning is increasingly used in schools, universities, and higher education (Kopp, Matteucci, & Tomasetto, 2012). Computer-supported collaborative learning refers to a learning environment in which learners in different places participate in discussion or work on a collaborative task via communication technology (Lipponen, Rahikainen, Lallimo, & Hakkarainen, 2003).

Research has examined the comparison between online group discussions and face-to-face discussions (Carswell, Thomas, Petre, Price & Richards, 2000; Mandernach, Dailey-Hebert, & Donnelly-Sallee, 2007; Romiszowski & Mason, 2004; Schrire, 2006; Stahl, 2003). Findings from the literature suggest that online group discussions produce similar learning outcomes to those of face-to-face discussions. For example, similar to group discussions in the classroom, online group discussions can promote group members' critical thinking skills, knowledge construction, and problem solving (Carswell et al., 2000).

Moore (1989) categorized three forms of interaction in computer-based collaborative learning: student-student interaction, student-instructor interaction, and student-content interaction. A number of studies have revealed disadvantages of CSCL due to lack of an instructor's facilitation. In a natural setting, students do not actively post messages in online learning. For example, college-level students contributed a mere average of 4.8 messages during a 10-week trimester (Guzdial & Turns, 2000). Graduate-

level students posted an average of 15 messages during one 15-week semester (Hara, Bonk, Angeli, 2000). Furthermore, eighth-grade students posted an average of 4.82 messages during an 18-week period (Hsi, 1997). Guzdial and Turns (2000) noted that not all online discussions in CSCL are effective. Instead, they characterized effective online discussion as sustained, even, and on-topic participation. They claimed that an instructor's involvement or presence in online discussions is important to foster students' participation. Similarly, an instructor's feedback has long been recognized as a deciding factor in promoting students' engagement in many studies (Moore, 2002). In particular, when an instructor fails to provide feedback, students in CSCL are less likely to engage in their discussion compared to face-to-face interaction. Other research findings (Ko & Rossen, 2001) support the importance of an instructor's directive guidance or instruction.

Abrami and his colleagues argued that student-student interaction is often missing when students work in online small groups (Abrami, Bernard, Bures, & Borokhovski, 2011). The instructor-centered online group activities tend to be led not by students but by the instructor. Members may not notice other members' absence in online group discussions and, even worse, they may not know who is taking the online course or participating in the online group discussion. Abrami et al. (2011) additionally suggested that educators need to design computer-based collaborative learning not only to support more interaction among students, but also to develop instructional tools to promote underlying processes and support the production of learning products.

Research on CSCL focuses mainly on instructor-student relations (Markel, 2001). We have limited understanding of specific student-student interactions that influence the

number of postings and online group interactions. Thus, questions remain regarding how students can interact without an instructor's presence in CSCL.

In terms of student-student interaction in CSCL, the best scenario is the emergence of students' productive interactions and joint collective regulation of their learning process (Hadwin & Oshige, 2011). However, collective regulation activities by providing questions or suggestions or monitoring each other's ideas do not automatically occur in CSCL (Järvelä & Hadwin, 2013).

One benefit of CSCL is flexible schedules, which loosen constraints of time and space for learning so that learners benefit from participating on a more flexible schedule (Barnes & Greller, 1994; Hara et al., 2000). Another advantage is individual knowledge attainment (Hoadley & Linn, 2000; Hurme & Järvelä, 2005) and social competencies (Cohen, 1994). Similar to face-to-face discussion, computer-supported collaborative learning increases higher order cognitive skills such as complex reasoning and argumentation. For instance, Hoadley and Linn (2000) examined computer-supported collaborative learning environments by comparing a traditional debate to an online asynchronous discussion in science. They found that 20 eighth grade students benefited from both methods in generating science knowledge. In particular, students in asynchronous online discussions engaged in self-explanation where they attempted to reflect on their understanding of science before posting their ideas on the Web. Interestingly, Hara et al. (2000) found that asynchronous online discussions fostered more depth of reflection than synchronous ones. Students in asynchronous online discussions had more opportunities to think about other members' ideas before giving feedback. Thus, Hara et al.'s (2000) findings support those of Hoadley and Linn's (2000),

whose study showed that computer-supported collaborative learning promoted complex cognitive skills such as self-explanation, inference, judgments, and metacognition.

A third benefit of computer supported collaborative learning is that collaborative knowledge building can occur (Cohen & Scardamalia, 1998; Hoadley & Linn, 2000; Lipponen, 2000; Scardamalia, Bereiter & Lamon, 1994). For example, Cohen and Scardamalia (1998) examined how two different environments, face-to-face and online discourse, generated different learning processes and outcomes in physics with fifth and sixth grade students. Cohen and Scardamalia's (1998) findings show evidence of powerful co-construction of knowledge in CSCL. Similarly, Hoadley and Linn's (2000) finding supported the co-construction of knowledge in CSCL. They found that students engaged in the CSCL environment reflected upon their thinking more than students engaged in only face-to-face learning. Additionally, students in CSCL experienced equal obligations to the group. For example, each group member equally contributed to the group discourse and monitored the group's learning processes. Since students in CSCL learning were more task-oriented and needed to consider input from all members, they tended to involve self-regulatory processes of their own learning as well as other regulatory processes, monitoring other group members' understanding.

Socially shared regulation

A body of research claims that students develop shared knowledge in CSCL through social interaction (Cohen & Scardamalia, 1998; Hoadley & Linn, 2000; Lipponen, 2000; Scardamalia, Bereiter & Lamon, 1994). However, social constructionist researchers (Hadwin & Oshige, 2011; Hadwin, Oshige, Gress, & Winne, 2010; Järvelä & Hadwin, 2013) recognize the importance of socially shared regulation in CSCL, defined

as multiple members' regulation of their collective learning (Hadwin & Oshige, 2011). Researchers distinguish shared knowledge and socially shared regulation in CSCL by viewing co-construction of shared knowledge as engagement in self-regulatory activities while socially shared regulation as engagement of team related activities (Fransen et al., 2013; Järvelä & Hadwin, 2013). Järvelä and Hadwin (2013) argued that distributed regulation among members is necessary in CSCL because it supports successful collaborative learning by developing shared standards and shared goals, suggesting multiple ideas and perspectives, and sustaining shared regulatory processes. They pointed to the fact that previous research in CSCL ignored the aspect of regulated learning in CSCL. Therefore, I argue that the development and sustainment of an online group's socially shared regulation needs to be investigated in order to acquire in-depth understanding of CSCL.

The importance of student-student discourse has been discussed in CSCL (Ko & Rossen, 2001; Kopp & Mandl, 2011; Moore, 2002; Scardamalia & Bereiter, 2006). Students generate a great deal of discourse in school and sometimes actively participate in discussion. However, the typical type of oral discourse is recitation. Typically, recitation does not lead students to build a learning community (Doyle, 1983). At worse, in online and face-to-face discussions, teachers typically lead the discourse and students passively listen to or react to them (Scardamalia & Bereiter, 2006). Previous studies (Ko & Rossen, 2001; Moore, 2002) support the claims of Scardamalia and Bereiter. However, they argue that discourse among students should focus not on reactions to the instructor's guidance or feedback, but rather on on-task discussion and group members' contributions.

In particular, discourse leads members not only to construct collective understanding but also to regulate collective learning communities.

Group members' discourse in online group discussions has three characteristics (Kopp & Mandl, 2011). First, the discourse generates content specific knowledge when students exchange knowledge with each other, and when they share and argue different perspectives in depth. Second, discourse develops group motivation through such processes as competition, conflict, equal status, and balanced participation. When members hold achievement goals, group members tend to compete with each other (Elliot & McGregor, 2001). Meanwhile, balanced participation or equal status fosters group members' positive social influence. Without non-verbal clues online, members develop and experience their motivation through discourse. Third, members regulate their learning processes by discourse. Group members set a goal, monitor and regulate their collaborative learning progress together, and finally evaluate their learning success through discourse. Kopp and Mandl (2011) stressed the role of discourse in CSCL. They did not, however, investigate the emergence of socially shared regulation through discourse. Therefore, it is necessary to explore and analyze students' discourse, especially log files, in order to examine how discourse influences the development and sustainment of socially shared regulation in CSCL.

The literature on CSCL stresses the role of facilitative guidance in effective and successful collaborative learning (Kirschner, Sweller, & Clark, 2006; Kopp et al., 2012). As educators and teachers increase their interests in collaborative learning, they have attempted to implement more small group assignments and reduce direct instruction to students (Kirschner et al., 2006). However, Kirschner et al. (2006) argued that adequate

support and guidance are necessary for successful collaborative learning. Moreover, Kopp et al. (2012) emphasized that online group discussion demands even more guidance than face-to-face interaction since it requires new ways of communication and collaboration. Students, for example, cannot employ contextual cues (e.g., body language) in online group discussions to know how to interpret other members' comments on their postings. Thus, students should be provided detailed guidance for their group work (Kopp et al., 2012). Detailed guiding questions assist in the emergence of socially shared regulation in CSCL.

Despite the benefits of discourse in online group discussion, an analytical framework for online discourse is lacking. Previous analytical frameworks do not analyze the emergence of socially shared regulation in CSCL. Moreover, they are appropriate to understand individual self-regulated learning or the group's collective knowledge building. For example, Henri's (1992) analytical framework proposes five learning processes that are evident in online discourse: student participation, interaction patterns, social cues, depth of processing of cognitive skills, and meta-cognitive skills and knowledge. Jiang and Ting (2000) attempted to analyze students' discourse by taking into account the quantity and quality of postings in online discussions. Additionally, Lipponen and his colleagues (2003) pointed to methodological issues where only a limited number of research studies have attempted to investigate such issues as the pattern of group members' interaction and discourse concurrently, and that previous studies have generally used one method, either quantitative or qualitative, alone.

There is one study by Rogat and Linnenbrink-Garcia (2013) that analyzed socially shared regulation in group activities in face-to-face collaborative learning environments.

They used an analytical framework of individual self-regulated learning to analyze groups' regulatory processes. They found that cognitive regulatory processes such as planning and monitoring processes in self-regulated learning can be applied to the analysis of a group's socially shared regulation. However, their study was conducted in face-to-face group activity environments. Despite several attempts, it is still difficult to examine online discourse empirically because of the unavailability of a reliable instrument (Hara et al., 2000) and analytical framework to analyze socially shared regulation in CSCL.

Literature on CSCL identifies other-regulation, where one dominant member instructs or leads the discussions (Lippone et al., 2002; Nurmela, Lehtinen, & Palonen, 1999; Scardamalia et al., 1994), resulting in the group failing to engage in socially shared regulation (Järvelä & Hadwin, 2013; Rogat & Linnenbrink-Garcia, 2013). The emergence of other-regulation has to do with low quality discourse because not all members contribute to their collective learning processes but rather simply respond to the dominant member's instruction (Järvelä & Hadwin, 2013; Rogat & Linnenbrink-Garcia, 2013).

Some groups successfully develop socially shared regulation while other groups experience other-regulation, where one or two members dominate regulation in CSCL. Without immediate communication with others, some members tend to be isolated from other group members and find it difficult to engage in socially shared regulation, preventing the construction of a community of practice (Azevedo & Hadwin, 2005; Manlove, Lazonder, & De Jong, 2006; Molenaar, Chiu, Slegers, & van Boxtel, 2011). The overriding concern is that synchronous online group discussions require students'

sustained commitment such as keeping track of other students' postings and continually posting messages in order to successfully regulate their collective learning. However, students often fail to frequently share their ideas with other members; instead, they simply follow the dominant member's instruction (Järvelä & Hadwin, 2013; Rogat & Linnenbrink-Garcia, 2013).

The emergence of socially shared regulation is related to a high quality of regulated learning (Rogat & Linnenbrink-Garcia, 2013). Other-regulation negatively affects the group's regulated learning because not all members participate in collective regulation (Järvelä & Hadwin, 2013; Rogat & Linnenbrink-Garcia, 2013). Despite the increasing use of CSCL, little is known about how socially shared regulation and other-regulation emerge in CSCL and, moreover, how each regulation pattern is related to the quality of regulated learning.

Statement of the Problem

In contemporary learning theory, social constructionist theory acknowledges learners as active participants in the learning process, actively building up knowledge rather than passively receiving it (Phillips, 1997). In particular, social constructionists pay attention to situated activity (e.g. Greeno, 2006; Lave & Wenger, 1991; Nardi, 2001) as learning is situated within a community of practice.

This social constructionist perspective leads educators and teachers to pay attention to collaborative learning (Johnson, Johnson, & Stanne, 1989; O'Donnell, 2006; O'Donnell, & O'Kelly, 1994; Wegner, 1995). The key to collaborative learning is communication between members in the group (Johnson et al., 1989; Wegner, 1995). For instance, group members communicate information within the group and coordinate their

learning actions together. Next, collaborative learning reduces group members' cognitive load and members gradually develop shared understanding by exchanging each individual group member's knowledge and expertise (Wegner, 1978). Moreover, collaborative learning is more effective than individual learning in particular educational situations. For instance, collaborative learning is more efficient for problem solving tasks requiring high-order thinking skills and imposing a higher cognitive load compared with individual learning (Kirschner, Paas, Kirschner, & Janssen, 2011).

In line with the increasing number of online courses and online discussions, online group discussions are widely used as an instructional method. Research on CSCL has examined synchronous and asynchronous online group discussions and their learning outcomes. From the literature, three problems in research on CSCL emerge.

The first problem is the focus of previous studies on knowledge co-construction in CSCL instead of the occurrence of socially shared regulation of learning as a group (Fransen et al., 2013; Järvelä & Hadwin, 2013). Research indicates that online group discussions in CSCL environments promote group members' critical thinking skills, knowledge construction, and problem solving (Carswell et al., 2000; Mandernach et al., 2007; Romiszowski & Mason, 2004; Schrire, 2006; Stahl, 2003). However, the co-construction of shared knowledge is not enough to describe CSCL. Although socially shared regulation has been ignored in CSCL research, it needs to be investigated because of the nature of collaborative learning, members in CSCL engage in collectively regulated learning.

Knowledge co-construction refers to domain specific learning to advance individual cognitive activity while socially shared regulation means team members'

interaction and their negotiation (Fransen, Weinberger & Kirschner, 2013). Socially shared regulation includes shared goals and plans and shared regulation of cognitive process. It is not easy for students to develop and acquire socially shared regulation in CSCL because shared meaning, shared goals, shared plans, shared monitoring, and shared understanding cannot take place spontaneously, but occur through mutual agreement and members' engagement and interactions (Cohen & Scardamalia, 1998; Lipponen, 2000; Scardamalia et al., 1994), which is the ultimate objective of CSCL. Thus, it is necessary to examine the emergence of socially shared regulation in CSCL by focusing not on the co-construction of knowledge but on the online group's jointly regulated learning.

Second, two different group regulation patterns are identified in the literature in CSCL (Hadwin & Oshige, 2011; Järvelä & Hadwin, 2013; Rogat & Linnenbrink-Garcia, 2013). Recent research on social regulation moves the focus of the analysis from individual members' self-regulated learning to collective regulation (e.g., co-regulation and socially shared regulation) as a group. Moreover, the literature on social regulation identifies two different group regulation patterns (e.g., socially shared regulation and other-regulation). The research findings indicate that some groups successfully develop socially shared regulation while other groups experience other-regulation, where a dominant member regulates and controls the group members' contributions and learning in CSCL. Nonetheless, we have limited knowledge of how socially shared and other-regulation emerge in CSCL and how they differ from each other. I assume that socially shared regulation results in higher quality of regulation and dynamic social interaction than other-regulation in CSCL because previous research (Volet, Summers & Thurman,

2009) argues that members develop socially shared regulation of learning by constructing meaning and developing dynamic social interactions and, as a result, engage in high level content processing.

During online discussions, students in online groups need to develop socially shared regulation such as shared task perceptions, shared goals, shared plans, shared monitoring of task completion, shared evaluation, and shared strategies in order to maximize the effects of their online learning. However, students tend to fail to develop socially shared regulation. Instead, one dominant member leads the group's discussion by setting goals for the group, monitoring the group's learning processes and instructing other members, called other-regulation. The current study attempts to identify a group's main regulation pattern as either socially shared regulation or other-regulation, provide in-depth description of each group pattern, and check group members' reflection on their group's regulated learning in terms of the quality of regulation and social interaction.

Third, methodologically, socially shared regulation analyzes a group as the unit of analysis because the focus is on collective regulation and interaction (Hadwin & Oshige, 2011). Only a limited number of research studies attempt to investigate both social interaction and discourse concurrently in CSCL (Lipponen et al., 2003). However, Hadwin and Oshige (2011) suggested that future studies need to scrutinize both collective regulatory processes and social interaction in CSCL, since combining methods is likely to result in better understanding of socially shared regulation. In particular, socially shared regulation needs to be understood by examining the discourse exchange and an individual member's role in the group. Previous studies have mainly tried to identify what is regulated, but Järvelä and Hadwin (2013) argued that both what is regulated and who is

regulating need to be combined to examine the online group's joint regulation. Thus, this study attempts to combine these two aspects - what is regulated and who is regulating - and to identify the group's regulatory process as socially shared regulation or other-regulation.

Purpose of the Study

The aim of this study is to understand online groups' regulatory processes by examining how online groups regulate their cognitive regulatory processes collectively and how group interactions (e.g., socially shared regulation or other-regulation) influence the construction of group regulatory processes. This study will use a social constructionist theoretical framework to investigate learners' group interactions and collective cognitive regulatory processes in CSCL. The quantitative and qualitative analysis of online log files will reveal the emergence of socially shared regulation as well as other-regulation, even though the main focus is on the former. Furthermore, an analysis of social dynamics will divulge how different social dynamics shape the development of different learning communities and different group functions. Finally, this study will reveal how online groups develop and maintain regulated learning in CSCL.

Research Questions

This dissertation addresses the following questions:

1. How do students jointly regulate their learning in CSCL?
 - (a) What kinds of socially shared regulatory processes emerge in CSCL?
2. What is the group's main regulation pattern – socially shared regulation or other-regulation?

- (a) How do groups with different regulation patterns vary in their interaction?
- (b) Does socially shared regulation improve the quality of regulation and social interaction more than other-regulation?
- (c) How do students reflect on the group's main regulation pattern?

Significance

The potential utility of this study is to: 1) expand on the current knowledge of a group's socially shared regulation in CSCL and 2) compare socially shared regulation and other-regulation in terms of the quality of regulation and social interaction. This study will provide an in-depth understanding of socially shared regulation. In particular, this study will reveal how online groups develop and sustain collective regulation over time and what kinds of cognitive regulatory process occur in the emergence of socially shared regulation in CSCL. Moreover, this study will provide in-depth description of how two different group regulation patterns (socially shared regulation and other-regulation) emerge, change, and are sustained in CSCL. The results will provide educators with tangible and practical knowledge of online course design and implementation of online group discussion.

As background to this study, the theoretical background and applicable literature are discussed in Chapter 2. An in-depth discussion of the methodology for this study is presented in Chapter 3. Chapter 4 reviews the qualitative findings of the emergence of socially shared regulatory processes in CSCL while Chapter 5 reviews the qualitative and quantitative findings of three case study groups in terms of different group regulation

patterns. Chapter 6 summarizes the research findings, limitations, and educational significance of the study.

Chapter Two

Review of the Literature

This literature review provides an explanation of the reasons for this study using socially shared regulation based on the social constructionist framework.

Theoretical Framework: Social Constructionism

Social constructionist theory has been influenced in part by social cultural perspectives based on Dewey's (1963) and Vygotsky's (1978) theories of development (Nolen & Ward, 2008). Although the two perspectives view knowledge as developing within social contexts, they are distinct because a social constructionist perspective is influenced mainly by activity system theory (Greeno, Collins, & Resnick, 1996; Greeno, 2006) and community of practice theory (Lave & Wenger, 1991; Wenger, 1998).

Alternatively, Hadwin and Oshige (2011) articulated that a social constructionist theory has evolved heavily from Bronfenbrenner's (1994) ecological theory, noting that, unlike personal construct psychology which focuses on individual meaning-making processes, Bronfenbrenner's theory deeply focuses on social meaning-making processes.

Social constructionists do not study individuals' cognition, behavior, or motivation but focus on individuals' interaction in social systems (Volet, Vauras, & Salonen, 2009). Based on Greeno et al.'s (1996) situative theory, they assume that individuals are part of their environments but "the total (active system) is greater than the sum of individuals" (Nolen & Ward, 2008, p. 444). As such, they attempt to account for systems. In their view, the activity system includes individuals, materials, and, moreover, physical and social space where individuals participate in community practices.

A social constructionist approach provides a unique interpretation of collaborative learning. As Barron (2003) suggested, research on collaborative learning needs to reveal the influence of group members' interactions on the by-products of collective thinking and co-construction of understanding. In particular, this perspective defines learning as the acquisition of situated structured knowledge. I claim that this perspective explains the development of socially shared regulation in collaborative learning contexts. O'Donnell and O'Kelly (1994) expressed the idea that collaborative learning helps group members, but some groups work and learn more effectively than other groups due to different group dynamics and the quality of discourse generated by group members. This consideration leads to questions as to how group members' interaction influences the productivity of the group discussion and how different types of interactions result in different learning outcomes.

A social constructionist theory views learners in collaborative learning environments as developing co-constructed knowledge and, moreover, co-regulating their learning processes by giving and receiving feedback from each other. For example, Volet, Summers, and Thurman (2009) argued that individuals learn through participation in co-regulated learning environments. Their study examined two different types of the group's knowledge building in terms of content processing – group's meaning construction and simple knowledge acquisition. Additionally, they attempted to frame self-regulation socially. Thus, they compared individual regulation in collaborative learning groups and socially shared regulation as a whole group. They found that socially shared regulation is more effective than an individual member's self-regulation in a group

because socially regulated learning is related to both high level collective regulation and high level content understanding.

Online collaborative learning requires purposeful interaction so that learners involve self-regulated learning where learners need clear plans, strategies for achieving their goals, checks on their learning progress, as well as reflections at the individual level and group level (Lippone et al., 2003). Online group discussion needs to be assessed at the group level.

From social constructionist theory, groups co-construct motivation, share problem solving, and participate in collaborative learning within joint activity. As a result, they produce shared meaning and regulation. Their focus on joint activity situations leads them to concentrate on the processes of co-construction but is not limited to account for the development of mental representations of knowledge (Volet, Vauras & Salonen, 2009). Moreover, this perspective views the individual as part of a collective entity. For example, when three students discuss a socio-scientific topic in a science class, researchers operating from this perspective study the discourse or the students' dynamic interaction. As such, the focus of this perspective is not on the individual's mental representation but on their collective interaction and shared regulation of learning.

Social constructionist researchers attempt to understand the systems of meaning in which that individual participates (Hadwin & Oshige, 2011). In collaborative learning contexts, researchers need to take into account social interaction and social regulation. Socially shared regulation refers to the process by which students regulate their collective processes, such as shared goals and progress (Vauras, Iiskala, Kajamies, Kinnunen, & Lehtinen, 2003; Järvelä, Järvenoja, & Veermans, 2008; Järvelä, Volet, & Järvenoja,

2010) and shared knowledge (Greeno et al., 1998, 2006) as the desired product of collaborative learning. From this perspective, individual learners in a small group co-develop a collective regulatory process (Leinonen, Järvelä, & Lipponen, 2003; Hurme & Järvelä, 2005).

Social constructionist theorists studying self-regulated learning have tried to include the social nature in learning (Hadwin & Oshige, 2011). They postulate that socially shared regulation is a social phenomenon created and maintained through the active and ongoing process of shared goals, shared plans, shared monitoring, shared evaluation, and shared strategies. Similarly, Järvenoja and Järvelä (2009) noted that a group is a social entity co-constructing its collective engagement in joint learning activities.

Drawing on the work of Yowell and Smylie (1999), Hadwin and Oshige (2011) outlined how self-regulation initially develops in interpersonal interactions but it is “embedded within and across multiple layers of nested social systems” (p. 22). For example, in the microsystem, a student develops his or her knowledge and learning goals through interaction with a teacher. In the mesosystem, a student interacts with teachers, peers, and the school concurrently. Moreover, in the exosystem, a student is affected by the social norms and values of the larger societal context and pursues socially valued knowledge or goals.

In online group discussions, group work is done by the group as a whole through discoursemaking it impossible to separate the individual’s self-regulated learning processes from the group’s social regulation processes (Dillenbourg, 1999). For this

reason, the social constructionist framework is especially appropriate to investigate how an online group collectively regulates the learning processes of its group members.

Socially Shared Regulation

Social regulation in three self-regulated learning approaches

Self-regulated learning (SRL) occurs when students generate their own thoughts, feelings, and actions to achieve academic goals (Zimmerman, 1998). There are many different SRL models (Boekaerts & Niemivirta, 2000; Butler & Winne, 1995; Winne & Hadwin, 1998; Corno, 1993; Pintrich 2000; Zimmerman, 1989, 1990, 2000). According to Pintrich (2000), despite the difference in SRL models in terms of constructs and mechanisms, all of the models share a number of common assumptions. First, learners are viewed as active participants in their learning process. Second, learners are viewed as monitoring, controlling, and regulating their own cognition, motivation, and behavior. Third, learners set goals or standards that eventually regulate their learning process, particularly their cognition, motivation, and behavior. Fourth, self-regulatory activities are mediators between person, context, and eventual achievement.

Recently, increasing attention has focused on the social nature of self-regulated learning (Järvelä et al., 2010; Järvelä & Järvenoja, 2011; Vauras et al., 2003; Volet, Vauras, & Salonen, 2009). As mentioned above, all SRL models share common aspects. However, all SRL models provide different explanations of how social regulation occurs in collaborative learning contexts (Hadwin & Oshige, 2011; Järvelä et al., 2010; Volet, Vauras, & Salonen, 2009).

Previous research mainly focuses on an individual students' self-regulated learning within group activities (Fransen, Weinberger & Kirschner, 2013; Järvelä &

Hadwin, 2013). First, social cognitive perspectives mainly view self-regulated learning as individual processes. Therefore, social cognitive researchers argue that individual members' self-regulated learning, for example, his/her cognition, metacognition, motivation, and behavior, should be investigated in collaborative learning contexts (Järvelä & Hadwin, 2013).

Second, social cultural perspectives view social regulation in collaborative learning contexts as co-regulated learning, a transitional process in a learner's acquisition of SRL from a shared process with a more capable learner that leads to internalization (Hadwin & Oshige, 2011). To put it another way, social cultural perspectives generally stress a co-regulated learning process where a more advanced person assists a less advanced person in collaborative learning settings. Therefore, the goal of social cultural models is that an individual learner internalizes self-regulation through assistance from a more regulated other. During co-regulated learning, scaffolding and intersubjectivity are two essential processes. Scaffolding refers to a teacher's assistance that supports students' development of their own regulatory abilities (Kirschner et al., 2006). Intersubjectivity refers to a socially dynamic interaction between a teacher and students in which the teacher and students come to a shared understanding. Gradually, students take on the responsibility to regulate their own motivation, cognition, and behavior. Finally, students internalize regulatory skills and regulate their cognition, motivation, and behavior independently. They argue that the outcome of internalization and scaffolding can be studied at the individual level.

The more recent view of social regulation in collaborative learning environments derives from social constructionist perspectives (Hadwin & Oshige, 2011; Järvelä &

Hadwin, 2013). Social constructionists developed the notion of socially shared regulation, defined as multiple members' regulation of their collective learning by developing shared goals, shared plans, shared monitoring, and shared evaluation through mutual agreement (Hadwin & Oshige, 2011; Järvelä & Hadwin, 2013). They argue that socially shared regulation needs to be investigated because the focus on an individual member's self-regulated learning in group activities is not enough to reveal the group's regulated learning. Yet, limited literature has examined socially shared regulation; therefore, the current study is built on this new perspective. Socially shared regulation will be discussed in detail in the next section.

Socially shared regulation

Social constructionists developed the notion of socially shared regulation, where group members have equal responsibilities to regulate their learning process together (Hadwin & Oshige, 2011; Järvelä & Hadwin, 2013). In CSCL, individual students regulate three different features of their work across levels of self-, co-, and shared regulation. Among the three types of regulated learning, socially shared regulation is the most appropriate framework for this study because group level analysis is the most suitable approach in an online group discussion (Scardamalia & Bereiter, 2006; Stahl, 2003). Social constructionists use the term “socially shared regulation” to articulate the group's collective self-regulated learning (Hadwin & Oshige, 2011).

Socially shared regulation means that multiple group members make verbal contributions to the construction of knowledge by sharing their ideas, giving and receiving feedback, and finally regulating their learning (Hadwin & Oshige, 2011; Rogat & Linnenbrink-Garcia, 2011; Volet, Summers & Thurman, 2009). Socially shared

regulation is also called socially constructed self-regulated learning in collaborative groups (Järvelä & Järvenoja, 2011) or shared-regulation of collaborative peers (Vauras et al., 2003). In this study, socially shared regulation includes socially constructed self-regulated learning and shared-regulation.

Although social cognitive and social cultural models of SRL take into account social aspects to explain self-regulated learning, social constructionists attempt to understand social interaction and individual members' roles within social systems (Volet, Summers & Thurman, 2009). Social constructionists (e.g., Greeno et al., 1998) focus on accounting for the active system, including individuals, materials and, moreover, physical and social space where individuals participate in community practices. Similarly, Hadwin and Oshige (2011) claimed that self-regulation is inevitably understood within social systems and that social regulation should be studied within social interactions. Among several layers of social systems, they added the idea that the exosystem can best account for social aspects because individual actions are “embedded in collective society” (p. 22). For example, an individual student regulates his learning process while taking into account the cultural standards or norms. As such, this perspective suggests that individual action cannot be separate from the group's learning process. Thus, this study attempts to investigate the activities of individuals engaged in socially organized tasks.

Prior research (Rogat & Linnenbrink-Garcia, 2013) on socially shared regulation from this perspective has primarily focused on shared goals, shared plans, shared monitoring, shared evaluation, and engagement in face-to-face collaborative learning environments. Similarly, another study (Volet, Summer, & Thurman, 2009) investigated socially shared regulation by taking into account two aspects, social interaction as well as

content processing in face-to-face group activities. They found that socially shared regulation emerged with high level content processing as well as multiple group members' contribution to the construction of knowledge by sharing their ideas, giving and receiving feedback, and finally regulating their learning. Both of these studies attempted to study the emergence of socially shared regulation within face-to-face collaborative learning contexts. Further examination is needed as to whether the same forms of socially shared regulation emerge in CSCL contexts.

One issue in socially shared regulation is that social interaction in terms of who regulated learning has been neglected. There are a few studies that include both co-construction of knowledge and distributed regulation into their analysis. Volet and her colleagues (2009) analyzed socially shared regulation with two-dimensional analysis. They argued that content understanding as well as social interaction should be taken into account in the study of socially shared regulation. In this study, high level content processing refers to engagement in elaborating, interpreting, and reasoning, explaining in one's own words, or seeking help for understanding while low level content processing refers to clarification of basic facts. However, an analysis of content processing cannot account for socially shared regulation but only the co-construction of knowledge. Therefore, they adopted one more dimension, social interaction, into their analysis. They conceptualized socially shared regulation as high quality social interaction and high level co-construction of content knowledge.

Similarly, researchers realized that co-construction of knowledge and socially shared regulation should be distinguished because co-construction of knowledge is related to individual members' self-regulatory activities but does not really explain the

group's level of social interaction (Fransen, Weinberger & Kirschner, 2013; Järvelä & Hadwin, 2013). Järvelä and Hadwin (2013) argued that socially shared regulation is developed through distributed regulation. They stressed the development and sustainment of shared standards, shared goals, shared monitoring, and the reaching of the mutual agreement through negotiation. The literature points to the importance of an analysis of social interaction to understand the emergence of socially shared regulation. In conclusion, social interaction has been ignored by researchers and only a few research studies consider who is regulating the group's learning process.

Additional problems depend on the quality of socially shared regulation. Previous studies on socially shared regulation identified different quality levels of regulation (Rogat & Linnenbrink-Garcia, 2013; Volet, Summer, & Thurman, 2009). Volet and her colleagues examined how a high level of regulated learning occurred (Volet et al., 2009). They conceptualized multiple members' contribution and regulation as a group as high level socially shared regulation while individual member's self-regulation within a group as low level socially shared regulation or individual regulation. Interestingly, they found that socially shared regulation, where multiple members are constantly monitoring and regulating their joint activity, is the most effective mode of collective regulation. For example, when individual members non-defensively reacted to another's critical comment on their idea, their openness made the group's shared regulation possible. Moreover, the group moved toward creating space for negotiation. However, it was found that low quality regulation was related more to individual oriented regulation than distributed regulation among members because individual members constructed individual meaning of their group activities, resulting in low quality regulating.

A methodological issue needs to be addressed. Research methods for this approach involve observation of both individuals and the classroom community or small group, followed by interviews (Rogat & Linnenbrink-Garcia, 2013; Volet, Summer, & Thurman, 2009). Volet and her colleagues (2009) analyzed transcripts from video recordings, making episodes of group engagement the unit of analysis, and had students complete a self-report measure. They found that verbal interactions caused socially shared regulation in collaborative contexts, specifically, the recurrence of questions, tentativeness of explanations, and shared positive emotions played a role in motivating the group to advance to high-level socially shared regulation in collaborative contexts. Similarly, Vauras et al. (2003) studied socially shared regulation in peer-mediated learning. Through a case analysis, they discovered that just because students participated in group discussion, this did not guarantee that they regulated their cognition and motivation together. Rather, for successful socially shared regulation, effective collaboration, task-orientation, and social and cognitive competences are necessary. While such discourse analysis of transcripts has been used prevalently, Hadwin and Oshige (2011) suggested individual members' role within group activities as well as discourse analysis need to be analyzed in order to investigate socially shared regulation. They recommended that the study of socially shared regulation include not only discourse analysis but also network analysis.

As such, extant research provides clear evidence for the existence and value of socially shared regulation, especially in collaborative learning environments. In terms of methodology, researchers study the group as the unit of analysis, focusing on collective

interactions (Hadwin & Oshige, 2011). Also, in terms of research design, most of these studies have utilized content analysis to investigate group interactions.

Individual and social processes occur concurrently in a collaborative learning environment so they cannot be not separated (Volet, Summers & Thurman, 2009). However, each process occurs at different systemic levels. Additionally, each group constructs its own social dynamic. Thus, socially shared regulation in the current study was investigated by assessing each group member's contributions to the group and roles in the group, including the group's collective products (Järvenoja & Järvelä, 2009). Despite the plethora of literature addressing collaborative learning, little research has used the social constructionist lens to examine socially shared regulation processes among online learners. Thus, the current study investigated the emergence of socially shared regulation within the context of CSCL.

Online Group Discussion

Online group discussion as collaborative learning contexts

Online collaborative learning is viewed as the process of building productive collaborative interactions, leading to a new degree of understanding (Scardamalia & Bereiter, 2006; Stahl, 2003). In online collaborative learning contexts, although learners individually regulate their learning, they are involved with planning and monitoring their group's learning process collectively. For example, they brainstorm together, divide their tasks with one another, give and receive feedback, share different perspectives, criticize others' perspective, argue with each other, negotiate meaning, and pool results. During the discussion, individuals in the group are influenced by other members' comments, contributing to deep learning. Thus, learning in online collaborative learning contexts

heavily depends on group discourse and how that discourse process is situated (Scardamalia & Bereiter, 2006; Stahl, 2003; Bereiter, 2012).

Stahl (2003) claimed that the group level is appropriate to assess and understand group processes with technology. Similarly, Scardamalia and Bereiter (2006) argued that in CSCL, as a whole group, learners develop the community. Lave and Wenger's (1995) situated learning involves changes in the social practices and configuration of the community itself.

The group unit is significant particularly in discourse analysis of collaborative learning. Dillenbourg (1999) described cooperative work in which tasks are often divided up so that individuals actually work and build knowledge on an individual basis and then attempt to share the results. He differentiated collaborative learning from cooperative work by defining the former as the process in which the work is done by the group as a whole, such as in online group discussions. For this reason, online group discussion needs to be viewed as collaborative learning.

Socially shared regulation in online group discussion

Socially shared regulation in online group discussions has four assumptions for successful collaboration (Hadwin, Järvelä & Miller, 2011; Järvelä & Hadwin, 2013). First, multiple individuals develop shared goals because socially shared regulation is deliberate and goal directed. Second, multiple individuals involve metacognitive regulation. They monitor a current state compared with a goal and evaluate their products together. Third, multiple individuals regulate their behavior, cognition, and motivation. The aim of socially shared regulation is not shared knowledge construction, co-developing domain specific knowledge, but regulation of behavior, cognitive strategy, and motivation/affect.

Lastly, socially shared regulation is social. It is vital to investigate how individuals deal with a challenge or difficulty in the online group because this reveals the group's types of social interaction. In order to explore socially shared regulation, the group unit needs to be investigated.

Järvelä and Hadwin (2013) claimed that like face-to-face collaborative learning, three different types of regulated learning (e.g., SRL, Co-regulation, and Socially shared regulation) occur in the field of CSCL. In online group discussions, an individual member takes responsibility for his or her own learning. At the same time, one influences or is influenced by other group members since one can provide or receive assistance in the group. Multiple group members regulate their learning processes together by giving and receiving feedback and developing shared goals and shared strategies. For instance, the work is done by the group as a whole. Limited literature has examined a group's socially shared regulation in CSCL. For this reason, this study focuses on socially shared regulation.

Arvaja and her colleagues attempted to examine both individual and the group level's regulation in online group discussion (Arvaja, Salovaara, Häkkinen, & Järvelä, 2007). Their study, based on a social cultural framework, assumed that the group level analysis focused on the development of shared understanding. Thus, they analyzed transcripts of asynchronous online discussion, focusing on the negotiation process. Their main interest was to identify collaborative knowledge construction. As they noted, what still remained was to take into account other regulatory aspects such as combining cognitive, motivational, and behavioral group regulatory processes and group interaction.

Hmelo-Silver and Bromme (2007) noted that analysis of transcripts and individuals' statements are predominantly used in online group discussion. Järvelä and her colleagues (2008) also investigated students' engagement in online discussion. They used observation, interviews, content analysis, and questionnaires in order to account for the complex interaction of cognitive and motivational aspects of engagement. The situative framework makes the analysis of this study context-sensitive. Their key finding was that students in online learning can shape their engagement by choosing their role and contribution. Moreover, students are typically on-topic oriented in online learning. Once students decide to contribute to the discussion, they are task oriented and reflective in their postings. Also, this study found that collaborative interaction in online discussion fosters the gradual construction of shared meaning and group regulation.

Meanwhile, O'Donnell (2006) argued that methodology for the study should be selected based on the theoretical framework. Thus, the current study based on a social constructionist framework used a mixed method to account for online groups' collaborative learning processes.

Socially Shared - and Other-Regulation

The literature on self-regulated learning and social regulation conceptualizes three different modes of regulation in collaborative learning: self-, other-, and shared regulation (Vauras et al., 2003). Self-regulation is defined as a process in which an individual learner regulates his or her own learning by setting a goal, monitoring progress, and revising the plan. Other-regulation is defined as a process in which a more advanced person such as an instructor or a peer leads the group's discussion by setting goals, presenting questions, and giving feedback. Meanwhile, socially shared regulation is

defined as multiple members taking responsibility to post a number of messages, keep track of their learning processes, and develop the learning community online (Vauras et al., 2003).

As Guzdial and Turns (2000) noted, online group discussion can be successful when every member commits to the discussion by constantly posting a number of messages and extensive dialogues. In other words, the emergence of socially shared regulation in CSCL results in divergent contributions from each member and the construction of the learning community online. Also, equal participation as well as distributed participation is necessary for high quality regulation in online group discussion. Lastly, group members need to remain on-topic. Similarly, Lipponen, Rahikainen, Hakkarainen, and Palonen (2002) suggested that the quality of communication in online group discussion relies on the dense interaction among group members. Literature indicates that all group members need to continually participate in online group discussion in order to generate high quality discourse and regulation. However, socially shared regulatory processes by providing questions or suggestions or monitoring each other's ideas do not automatically occur in CSCL (Hadwin & Oshige, 2011; Järvelä & Hadwin, 2013; Rogat & Linnenbrink-Garcia, 2011, 2013).

Although three different modes of regulation, self-, other-, and shared regulation (Vauras et al., 2003), are presented in collaborative learning, the literature on socially shared regulation identifies two types of social regulation: socially shared regulation and other-regulation (Hadwin & Oshige, 2011; Järvelä & Hadwin, 2013; Rogat & Linnenbrink-Garcia, 2011, 2013). The reason for excluding self-regulation is that an

analysis of socially shared regulation takes into account only group level activities and interactions.

One problem that exists is in the definition of other-regulation. Literature on socially shared regulation conceptualizes other-regulation as a dominant member's temporary facilitation of the group's learning by taking an instructive role to guide the joint activity and others' understanding in CSCL (Hadwin & Oshige, 2011; Järvelä & Hadwin, 2013; Rogat & Linnenbrink-Garcia, 2013). This conceptualization differs from a previous notion of other-regulation (Hadwin, Wozney, & Pantin, 2005; Kirschner et al., 2006), in which a more knowledgeable person exists and guides the rest of the group in teacher-student interaction contexts from a social cultural perspective. However, other-regulation in student-student interaction contexts occurs spontaneously without a clearly assigned role of a leader or facilitator. Thus, further examination is needed as to whether other-regulation in the socially shared regulation model from a social constructionist perspective (e.g., Hadwin & Oshige, 2011) is different from other-regulation in the co-regulated learning model from a social cultural perspective (e.g., Hadwin et al., 2005).

The emergence of other-regulation is related to low quality social interaction and discourse (Rogat & Linnenbrink-Garcia, 2013). When one or two members dominantly leads or highly regulates online group discussion, this centralized regulation prohibits high quality discourse and high quality regulation (Lippone et al., 2002; Nurmela et al., 1999; Scardamalia et al., 1994). In other words, other-regulation results in centralized discussion where some vital members lead the online discussion while some members are isolated.

Within the two group regulation models, a number of outstanding issues remain to be addressed, including the nature of these two group regulation patterns and differences in social interaction and the quality of collective regulation. Previous studies (Hadwin & Oshige, 2011; Järvelä & Hadwin, 2013; Rogat & Linnenbrink-Garcia, 2013) support the idea that socially shared regulation produces the highest quality regulation in CSCL because it is derived from multiple group members' commitment, dynamic social interaction, and high quality regulation. However, we have little knowledge of socially shared regulation and other-regulation in CSCL in a socially shared regulation framework. Little is known about their development and maintenance, the difference in social dynamics, or the quality of regulation, resulting in the need for further empirical evidence.

Chapter Three

Method

Participants

The sample consisted of 13 online groups made up of a total of 59 undergraduate students who completed the prerequisite course, General Psychology 101. These students were enrolled in the Educational Psychology course at a large public university in the mid-Atlantic region during the fall of 2012. They participated in synchronous online group discussions after agreeing to have their online data be used for research purposes (i.e., IRB approval). After collecting their consent forms, the students were assigned to 13 groups.

To answer research question 1 (How do students jointly regulate their learning in CSCL?), the 59 participants' data were analyzed. For research question 2 (What is the group's main regulation pattern – socially shared regulation or other-regulation? (a) How do groups with different regulation patterns vary in their interaction? (b) Does socially shared regulation improve the quality of regulation and social interaction than other-regulation?), three online groups (n=14) were selected for analysis. A detailed rationale for their selection is found in a later section.

The 59 participants were selected from three sections of an Educational Psychology course taught by three instructors, including one professor and two part-time lecturers. Of the 12 sections of the class, these three instructors voluntarily participated in the study. Class size of the three sections ranged from 15 to 35 students. Typical assessments for this course were mid-term and final exams and project papers.

Participation in online group discussions was a course requirement, but the decision to have one's data included in the research was voluntary.

Limitations in choosing participants from three different instructors need to be discussed because differences among the three instructors may have influenced the study's results (Table 1).

Table 1

Instructors' Descriptive Information

Instructor	Career	Teaching Year(s)	Race/Ethnicity	Language	Group
Professor A	Professor	7	Caucasian American	English	Group 1 - Group 5
Instructor B	Doctoral Student	7	Asian American	Korean, English as a Second Language	Group 6 - Group 10
Instructor C	Doctoral Student	1	Taiwanese	Chinese, English as a Second Language	Group 11 - Group 13

First, the instructors' race and language varied. Professor A was a Caucasian American and native English speaker. For two of the instructors, English was their second language. I am one of the instructors.

Second, their teaching experience differed. Professor A and instructor B had seven years of teaching experience in the educational psychology course at the university while instructor C had only one year of teaching experience.

Third, the start of online group discussion varied from the third week of the semester to the eighth week of the semester, depending on the instructors. Professor A's five groups began online discussion sessions during the third week of the semester, where she matched the task topic of discussion to her lesson. Instructor B's five groups began online discussions in the seventh week of the semester while instructor C's three groups started in the eighth week of the semester.

Fourth, the contribution of the three instructors to the study varied. Professor A participated in the study's design and gave detailed instructions for her students. Similar to professor A, instructor B was a principal investigator and provided detailed instructions. Instructor B visited instructor C's class and gave oral and written instructions to the participants while instructor C did not mention this study in class. Lastly, group formation varied by instructor. In professor A's class, the 24 students were assigned into five groups based on each student's major and interest. Instructor B purposively assigned five of her students who did not sign the consent form into one group (to exclude their online log files from analysis) and randomly assigned the other 20 students into four groups. Instructor C divided her 15 students into three groups, assigning students who did not have a chance to talk to each other in class into a group.

The instructors' differences in assigning groups may have influenced the group members' interaction and the quality of educational psychology knowledge taught.

These 59 students participated in online group discussions once a week for three consecutive weeks. Participants were preservice teachers, majoring in English, history, music, dance, biology, nursing science, psychology, and pre-k through high school certification. Previous teaching experience and the number of education-related courses taken were not taken into account in forming the groups. The participants were sophomores through graduate students and had average knowledge of psychology from the prerequisite course. They were heterogeneous in terms of gender, major, and race/ethnicity.

Group Formation

Students who signed a consent form as voluntarily agreement to participate in the study were assigned into groups and worked on three collaborative learning tasks while participating in synchronous online group discussions. The same group members worked together on all group discussions. Each group held discussions in a chat room in the Sakai website and had access to its own chat room but not to other groups' online chat rooms. Each group scheduled time for their online group discussion and informed the investigator and instructor. Group members were expected to post ideas, positions, reasons, evidence, and feedback to other members' comments in the chat room for one hour each week.

Participants were not assigned any specific role (i.e., facilitator, recorder, materials manager, and presenter). Instead, students were asked to plan and assign roles

before online group discussions began. Thus, the group decided on its own what kind of roles each member took to organize the group work.

Online Learning Environment and Tools

In this study, students worked on three different collaborative learning tasks via the Sakai website supported by the university. The Sakai website is a web-based learning management system. Course instructors can create a course website for their class and add or manage tools such as syllabi, announcements, resources, tests and quizzes, the chat room, assignments, and grades. For example, an instructor can post the course syllabus or test results or have students synchronously or asynchronously communicate in the Sakai course website. Thus, it is possible to use the Sakai website for hybrid, online, and offline courses.

In this study, one professor and two part time instructors integrated the Sakai website into their instruction. All three posted their syllabi and announcements in Sakai and had their students participate in online discussions in the chat room in Sakai. In the chat room, students are able to view all posted messages and type messages. The chat room in Sakai is a synchronous online group discussion environment while maintaining all archived messages. The use of online chat creates an environment where students can negotiate, argue, and collaborate. Compared to asynchronous online environments, synchronous environments are more advantageous for collaborative learning because members easily share real time feedback, promoting student engagement (Moore, 2002; Ko & Rossen, 2001).

Each session lasted one hour, including online chatting, completing a summary report, and completing surveys. Three sessions were held once a week for three

consecutive weeks. There was one exception due to extreme weather conditions. Students spent a total of three hours participating in the study. Group members scheduled their discussion time. When any member needed to reschedule, the group did so autonomously. When there were time conflicts, the group rescheduled within a month.

Group Selection

Data from the 13 groups (n=59) were analyzed with a coding scheme derived from an earlier study of other-regulation (Rogat & Adams-Wiggins, accepted). The primary aim of this study was to identify the occurrence of socially shared regulatory processes. A secondary aim was to compare socially shared regulation to other-regulation in CSCL. Therefore, I attempted to categorize each group's main regulation type as either socially shared regulation or other-regulation. My criteria of categorization included whether a) the ratio of posting text-messages was equally distributed among members; b) all members were responsive or not; and c) the discourse was based on one dominant member's idea. I counted the frequency of interaction, focusing on not aspects of regulation rather than aspects of domain knowledge construction. However, it was difficult to categorize the groups into one of two types of regulation because each group exhibited both instances of socially shared regulation and other-regulation. Socially shared regulation varies across groups in terms of quality and frequency and even a moderate quality of socially shared regulation group maintained other-regulation as well as socially shared regulation across tasks (Rogat & Linnenbrink-Garcia, 2013). I also view socially shared regulation and other-regulation on a continuum. Therefore, in this study, a group categorized as socially shared regulation meant that the group's major regulation type was socially shared regulation but still included several instances of

other-regulation. As such, frequency counts were a limitation to this particular study because the length of log files was varied with tasks and groups. Thus, a more holistic approach in defining a group's regulation pattern was used which considered the frequency of instances, equally distributed participation, and responsiveness/ignorance.

Table 2

Group's Main Regulation Pattern

Group	Group's Main Regulation Pattern
1	Mixed regulation
2	Socially Shared Regulation
3	Socially Shared Regulation
4	Socially Shared Regulation
5	Socially Shared Regulation
6	Socially Shared Regulation
7	Socially Shared Regulation
8	Socially Shared Regulation
9	Socially Shared Regulation
10	Socially Shared Regulation
11	Other-Regulation
12	Mixed Regulation
13	Other-Regulation

Table 2 illustrates the categorization of main regulation pattern of each group based on these criteria. Nine groups were identified as socially shared regulation groups

and two as other-regulation groups. Two other groups did not fit either type, so they were categorized as mixed groups.

The main feature of the nine socially shared regulation groups is that most of the instances observed were of socially shared regulation. Among these nine groups, group 10 was selected for further analysis because it was viewed as a representative group in that all members participated equally, the quality of regulation was high, and all members participated in the three sessions.

The two groups (groups 1 and 12) identified as mixed were categorized as such not because half of their instances were socially shared regulation and the rest were instances of other-regulation. Instead, they were categorized as mixed groups because it was difficult to categorize each group into either socially shared regulation or other-regulation. These two groups were analyzed further in depth. Group 12's discourse was of high quality and its regulation was mostly socially shared regulation since all members actively participated in discussions. However, the regulation of Sharon, the dominant member, influenced the entire group's learning processes.

While group 12 appeared to have socially shared regulation, a dominant member existed. Therefore, group 12 was identified as a mixed group. Meanwhile, group 1 changed their main regulation type over time, from other-regulation in the first session to mixed regulation in the second session and then to socially shared regulation in the third session. Therefore, I viewed it as a mixed group. Group 1 was selected as the representative mixed group because its unique feature was the change in regulation type.

The two other-regulation groups had one or two dominant members who instructed other members or regulated the group's learning processes. In addition, other-

regulation instances were detected. Between groups 11 and 13, group 13 was chosen as the representative other-regulation group since Keve, the dominant member, directed and taught the other members. I assumed that further analysis of this group would disclose how other-regulation regulated an online group's learning processes.

Table 3

Descriptive Information of the Three Groups

Group	Regulation Type	Instructor	Name	Gender	Grade
Group 1 (MRG)	Socially Shared & Other-Regulation	Professor A	Kate	Female	B
			Lily	Female	A
			Abby	Female	A
			Merrill	Male	A+
			Louise	Female	D
Group 10 (SSRG)	Socially Shared Regulation	Instructor B	Camila	Female	B
			Jimmy	Male	A
			Gina	Female	A
			Lucio	Male	B
Group 13 (ORG)	Other-Regulation	Instructor C	Emily	Female	B+
			Tracy	Female	B
			Nataly	Female	B
			Alena	Female	B+
			Keve	Male	A

Note. MRG= Mixed Regulation Group. SSRG= Socially Shared Regulation Group. ORG= Other-Regulation Group. Pseudonyms were used. Grades were each individual's final grade from the course, reported by the instructors.

Three groups were selected to represent the three regulation types (socially shared, other, and mixed regulation) observed in the 13 groups in order to investigate how different regulation types influence an online group's learning and group interaction in CSCL (Table 3). The quality of discourse was beyond the purpose of this study. Also, the guiding questions were designed to promote high quality discourse of content understanding. As a result, quality differences between different regulation types were not the focus in the second analysis, but rather on the development and sustainment of each regulation type over time in CSCL by providing a rich description of how the final task solution was reached through discourse.

Learning Tasks

Students were presented with three tasks regarding learning and instruction and course-related content. Each learning task consisted of a course-related task, guiding questions to support the completion of the task, and a group summary report. The three tasks were selected to fit into the course schedules since the textbook introduced the three theories in order. However, each instructor had, to some extent, different course schedules so that each group began their online chats at different times in the semester. Specifically, five groups taught by one professor began their online discussions in the third week of class, five groups taught by a part time instructor began in the fifth week, and three groups taught by another part time instructor began in the eighth week. The order of the three tasks was the same across the groups.

I designed the three tasks. The purpose of the tasks was to apply educational psychology principles learned in class to the tasks. In particular, for this study, I aimed to generate the group's socially shared regulation on the three tasks in CSCL. The focus was

to discover the development and maintenance of socially shared regulation. It was expected that progress in regulation and quality of response would be observed by the third task. Task differences that influenced regulation and discourse quality were not taken into consideration since they were beyond the scope of this study.

During each session, each group worked on one task. Table 4 illustrates the purpose of each task. The tasks were designed so that students could practice the course content. For example, students thought about how to interpret different learning and teaching strategies and how to apply their educational psychology course knowledge to a teaching situation they may encounter in the future.

Table 4

Task Objectives

Task	Course concepts	Objectives
1	Social Cognitive Theory	Identify a student's learning needs & Elaborate how to advance his learning
2	Cognitive Views of Learning	Analyze academic strategies
3	Social Constructivist Theory	Analyze a student's artifacts & Develop instructional design

The guiding questions were designed to promote socially shared regulation. Just because students share ideas in online group discussion environments does not guarantee that they share their regulation (Järvelä & Hadwin, 2013). Students in collaborative learning environments tend to fail to view a problem from various angles and, instead, just provide their prompt suggestion and boil down to a solution. Task prompts and guiding questions need to support different aspects of socially shared regulation and have

a clear target to scaffold such as fostering planning, monitoring, and evaluation (Azevedo & Hadwin, 2005). Thus, I designed specific guiding questions to promote planning, goal setting, role assignment, content monitoring, task evaluation, and content evaluation regulatory process. Table 5 presents the intention of the questions for each phase of regulation. The guiding questions in Table 5 were used in all three tasks.

Table 5

Targeted Regulatory Process of Guiding Questions

Targeted Regulatory Process	Guiding Questions (Task 1, 2 and 3)
Planning & Goal Setting, Role Assignment	Before starting the task, plan your online group discussion such as: What are individual goals and group goals and how to assign each member's role? (e.g., Who will manage the time? Who will write and/or submit the group summary report?)
Content Monitoring	Did your group use all appropriate and related concepts from asocial cognitive theory (or a cognitive theory or social constructivist theory) to answer the questions?
Task Evaluation	Did your group answer all questions?
Content Evaluation	Did your group meet your initial plan or goals? To what extent does your group understand the central concepts of social cognitive theory (or a cognitive theory or social constructivist theory)?

The synchronous online discussion setting in this study was designed for members to solely rely on each other without the presence of an instructor or facilitator. The detailed guiding questions in Table 5 fostered the emergence of socially shared regulation in CSCL since they facilitated socially shared regulation.

Task 1 was taken and revised from Ormrod and McGuire (2006) (see Appendix A). The purpose of the first task was to find a way to advance students' learning after reading a scenario. First, students identified the main reason of a student's screaming behavior using social cognitive theory. Next, students discussed how to deal with maladaptive behaviors in the classroom. Apart from the guiding questions to promote socially shared regulation, I provided three more guiding questions to help students apply social cognitive theory to the first task: 1) How has Tyler acquired the screaming behavior? Which course concepts are used to answer this question? 2) What advantages and/or challenges are there in placing Tyler in Allie Schenk's classroom for most or all of the school day from a social cognitive perspective? 3) If you were Tyler's teacher, what strategies grounded in a social cognitive theory might you use to advance his learning in the mainstream classroom?

Task 2 was selected and revised from Chinn (2012) (see Appendix B). The goal of the second task was to analyze four different learning strategies used by fifth grade students. This task made students account for the strengths and weaknesses of each strategy from a cognitive view of learning. They decided which strategy was best and which was the worst, explaining the criteria of their ranking by identify the employed memory strategies that each interviewee used. In addition to the four guiding questions, I provided five more guiding questions for students to apply a cognitive theory to their

ranking: 1) Evaluate the quality of the students' employed learning strategies, 2) How would you rank the quality of these students' strategies? 3) What criteria did your group use for ranking? Why were these criteria selected? Which course concepts played a role in your discussion? 4) What might explain differences in the students' employed strategies? Consider student characteristics as well as the role of the task and instruction, and 5) Describe what improved strategy use would look like.

Task 3 was selected from Ormrod (2003), (see Appendix C). The intent of the third task was to analyze a student's artifacts and to develop an instructional design. The group investigated the development of a student's writing from rough draft to the final draft. The group discussed how they made the student's writing more socially constructed and presented the concepts of scaffolding, modeling, and peer feedback. Similar to tasks 1 and 2, two guiding questions were asked: 1) What about this writing assignment and this process of writing is socially constructed? Try to include many terms and principles from this theory. (a) In what ways has the teacher scaffolded the writing tasks? (b) What are the advantages of breaking a creative writing task into such steps? In identifying the advantages, your group can also draw on what you have learned about cognition and memory (i.e., information processing theory). (c) What cultural tools are being taught within this assignment? 2) How could you make this writing task and lesson even more socially constructivist? These two guiding questions facilitated students' practice and task solution. Overall, the purpose of the three tasks was to apply educational psychology theories into the tasks and to develop their content knowledge through discussion in CSCL. The four guiding questions promoted socially shared regulation in CSCL.

Although each task had a broad task goal, I provided several additional guiding questions for educational psychology content understanding.

Data Collection

Procedure

Before the beginning of the semester, I met with the instructors who taught the educational psychology course and explained the study's purpose and procedures. I collaborated with the course instructors to match their course schedules and content since the three classes began online group discussions at different points in time.

Once the semester started, I visited each class and explained the study to the students and collected their consent forms. For the class I taught, a third party came into my class to collect the consent forms in order to avoid coercion of my students. One professor and one instructor assigned their students into groups. For my class, the third party randomly assigned my students into groups. I did not know who participated in the study until the semester was over.

Each group participated in three synchronous online group discussions, each lasting one hour. After reading an authentic task and guiding questions, the participants engaged in online group discussions by posting their opinions, claims, questions, and suggestions. Participants were required to engage in all three online group tasks for three consecutive weeks.

The start time of the 13 groups ($n=59$) differed because the three instructors decided the start point to fit their schedule. Ten groups ($n=44$) from two sections taught by a professor and a part time instructor matched the three tasks by the content of the course. For instance, one group learned about social cognitive theory in class and then

discussed task 1, matching the content of the course within a week. Of the 13 groups, three groups (n=15) learned all three theories in class before beginning online group discussions.

To answer the second research question on how different regulation types influence an online group's learning and group interaction, I selected three representative groups for further analysis. Groups 10 (socially shared regulation), 1 (mixed regulation), and 13 (other-regulation) were selected and renamed Socially Shared Regulation Group (SSRG), Mixed Regulation Group (MRG) and Other-Regulation Group (ORG) respectively, and had their first online group discussion session on the fifth, third, and eighth week of the semester, respectively.

In addition to answering the guiding questions, participants were asked to submit a self-report questionnaire (see Appendix D) and group summary report. The self-report questionnaire was collected from each participant at the end of each session. For the group summary, each group posted a summary of their discussion in the chat room at the end of each session. Table 6 illustrates the data collection schedule.

Table 6

Data Collection Schedule

Week	Online group discussion and <i>Self-report questionnaire</i>
Week 1	Consent forms
Week2	Online group discussion (Task1) & Self-report questionnaire
Week3	Online group discussion (Task2) & Self-report questionnaire
Week4	Online group discussion (Task3) & Self-report questionnaire

Log Files

Data included synchronous online log files from the Sakai chat room. This study mainly used log files of archived online chats to examine the emergence of regulated learning in CSCL. Group discourse can reveal the socially shared cognition and the evolution of idea units as well as individual roles in the group dynamic (Hadwin & Oshige, 2011). Within computer-based learning environments, online trace methodologies such as log files can be used as evidence of various types of social regulation processes (Greene & Azevedo, 2009). Thus, I used log files from the online chat rooms as a trace methodology to provide evidence of socially shared regulation.

Measure

Content analysis

Log files are useful for capturing the development of regulatory processes (Greene & Azevedo, 2009). Therefore, I expected that a content analysis of the log files would identify students' actual group-level regulation strategies in CSCL and reveal the emergence of socially shared regulation. Consistent with a social constructionist framework, the content analysis focused on identifying socially shared regulatory processes and each group's main regulation pattern across the three sessions.

Coding scheme 1: Socially shared regulatory process

To answer the first research question, "How do students jointly regulate their learning in CSCL? (a) What kinds of socially shared regulatory processes emerge in CSCL?", I expected the content analysis to disclose the kinds of socially shared regulatory processes observed in CSCL. To do this, I developed a coding scheme to identify the kinds of socially shared regulatory processes observed (see Appendix E).

There were several steps to reach the final coding scheme 1. First, the initial coding scheme was developed prior to data collection and was derived from earlier studies of computer supported inquiry learning (Hakkarainen, Paavola, & Lipponen, 2004; Leinonen et al., 2003) and socially shared regulation in collaborative groups (Rogat & Linnenbrink-Garcia, 2011). The coding scheme reflects a process-oriented focus to capture changes in and during the social regulation process.

Second, the final coding scheme (see Appendix E) was developed through the revision and in consultation with two educational psychology professors. Once the data were collected, I revised the coding scheme, listing the socially shared regulatory processes and their definitions. The categorization of socially shared regulation focused on what kinds of regulatory processes occurred in CSCL. I coded one group's data as a sample and revised the initial coding scheme based on what groups' regulated learning process was observed. Then, I read and reread the 13 group's archived log files across three tasks and eventually came to the final coding scheme. In addition, my categorization reflects the targets of each guiding question. Since the guiding questions were oriented toward promoting planning, goal setting, role assignment, content monitoring, task evaluation, and content evaluation, the final coding scheme included all of these aspects. In addition, two more codes were included — scheduling and task monitoring — because they were observed in CSCL and were related to the group's regulation. Scheduling and task monitoring revealed how the group regulated, set its goals or standards, exchanged ideas, and finally reached mutual agreement.

Coding scheme 2: High and low quality of regulation

I developed the coding scheme 2 of high or low quality of regulation (see Appendix F). I defined the quality of regulation for the first two research questions. I attempted to identify the quality of each regulatory process to provide a rich description.

Rogat and Linnenbrink-Garcia (2013) argued that in order to understand socially shared regulatory processes, quality variation needs to be taken into account in each regulatory process. They identified five quality variations from high, moderate-high, moderate, moderate-low to low in socially shared regulation. Similarly, Volet, Summers and Thurman (2009) attempted to account for the quality difference in group discussion and their quality variation, where the high and low levels were based on the level of content processing. A previous study (Volet, Summers & Thurman, 2009) found high quality regulation related to content understanding through questioning and expressing tentativeness.

However, quality variation in socially shared regulation in previous study (Rogat & Linnenbrink-Garcia, 2013; Volet, Summers & Thurman, 2009) was drawn from data from face-to-face group work. Due to a lack of empirical evidence on online group discussion, I examined the groups' regulatory processes, mainly focusing on online collaborative learning environments. I attempted to extend previous knowledge on the quality of socially shared regulation to provide in depth understanding of how online groups regulate their learning in CSCL and how socially shared regulation emerges in CSCL. Rogat and Linnenbrink-Garcia (2013) argued that the quality of each regulatory process is independently considered and, at the same time, the interrelationship between each regulatory process needs to be accounted for.

I defined high quality regulation as social interaction and group discussion resulting in deep understanding of the given theory. Meanwhile, I viewed low quality regulation to be related to answering the guiding questions without checking the accuracy of the response and superficially agreeing to members' responses.

Coding scheme 3: Regulation pattern

For research question 2, "What is the group's main regulation pattern — socially shared regulation or other-regulation?" I needed to identify whether each group's main regulation pattern was socially shared regulation or other-regulation. To do this, I used the coding scheme for regulation pattern (see Appendix G). My categorization between socially shared regulation and other-regulation was generated from a review of the research literature (Hadwin & Oshige, 2011; Salonen, Vauras, & Efklides, 2005; Vauras et al., 2003) that defined each construct and identified the role of each construct in collaborative learning. Particularly, Hadwin and Oshige (2011) and Rogat and Linnenbrink-Garcia (2013) defined socially shared regulation as a process in which members set goals or standards through mutual agreement and regulate their learning process mutually through planning, monitoring, and evaluation of the goal attainment while other-regulation was seen as a process in which an individual member regulates the group's learning process by instruction and guidance. In conclusion, previous studies (Hadwin & Oshige, 2011; Salonen et al., 2005; Vauras et al., 2003) primarily focused on who regulated the learning process. In this current study, I also focused on who was regulating the group's discussion and identified the group's main regulation pattern. In conclusion, the coding scheme 3 of regulation pattern included socially shared regulation and other-regulation.

Self-report questionnaires

The self-report questionnaires were as intended to measure the socially shared regulation construct by revealing the individual member's personal interpretations of online collaborative work and, moreover, the online groups' socially shared regulation. The purpose of the questionnaire was to identify whether the group's main regulation pattern was socially shared regulation or other-regulation. (see Appendix A).

First, *the Perceptions of the Quality of Group Interaction* instrument included five items, specifically, four Likert scale items and one open-ended question. This scale was adapted from scales developed by a motivation research group at the University of Michigan (Hruda, Linnenbrink, Haydel, Paris & Maehr, 1999; Kempler, Linnenbrink, Zusho, & Maehr, 2002; Maehr & Pintrich, 2001). Each individual was asked to state their level of agreement on 4 items using a 5-point Likert scale (5=Strongly Agree, 1=Strongly Disagree). *The Perceptions of the Quality of Group Interaction* scale measured an individual member perception of how well the group regulated their learning collaboratively ($\alpha = .97$). An open-ended question (What is the main challenge your group encountered on this task?) was included to allow students to express their intimate understanding of online group interaction.

Second, *the Quality of Socially Shared Regulation scale* assessed how individuals perceive the group's socially shared regulation by asking questions about the group's planning, monitoring, and group-checking. This scale was adapted from the *Motivated Strategies for Learning Questionnaire* (Pintrich, Smith, Garcia, & McKeachie, 1993), measuring the quality of socially shared regulation. Each individual was asked to state their level of agreement on 4 items using a 5-point Likert scale (5=Strongly Agree,

1=Strongly Disagree). A “5” indicates “strongly agree” where as a “1” indicates “strongly disagree”. The 4 items (item 5 to item 8 on the self-reported questionnaire) measured an individual member’s perception of how well the group regulated their learning collaboratively ($\alpha = .97$).

Third, the *Social Loafing* scale, referring to group members’ tendency to lessen their effort in the collaborative learning, included seven statements which asked students to state their level of agreement on 7 items using a 5-point Likert scale (5=Strongly Agree, 1=Strongly Disagree). The Social Loafing scale was adapted from a scale developed by a motivation research group at the University of Michigan (Blazevski, McKendrich, & Hruda, 2002; Hruda et al., 1999; Maehr & Pintrich, 2001). In contrast to the above two scales, a “1” indicates “strongly agree” where as a “5” indicates “strongly disagree”. The 7 items measured an individual member’s perception of how much he/she relied on other group members in CSCL ($\alpha = .95$).

Quantitative and Qualitative Analytic Procedures

Reliability analysis procedures

Reliability refers to the degree to which the scores on given tests are “precise, consistent and replicable” (p. 15) and the degree to which scores are free of random error (Dimitrov, 2009). When the accuracy and consistency of scores on a given test are high, reliability is interpreted to be high. There are several reliability analyses such as internal consistency reliability, test-retest reliability, criterion-referenced reliability and inter-rater reliability. For this study, I tested internal consistency reliability.

Internal consistency reliability indicates the average correlation among the items on a test. I estimated Cronbach’s coefficient alpha to test how consistently students

performed on items within the questionnaires. Each item was scored on a 5-point Likert scale on the self-reported questionnaires. Cronbach's coefficient alpha for three questionnaires was estimated. Cronbach's alpha was $> .85$ for the three questionnaires, indicating that the self-report questionnaires were reliable in that the items on each questionnaire (the four items on the *Perceptions of Quality of Group Interaction* questionnaire, the four items on the *Quality of Socially Shared Regulation* questionnaire, and the seven items on the *Social Loafing* questionnaire) measured the same latent construct since a Cronbach alpha $> .85$ was interpreted as excellent (George & Mallery, 2003).

Social network analysis procedures

Social Network Analysis (SNA) examined whether two different types of socially shared regulation groups (socially shared regulation group vs. other-regulation group) emerged. SNA is generally used to reveal quantitative group interaction patterns by showing the number of interaction between members, the amount of mutual feedback, and the role of a member such that of a facilitator or isolated member within a group (Scott et al., 2005). SNA in socially shared regulation research is a new approach. I expected the results to reveal the social interaction pattern and existence of a dominant contributor in groups A, B, and C, leading to determine each group's main regulation type.

Specifically, I used the Pajek program for SNA to generate measures of density and centrality. I defined density as the ratio of the number of connections between members in each group over the total number of possible connections between all pairs of members (Lowes, Lin, & Wang, 2006). A density of 100% means that every member in

the group perfectly interacted with everyone else. I expected density to illustrate the social interaction patterns in groups A, B, and C.

Centrality was measured based on the number of comments and the sending and receiving of feedback within the group. Centrality detected the presence of a dominant member in each group. I expected the analysis of centrality to reveal whether the group members' contribution was equal or relied on one dominant member.

Content analysis procedures

The first step in content analysis was to analyze the data to identify the emergence of socially shared regulatory processes, providing a rich description and comparing it to that of face-to-face collaboration with coding scheme 1 (see Appendix E). Content analysis of the log files of six groups (groups 1, 2, 10, 11, 12, and 13) was conducted with the Dedoose program, a web-based qualitative research data analysis program. The rest of the groups were coded by hand.

My coding unit of analysis was at the individual level. I coded a single turn of an individual member who posted a message in the chat room. I coded a single instance of a socially shared regulatory process as one coding segment. However, if an individual member divided one sentence into two or three postings, the entire posting was viewed as one coding segment. Also, if one member posted two sentences in one posting, I viewed them as two coding segments. Two raters (a professor and I) coded 12% of the log files. Inter-rater reliability was .65. We eventually came to agreement on all codes through discussion.

The second step was to identify whether regulation was socially shared regulation or other-regulation. I used coding scheme 2 (see Appendix G) to identify the regulation

pattern of each instance. The unit of analysis was at the group level, particularly at the episodic level of a short exchange of discourse. Unlike the first step, a single episode where multiple members discussed one issue or one topic was coded as a coding segment. Episode length ranged from a single statement to a short exchange of discourse. For example, a single episode included instances of suggestions, questions, task responses, feedback on task responses, and agreement or disagreement while several members discussed one topic. Two raters (a professor and I) coded 12% of the log files collaboratively. Agreement on all codes was reached through discussion.

The third step was to analyze the quality of the regulatory process with coding scheme 2 (see Appendix F). For research question 1, I analyzed each regulatory process to determine the quality of each regulatory process. Similar to the second step, the unit of analysis was at the group level. I viewed a single episode of as one coding segment. I read a short exchange of discourse and determined whether the regulation of the episode was high quality or low quality. I coded the quality of regulation collaboratively with a professor, reaching mutual agreement through discussion.

The fourth step was to determine the group's main regulation pattern. For research question 2, I needed to identify whether each group's main regulation pattern was socially shared regulation or other-regulation. I read and re-read the online discussions of the 13 groups from the first session to the third session. I then determined the main regulation pattern of the group using coding scheme 3 (see Appendix G).

The focus of analysis was on group interaction, representing two different patterns of regulation — socially shared regulation and other-regulation. In particular, how multiple group members made verbal contributions was analyzed. The unit of analysis

was at the group level. Consecutive postings on one topic were coded once. I holistically accounted for each group's interaction by taking into account the SNA results, the quantitative analysis, as well as the content analysis to determine each group's main regulation type.

The fifth step of content analysis was to analyze the quality of regulation in the three selected groups (groups 1, 10, and 13). The purpose of this step was not to rank the groups in terms of which pattern was superior, but rather, to reveal the development and maintenance of each group's socially shared regulation or other-regulation. I holistically analyzed data from the log files, group summaries, and surveys. The unit of analysis was at the group level. I found two group regulation pattern (socially shared regulation and other-regulation) and one transition group from other-regulation to socially shared regulation over time.

Chapter Four

Results and Preliminary Discussion on Socially Shared Regulation in CSCL

Log files from synchronous online group discussions were qualitatively analyzed to determine how students jointly regulated their learning in CSCL and what kinds of socially shared regulatory processes occurred in CSCL (research question 1).

This chapter focused on the occurrence of socially shared regulatory processes. I analyzed short exchanges of conversation and coded particular joint regulatory processes that took place. I identified seven socially shared regulatory processes, mainly cognitive regulation processes.

Below, I describe instances of each socially shared regulatory process based on what was regulated in the CSCL environment and discuss the quality of regulation (Table 7). I identified seven socially shared regulatory processes, focusing on cognitive regulatory process.

Table 7

Definitions and Examples of Socially Shared Regulation

SSR	Definition	Example
Planning and Goal Setting	1. Present a question as a starter for the group's plan or goal.	"What are group goals?" "Does 'To use all relevant concepts and theories' sound good?"
	2. Discuss plans and goals.	"Yes, and to understand more in-depth social constructivist theory in particular through working on our task."
	3. Express agreement.	

Table 7. Continued.

Scheduling	1. Set a time for the online discussion session.	“I’m available for the online chat tonight after 7:30pm, Friday anytime after 4pm.”
Role	1. Discuss plans to assign roles.	“Who will write the summary at the end?”
Assignment		“I’ll keep track of time.”
Task	1. Correct typos.	“Megan, that is the next question.”
Monitoring	2. Check time.	“What question are we on?”
	3. Verify the progress or the completion of each guiding question.	“We have 40 minutes left and we’re only on the first question, so we need to keep going.”
		“Are we ready for the next question?”
Content	1. Check for the accurate use of educational psychology concepts, principles, and terms to solve the task.	“True. I agree with that.”
Monitoring		“Tyler acquired some of the behaviors from watching Marcus. We can all agree on that.”
		“We covered the advantages of breaking a creative writing task into such steps, right?”

Table 7. Continued.

Content	2. Check the accuracy of	“Should that be our answer?”
Monitoring	the task response or final solution.	
	3. Provide a reason to support responses or ideas.	
Task	1. Check whether all	“Yes, we used the concepts and yes, we
Evaluation	guiding questions were answered.	answered all of the questions.”
Content	1. Check whether the group	“I think we met our initial plan/goals
Evaluation	met its initial goals.	because we developed a lot of solutions to Tyler's problems.”
	2. Check the use of all relevant educational psychology concepts.	“We all have a good grasp on information learning theory like be organized in studying, use memory devices like elaboration, and rehearsal is good but not in every aspect.”

Planning and Goal Setting

I observed task planning, which refers to planning how to outline and proceed with the plans of the group discussion. In this study, I observed three task planning processes – planning and goal setting, scheduling, and role assignment.

Planning and goal setting was a task planning process in which members brainstormed the group's goals, planned how to answer all of the task prompts, and posted a question as a starter. Planning and goal setting occurred at the beginning of the discussion and included a restatement of the task prompts, suggestions, questions as a starter, instructional comments, and prompt responses. Typically, this process was followed by role assignments at the beginning of each session. It also occurred throughout the discussion when participants revisited the question or requested to move on to the next stage of the discussion.

My first observation was that the planning and goal setting process was used to discuss planning, particularly how to answer the question and how to reach a solution for each task. In Figure 1, Sharon started the group plan stating, "Ok, so basically we just have to make sure we answer questions 2 to 4." Avery, Ivy, Fiona, and Kiara expressed their agreement. Therefore, the group reached a solid plan through mutual agreement. This process occurred when the group initially decided to go through each guiding question explicitly or not. Thus, I assumed that the online groups tacitly assumed and agreed that they would answer each question from guiding question 1 to 8. I observed that the existence of clear guiding questions caused this posting of each guiding question, regulating the group's planning and goal setting processes.

I observed high and low quality postings in planning and goal setting regulatory processes. High quality regulation was observed when all members mutually agreed to answer the guiding questions in order. In Figure 1, Sharon proposed a clear plan and the others agreed. Therefore, I viewed this planning and goal setting process as high quality regulation because this short conversation portrayed the group's detailed plan and consensus. Rogat and Linnenbrink-Garcia (2013) defined high quality task planning as successfully reaching mutual agreement with a clear plan through collaboratively discussing task directions while low quality planning involved minimal discussion and not enacting a group plan. I attributed high quality regulation in planning and goal setting to the guiding questions, which provided clear and detailed plans for the group discussion.

Figure 1

Planning and Goal Setting

Sharon: Ok so basically we just have to make sure we answer questions 2-4 (*planning and goal setting*)
Avery: Okay. Let's get started (*planning and goal setting*)
Ivy: Sounds good (*planning and goal setting*)
Fiona: Yes, I looked over them a little while ago (*planning and goal setting*)
Kiara: alright!! (*planning and goal setting*)
Ivy: So do we start with the planning? (*planning and goal setting*)
Sharon: Okay, so I think he's repeating the behavior because he is learning through vicarious experience. And Marcus isn't getting punished for screaming, he gets attention instead (*task response*)
Kiara: Sharon, you are typing it up right? (*planning and goal setting*)
Avery: So the second question is "how has Tyler acquired the screaming behavior?" and in terms of social cognitive theory (*planning and goal setting*)
Sharon: Yea (*planning and goal setting*)

In Figure 1, low quality regulation was also observed when Ivy asked if they should start with planning and the others did not respond. Prior to Ivy's comment, the group had already decided to answer guiding questions 2 to 4. Therefore, Ivy's comment was viewed as low quality regulation since what she suggested was not collectively

discussed and was ignored by the others. Although the short exchange of discourse before Ivy's comment was classified as high quality regulation, Ivy's comment was of low quality regulation, failing to collectively discuss or to reach mutual agreement. I observed this phenomenon across all three groups. The nature of CSCL, where posting several messages concurrently makes it impossible for members to read and respond to all messages, resulted in low quality or isolated regulation. However, these abandoned comments did not affect the groups' plans to answer all guiding questions in order.

My second observation was that the members posted guiding questions and suggestions as starters or reminders, eventually leading the group to begin discussing and answering the question. A unique feature of this study was the posting of each guiding question to revisit the initial task plan or to suggest task direction. This process emerged because the CSCL environment kept members from reading each other's facial or body expressions. Therefore, the members had to post a guiding question to move on to the next question in order to implement their initial group plan. In this particular study, posting a guiding question was viewed as a part of planning since it related to planning or revisiting the group plan or task direction. I observed each group posting each guiding question across all tasks and concluded that this was a unique process to regulate online learning but essential for further progress in CSCL.

I observed the restatement of task prompts. Restatement was generated by a member analyzing the task prompts and creating a new question reflecting his/her understanding of the task. Meanwhile, in the process of transferring task prompts into new questions, the quality increased since members used their cognition and metacognition to construct understanding. The function of restatements of task prompts

was similar to that of guiding questions in terms of regulating the online group's learning processes.

At times, the planning process of posting a guiding question or restatement was omitted. Instead, members immediately jumped into posting the answer to the task prompts. In Figure 1, the group agreed early on to begin discussing guiding question 2. Sharon immediately began with posting an answer to question 2. I observed that the group's discourse still went well without posting of the task prompt. In this case, I assumed that all members knew where they were because each group went over each guiding question regardless of whether they posted the task prompts or not. This confirmed that guiding questions worked as a planning and goal setting process for groups in CSCL.

Third, the planning and goal setting process occurred when members designed the plan apart from the task prompts. This was unique because content planning occurred. For example, Jordan said, "I am just going over my notes I took on social learning theory," using his notes to expand his knowledge about social learning theory. This was a process of content planning since he tried to come up with a way to find content knowledge for the discussion session. I observed this across all groups. Typically, members asked in which chapter they would find the relevant content knowledge or asked the definition of a particular theory before they began to discuss the task. When members simply checked or confirmed the relevant chapter, I defined this as low quality regulation since it could be simply answered by one or two members. It did not contribute to deep information processing and did not require all members' participation or negotiation to reach mutual agreement.

I observed instances where members discussed task relevant content knowledge. In some instances prior to discussing task prompts, members attempted to review the course terms or their background knowledge. In this process, the group checked whether all members had a common ground for the task perspective. Thus, this planning and goal setting process resulted in high quality discourse. In Figure 2, Sharon initiated, “Let’s just start by defining social constructivism.” Her comment was generated not by task prompts but on her own. Sharon’s planning process led all members in this group to develop a common ground for the task. In Figure 2, five members discussed the key concepts of social constructivism. They talked about a community of learners, shared knowledge, and the role of others. In this process, all members constructed a common understanding of the theory as well as a shared task perspective even though they had already learned this in class. As a result, this shared task relevant theory understanding was categorized as high quality regulation.

Figure 2

High Quality Regulation of Planning and Goal Setting 1

Sharon: Okay, so I guess let’s just start by defining social constructivism.
(*planning and goal setting*)

Ivy: Well, it says that learners use cognitive skills to engage in complex cognition, constructing knowledge and meaning by participating in a community of learners. (*planning and goal setting*)

Kiara: I would say it’s a task done in groups where group members share and construct knowledge. (*planning and goal setting*)

Avery: Okay, so learners in this theory construct knowledge in a social context. (*planning and goal setting*)

Kiara: Okay, so we all agree. (*planning and goal setting*)

Sharon: How students learn, how learning environments should be designed to promote learning, the role of others in learning. (*planning and goal setting*)

Fiona: Yes, and the goal of social constructivism is to gain knowledge through discourse with the community. (*planning and goal setting*)

Content planning processes, particularly high quality regulation, were rarely observed. The existence of guiding questions resulted in the infrequent occurrence of content planning. Task prompts and guiding questions served as guidance; however, the assumption was that members already learned social learning theory or information processing theory in class so they could apply their knowledge into the task solution in CSCL. Students just recently learned the content in class, which may be why there was limited observation of content planning.

The last planning and goal setting process was to establish the group's goal for the session. Without concrete goals for the session, it would be difficult to gauge the group's learning progress and determine whether it met its initial goals at the end of the session. In this study, goal setting focused on interpretation of the task purpose and analysis of a required task into subgoals. Goal setting processes occurred prior to or after assigning roles. Sometimes goal setting and role assignment occurred concurrently. Unfortunately, no individual goals were set despite the first guiding question asking to set individual and group goals for the session. Järvelä and Hadwin (2013) noted that in order to examine a group's regulation, an individual member's goal and the group's shared goal need to be analyzed together. However, this study focused only on the group as the unit of analysis and examined how the group developed and sustained shared goals.

This goal setting process was important because it was related to content monitoring and content evaluation. I analyzed how the group judged goal attainment at the end of the discussion along with the group's initial goals. I focused solely on instances of the goal setting process.

The groups across the three tasks attempted to understand the task in the goal setting process. I observed two goal setting phases. One was low quality goal setting in restating the task question. Another was high quality goal setting in restating the task question, reviewing each other's plans and goals, and setting sub-goals and plans.

My first observation in the planning and goal setting process was the simple statement or restatement of the task question. One individual member set the group goal and the other members agreed/disagreed. In this case, the goal setting process served as a reminder to the group of the task question. For example, Rebecca posted her goal, stating "The main goal of this is to find the main cause of Tyler's tantrum and to find ways to advance his learning." Rebecca's comment is exactly the same as the first task's main question. This was an appropriate goal for the group but was low quality regulation since the plan and goal students set was already generated by the instructor and no further discussion was necessary. I assumed that it was very easy to infer the goal from the task questions and guiding questions so that once a member posted the task goal from the task prompts, there was no need to participate in the goal setting process.

A second observation was that high quality regulation in the goal setting process was seen when members metacognitively monitored each other's plans and goals and constructed the group's goals and sub-goals. In Figure 3, Jordan started with setting the group goal, ranking the answers from worst to best. However, Skylar monitored his goal and mentioned that the group needed to think about each student's learning strategies first. Like Skylar, Grace monitored Jordan's goal and reconfirmed that the group begin to discuss identifying each strategy. After a short exchange, the members shared the common group goal and sub-goals.

Figure 3

High Quality Regulation of Planning and Goal Setting 2

Skylar: Okay, so the first question. (*goal setting*)
Jordan: Rank the answers from worst to best? (*goal setting*)
Grace: Sounds good, let's get started. (*goal setting*)
Skylar: Not yet, we have to say the strategies each student used...(*goal setting*)
Jordan: I would say obviously B is the worst answer. (*goal setting*)
Skylar: and the quality of them. (*goal setting*)
Grace: No, identify each strategy. (*goal setting*)
Jordan: I see that now. (*goal setting*)

This instance is distinguishable because members metacognitively reviewed other members' goals and gradually developed a shared goal. Although the task question provided useful clues for planning and goal setting, it did not provide well-defined sub-goals to fit the group. Therefore, I classified the statement of the main task question as low quality regulation. Meanwhile, Figure 3 was a high quality goal setting process since three members metacognitively monitored the group's goal and eventually planned detailed sub-goals. Furthermore, the members utilized high order thinking skills to set the goal and sub-goals. I concluded that the process to develop the group's goal and sub-goals through negotiation was high quality regulation. Eventually, this high quality regulation produced high quality goals for the group because several members actively contributed to the goal setting process in addition to the existing task goal.

Scheduling

I identified was scheduling as a task planning process. Scheduling refers to setting a time and date for an online chat. Scheduling was not prompted by guiding questions. It was observed at the end of each session and before the next session began.

Scheduling played a role in regulating the plan of the group's discussion. The

group developed autonomy through the scheduling process. In Figure 4, Rebecca began to talk about the next session and the rest actively participated in scheduling.

Figure 4

Scheduling 1

Rebecca: Awesome job guys! This time works for me for the next two sessions. Is this good for everyone as well? (*scheduling*)
Ross: I think we're doing Monday nights at 9 actually. (*scheduling*) That was what was initially agreed upon anyway. (*scheduling*)
Ichabod: Yeah, this time for now seems to be good for me. (*scheduling*)
Edgar: I think we were going to try and do the next ones on Mondays. (*scheduling*)
Rebecca: I have class. Can we do like 9:30 pm? (*scheduling*)
Esther: That's ok with me, Rebecca. (*scheduling*)
Vivian: I can do that. (*scheduling*)
Edgar: 9:30 pm on Mondays. (*scheduling*)
Ichabod: Sounds good guys. (*scheduling*)
Ross: O.K. (*scheduling*)
Rebecca: Sounds good! Nice job everyone. It was a pleasure. See everyone in class on Monday and we'll talk Monday nights at 9:30. (*scheduling*) Have a good night!

No one was left behind in this process. In the beginning, members simply posted their available times and gradually negotiated with each other to find the best time for everyone. This process did not directly influence the group's final products or task solution. Nonetheless, this process was evidence that all members contributed to their online discussion.

I observed that the members faced difficulty in scheduling because of unexpected circumstances and would spend an extra 5 to 15 minutes chatting to set up a time. For example, Skylar and Elizabeth showed up in the chat room as initially scheduled. However, Jordan and Grace were not present. Therefore, they postponed the discussion. The next day, Jordan and Grace posted their apologies in the chat room. I observed the

group's attitude toward the group discussion assignments and the group cohesiveness from this scheduling instance.

Figure 5

Scheduling 2

Skylar: I guess we're going to reschedule this? (*scheduling*)

Elizabeth: I couldn't remember if we said 10 or 10:30. (*scheduling*)

Jordan: Hey guys, sorry I missed it, I completely forgot we said Thursday. Let me know when you want to redo this. (*scheduling*)

Grace: Sorry guys, I just remembered this, let's talk in class. (*scheduling*)

One discussion point in this instance is one's identity as a member of the learning community. Skylar and Elizabeth were present in the chat room but waited for the two members and eventually postponed the discussion session instead of beginning the discussion without them. They developed and maintained their identity as members of this online group. I observed other similar instances. Three members were on time and one member was missing, whom they could not reach. They voted whether to postpone the session or begin without that person. Gina stated, "We vote to postpone until post-sandy" and Jimmy agreed, stating, "We can't really do it without Lucio." Like Figure 5, this group sacrificed the many for the few.

In terms of quality, all instances of scheduling were of high quality regulation because all members raised their voice and actively participated in scheduling. Each member posted an available time and date and eventually everyone arrived at a conclusion. Although scheduling processes did not affect the final products directly, the importance of this process was related to the development of group cohesion and their identity as members of a group.

Role Assignment

Role assignment is the plan to implement intentions for a given task as a task planning process. In this study, I defined role assignment as assigning roles to members as leader, timekeeper, or summary writer. Whenever members logged into Sakai and entered the chat room, they checked for the presence of other members. After a member check, the group planned their roles as requested by the first guiding question. Usually, at the beginning of each session, members were involved with the role assignment process, but they also revisited this role assignment process afterwards. In the midst of their discussion, members reviewed who would write the group summary for the session. The role assignment process was vital for the group to regulate each member's engagement and contribution to the discussion.

Although the role assignment process was led by guiding questions, it did not directly influence the group's task solution. Similar to scheduling, role assignment helped the group begin to discuss and regulate their learning process. The importance of role assignment was that all members contributed to the learning process.

Role assignment occurred when members discussed what kinds of roles they would take for the session. In the beginning, all groups attempted to discern the meaning of role assignment and discuss who would be the leader, timekeeper, and summary writer. Often, one member asked a question or posted a guiding question and then the rest engaged in the role assignment process. Interestingly, I observed that sometimes members skipped posting a question as a starter. Instead, one member's posting regarding the role he/she wanted for the session began the discussion. I assumed this occurred because the guiding question clearly asked the group to assign roles. Once a member

posted his or her role for the session, the rest of the group participated in the role assignment process. For example, Louise began to engage in role assignment, stating, “We’re just waiting on Merrill and then we can start. I can do the summary this time.” Louise’s role taking worked as a starter for the role assignment process.

Both high and low quality regulation was observed in role assignment. Low quality regulation related to instructional comments and simple answers. Figure 6 is an example of low quality regulation while Figure 7 is an example of high quality regulation.

Figure 6

Low Quality Regulation of Role Assignment

Steve: Ok. Let's start. Who will write the summary at the end? (*role assignment*)
Jasmin: I guess I'll write the summary this time. (*role assignment*)

In Figure 6, Steve asked who would write the summary and Jasmin quickly responded. Jasmin’s suggestion was not irrevocable. However, the rest did not express their agreement or disagreement to this. Jasmin’s answer to the question ended without further group participation. This short exchange of discourse did not include any negotiation among members and did not take into account all roles the task prompts requested. Thus, I concluded this was an example of low quality regulation.

Figure 7 illustrates an example of high quality regulation in role assignment. Early on, Ross’s question worked as a starter. Next, several members expressed interest in being the time keeper. Conflict occurred because three members wanted this role. Finally, Vivian suggested that they all keep track of time together and the others agreed. In the role assignment process, they put their heads together to find a solution. I defined this short exchange of discourse as high quality regulation since all members participated

in the process, eventually reaching mutual agreement through negotiation and understanding the task expectations and their roles for this particular session.

Figure 7

High Quality Regulation of Role Assignment

<p>Ross: So, who's going to keep us on time and who's going to submit the final report? The task says we have to pick these people. (<i>role assignment</i>)</p> <p>Esther: I'll keep time. (<i>role assignment</i>)</p> <p>Vivian: I can do time. (<i>role assignment</i>)</p> <p>Edgar: I vote against me to do the summary. (<i>role assignment</i>)</p> <p>Rebecca: I can do the summary at the end. (<i>role assignment</i>)</p> <p>Edgar: I don't mind keeping time though. (<i>role assignment</i>)</p> <p>Vivian: How about we all just keep watch of the time then? (<i>role assignment</i>)</p> <p>Esther: Okay. Good idea! (<i>role assignment</i>)</p> <p>Edgar: Agreed. (<i>role assignment</i>)</p>

Although the first guiding question asked the group to discuss roles, role assignment emerged differently according to the group members' contributions. High quality regulation appeared when members exchanged their opinions and reached a final decision by mutual consent. Similar to the scheduling process, the role assignment process did not influence the final task solution since it was a task planning process.

Task Monitoring

I identified the emergence of task monitoring, referred to as the metacognitive assessment of progress or planning to complete a task. Task monitoring was essential in socially shared regulation in CSCL since this process made members keep track of time, revisit initial plans and roles, assess the completion of each guiding question, discuss task difficulty and task understanding, check typos, and find more effective strategic actions to accomplish the task, if necessary. Examples of task monitoring included, "Megan, that is the next question," "25 minutes left," "What question are we on?," "We have 40

minutes left and we're only on the first question, so we have to keep a going," and "Are we ready for the next question?"

Task monitoring took place at throughout the discussion. Most instances were observed immediately before the group terminated the discussion. Members intermittently monitored their task in each session. Task monitoring appeared when a member brought up the question regarding time or task completion and the others responded.

In terms of the quality of regulation, I defined correction of typographical errors and time monitoring as low quality regulation since there is one answer and was simply regulated by one or two members, such as when one member monitored time they had left. Similarly, one member asked, "Do we have a time limit?" Another example was when Grace asked, "Sorry, do you guys know what chapter we're supposed to be working from?" and Skylar responded, "I guess maybe chapter 7?" This task monitoring process was necessary to keep the group discussion moving forward, but did not affect the quality of regulation or discourse.

Completion of each guiding question was related to the quality of the regulation. This process was observed across all groups. Low quality regulation was observed when members exchanged only simple factual information that did not enrich the quality of discourse or foster all members' participation. Instances of this included: "We didn't go over it (to my knowledge)" or "Did we talk about it?"

Figure 8

Low Quality Regulation of Task Monitoring 1

Kate: We skipped 2C. (*task monitoring*)

Abby: Oh, we did 2C. (*task monitoring*)

Another example is Figure 8. Kate metacognitively monitored the group's discourse and noticed that the group skipped guiding question 2C. Kate stated this and Abby responded, "Oh, we did 2C." Abby also metacognitively monitored the group's discussion progress and Kate's comment and then corrected Kate's inaccurate comment. Here, two members actively engaged in task monitoring and metacognitively supervised the task. However, this short exchange did not require all members' contributions or further negotiation among members because the answer was straightforward.

In Figure 9, Jordan metacognitively monitored Megan's comment and pointed out her untimely answer. Jordan instructed Megan not to talk about the next question but to maintain the task process. Jordan's instructional comment strengthened the group's sharing of the same task process but weakened Megan's autonomy to talk about anything within the group and not be judged by Jordan. However, Figure 9 were not exemplifying in high quality discourse.

Figure 9

Low Quality Regulation of Task Monitoring 2

Megan: I think D is the best strategy and B being the worst.

Jordan: Quality, Megan, not which is better than the other, that is the next question. Why is D the best? (*task monitoring*)

Megan: I like D because I feel like the interaction between the peers helps them learn. They discuss questions if one answers wrong then the other can let them know the right answer. They learn from each other.

High quality regulation in task monitoring occurred when members metacognitively monitored their progress but required further discussion among the members. First, the members checked whether they were ready for the next question or whether they mutually agreed on the final task solution. For example, Jordan questioned the group, "So, is that enough for that question?" His question provoked the rest to think

about whether the group reached mutual agreement and whether they could move on to the next question. This type of task monitoring enabled all of the group members to participate in the process and decide the group's answer was enough to end discussion on this topic.

Figure 10

High Quality Regulation of Task Monitoring 1

Vivian: Haha. Alright, so I guess now we can move on to the second question? *(task monitoring)*
Rebecca: Let's not go too fast or we'll be done in a half hour. *(task monitoring)*
Esther: I guess we can move on. Do we have to be here for a whole hour though? *(task monitoring)*
Edgar: I could be vicarious.
Rebecca: Yes. *(task monitoring)*
Ichabod: Does this have to go a full hour? *(task monitoring)*
Esther: A full hour, I think. *(task monitoring)*
Vivian: Well, only cause the other questions we probably have a lot more to discuss. *(task monitoring)*
Edgar: He did grab someone's behavior and re-direct it for his own purposes. *(task monitoring)*
Rebecca: Social Learning Theory points out that the learner is motivated when he perceives the act as positive or useful, which we agreed upon before when Tyler say Marcus getting attention. *(task monitoring)*
Esther: Yeah. We can also say that he went through all three phases of observation, which helped him learn the behavior. *(task monitoring)*
Ross: I think we can move on from the first question now that we have consensus. *(task monitoring)*

Another example of high quality task monitoring is found in Figure 10. Vivian asked to move on to the next question. Rebecca, Esther, Ichabod, and Vivian checked the time distribution for the guiding questions. Vivian mentioned that the later questions required more time for discussion. However, they kept discussing the first question while monitoring task completion. Finally, Ross suggested that the group found the right answer for the first guiding question and to move on to the second guiding question. In Figure 10, Vivian's suggestion led to active task monitoring processes regulated by all

members. Through exchanging ideas, Rebecca, Esther, and Ross confirmed the group's answer, with all members jointly agreeing. In this process, all members shared the group's final product and verified that they were ready to move on.

During the discussion, the members monitored their progress by asking whether the group carried out the plan they formulated, developing and maintaining shared task perspectives and solutions.

Another example of high quality regulation was observed when Elizabeth abruptly stated, "I am not sure what cultural tools are being used in this assignment." Elizabeth pointed out that she did not understand what the term "cultural tools meant here, which prevented her from moving forward to discuss the guiding question. Jordan suggested, "Let's go over it again." Later, the group discussed the term to get a better understanding of the task. As a result, Elizabeth's task monitoring comment led the group to define the term.

I observed a similar example in another group. In Figure 11, Ross and Esther expressed the need to understand the term before discussing the guiding question. The group tried to figure out the term through discourse. The members smoothly moved on from defining the term to discussing the guiding question when Rebecca asked, "Can any tools be used with this scenario?"

Figure 11 illustrates that task monitoring led the group to define the term and eventually to build a common ground for the task perspective and task understanding among the members. This discourse smoothly transitioned into the next phase.

The function of task monitoring was for all members to share the same task understanding and task perspective as well as task progress. The most frequent task

monitoring instance was to verify their readiness to move on to the next guiding question.

I observed this process at the end of the discussion of each guiding question across all groups and sessions.

Figure 11

High Quality Regulation of Task Monitoring 2

Esther: It says in our notes that cultural tools are things like maps, symbols, and tech.

Rebecca: Not make friends but to be able to interact with all kind of people without problems. (*task monitoring*)

Ross: Well, what is an example of a cultural tool? I'm not sure I understand this question. (*task monitoring*)

Ross: Yeah, like being civil? Is that a cultural tool? (*task monitoring*)

Esther: I don't really know. The book makes tools sound like objects or symbols.... (*task monitoring*)

Ichabod: And how to listen. (*task monitoring*)

Esther: Not sure how that stuff fits in.

Vivian: I don't really know what this activity has to do with maps and symbols though. (*task monitoring*)

Ichabod: Working with others when you're young is hard; you think your answer is the best over the others. (*task monitoring*)

Rebecca: So, can any tools be used with this scenario? (*task monitoring*)

Low quality task monitoring included such things as time check, correction of typographical errors, and task completion check without agreement or negotiation whereas high quality task monitoring resulted in checking task progress based on the initial plan and developing a common ground for task understanding or task perspective as members reached mutual agreement.

Content Monitoring

Socially shared regulation occurred in CSCL by answering the task questions and monitoring the answer. In this study, the group posted task responses and then jointly monitored those responses metacognitively. I observed that content monitoring, referred to as the process of members monitoring each others' responses to some degree and

deciding metacognitively whether that response was appropriate to the given task problem, was the key process of socially shared regulation in the online group. Examples of content monitoring process were, “True. I agree with that” and “That’s a very good point, Ivy.” Content monitoring was observed throughout the entire discussion sessions and with high frequency.

Content monitoring emerged when members metacognitively monitored other members’ comments and responses to the task prompts. In this process, individual members constructed their knowledge through social interaction and discourse in online discussion contexts. However, a crucial concept of content monitoring was the analysis of shared regulation of learning, not the co-construction of knowledge. I only focused on the emergence of socially shared regulation. In terms of regulating a learning process, content monitoring regulated the online group’s learning process through negotiation. In CSCL, negotiations were held through analysis, comparison, reasoning, and application, and final answers to the given task questions were then decided. When members found the answer to the task question easily through mutual agreement among members, they moved on to the next question. When mutual agreement was not met, they asked further questions to fill the gaps or persuaded others with evidence to support their ideas, ultimately, going deeper into the content.

Content monitoring occurred when members monitored or checked the group’s use of appropriate and accurate educational psychology concepts, principles, and terms to solve the task. This process arose in the form of confirmation. Figure 12 portrays an instance of content monitoring to judge the accuracy of educational psychology concepts. Elizabeth started off the discussion by defining the notion of social constructivism. This

was content planning in the planning and goal setting process to develop a shared task perspective. Jordan and Skylar monitored the accuracy of Elizabeth's definition and then verified, "Yes, the guided participation is definitely part of it" and "Yeah, I agree," respectively.

I interpreted the content monitoring in Figure 12 as low quality regulation because Jordan and Skylar simply verified Elisabeth's definition but did not provide any explanation as to why they agreed. The conversation on the definition of social constructivism ended at this point without any further discourse.

Figure 12

Low Quality Regulation of Content Monitoring

Elizabeth: Alright, so it starts off by asking about social constructivism which is basically guided participation, I think.

Jordan: It's a learning process that allows a student to experience an environment experience for themselves and yes, the guided participation is definitely part of it.

Skylar: Yeah, I agree. (*content monitoring*) For the first part, the teacher is scaffolding the students by giving them the autonomy to answer questions and things, and then actually scaffolding by providing the edits on the papers.

Elizabeth: The teacher makes marks on the draft so that the student can make the writing stronger.

Skylar: Exactly. So that's A, I guess. (*content monitoring*)

I also observed instances of high quality regulation when members monitored the accurate use of course concepts and terms. Figure 13 illustrates an instance of content monitoring to judge the accuracy of educational psychology concepts. Edgar and Ichabod monitored Ross's posting metacognitively, discovered Ross's use of an inaccurate term, and corrected his misconception. This was high quality regulation because Edgar and Ichabod actively monitored Ross's answer and instructed his misunderstanding. Through this process, the group developed an accurate understanding of the theory as well as took a step forward to improve their final products of the task.

Figure 13

High Quality Regulation of Content Monitoring1

Ross: Their editing of their own piece is definitely Piagetian social constructivism.

Edgar: Piaget is individual constructivism, not social. (*content monitoring*)

Ichabod: Vygotsky is helping the students do what they can't on their own. (*content monitoring*)

Second, I observed content monitoring to evaluate the accuracy of task responses.

Members posted their response to each guiding question because there were several guiding questions in each task. After a task response, content monitoring emerged as a form of agreement or disagreement. The issue of interpretation of agreement needs to be addressed. I identified two occasions of agreement/disagreement in this study. First, simple agreement/disagreement signified giving approval, meaning, "I like your idea." For example, in planning and goal setting, Avery said, "Let's get started." Ivy and Kiara agreed, stating "Sounds good" and "Alright," giving approval with Avery's plan. Their agreement was not viewed as content monitoring because it was simply approval.

Instead, I defined agreement/disagreement as content monitoring only when it verified whether the responses were appropriate and accurate. Simply put, monitoring the accuracy or quality of a task response was defined as content monitoring. In Figure 12, Skylar and Elizabeth answered the task question, "In what ways has the teacher scaffolded the writing tasks?" Skylar metacognitively monitored and agreed with Elizabeth's response. I defined this as low quality regulation of a content monitoring process since only one person, Skylar, participated in this process and her monitoring did not provoke deep information processing on the task question. Instead, it was limited to confirm Elizabeth's response to the task question.

I also observed instances of content monitoring improving from low quality regulation to high quality regulation and from verification through agreement/disagreement to detailed explanation or further questioning. In this case, members provided not only their agreement but also detailed explanation to support their agreement/disagreement. Content monitoring included analysis, comparison, reasoning, and application, resulting in deep information processing of the task. Moreover, content monitoring extended further questioning to clarify and to elaborate.

In Figure 14, Rebecca started posting a task response to the guiding questions, “How has Tyler acquired the screaming behavior? Which course concepts are used to answer this question?” After Rebecca’s task response, Vivian asked the group to account for this with educational psychology course content. Vivian tried to apply course concepts to the learning process. Esther answered Vivian’s question. I observed that Vivian’s question caused the entire group to transfer course content knowledge into this task. Vivian’s question was a type of task response to the guiding question “Which course concepts are used to answer this question?” I assumed that she attempted to apply course concepts to this situation.

After Esther posted the task response, “I think it is modeling,” several content monitoring processes emerged. Edgar, Ross, and Rebecca confirmed that Esther’s task response was right. I classified their postings as content monitoring processes since the posting monitored the accuracy of Esther’s answer.

As mentioned above, simply saying “I agree with modeling” was low quality regulation of content monitoring. However, Rebecca’s further explanation to account for

why modeling was the correct answer was high quality regulation since it provided her rationale with higher order thinking skills.

In addition to Rebecca's explanation, her question about whether this case was direct modeling or not was defined as an instance of high quality regulation of content monitoring since her question fostered further application of the course content as well as debate among the members. Rebecca's additional question of "Do you guys think it is direct modeling?" was monitored by the other members. Most members agreed with direct modeling while Rebecca disagreed. I observed that Rebecca's question brought conflict among the members. It led the group to argue and to exchange opinions, resulting in mutual agreement in the end. I identified Rebecca's further question as high quality regulation. Through the short exchange of discourse, the members reached the mutual agreement that they agreed Tyler's learning was direct modeling.

Content monitoring also appeared when members asked a question in order to satisfy their curiosity or to clarify their understanding. This question occurred along with members' content monitoring to determine the accuracy of the solution or answer. I viewed this question as high quality regulation of content monitoring. In Figure 14, Ross was not sure what direct and indirect modeling were. He asked the definition of direct modeling and Edgar explained it using Tyler's case. This appeared to be a self-regulated learning process for Ross. However, this question was, at first, generated while Ross monitored the discourse among the members. As a help-seeking behavior, this question led other members to pay attention to this concept and think about it again. As a result, I defined this question as a content monitoring process of high quality regulation.

Figure 14

High Quality Regulation of Content Monitoring 2

Rebecca: Basically, Tyler acquired the behavior by learning it from Marcus, the autistic student in the resource room. When Marcus was frustrated with doing the same work over and over, he would scream. Tyler saw that as a way to deal with his own frustrations.

Vivian: What kind of learning do you guys think this is? Observational, vicarious or modeling? (*content monitoring*)

Esther: I think it is modeling. He sees that Marcus gets attention from the teacher for screaming, so he modeled the behavior.

Edgar: I agree that it's modeling. (*content monitoring*)

Ross: Yeah, I agree. He clearly got it from Marcus, and yeah, I'd say modeling. (*content monitoring*)

Ichabod: I agree with modeling. (*content monitoring*)

Rebecca: Yes, because modeling is defined as observing and then imitating and enacting the observed behavior. (*content monitoring*)

Rebecca: Do you guys think it is direct modeling? (*content monitoring*)

Edgar: Direct modeling, to be exact.

Ross: The quote from Tyler - "Well, wouldn't you get pretty upset if you had to do the same stupid worksheets and listen to the same dumb stories all day-every day-while everyone else in your class gets to do new and exciting stuff?" pretty much sums it up.

Edgar: He watched in a direct setting Marcus's behavior.

Rebecca: I would think more so than symbolic modeling because it's symbolizing his frustrations but he is directly copying Marcus.

Ichabod: He didn't really have a choice but to watch.

Esther: Yes, I think he as frustrated and learned from Marcus to act out when frustrated.

Vivian: Yeah, I think it is direct modeling and Tyler views the screaming behavior as something useful because every time Marcus does it he gets attention from the teacher.

Rebecca: Because he was stuck in the resource room all day so it's the only exposure he got to other kids.

Ross: What's the difference between direct and indirect modeling? (*content monitoring*)

Edgar: but symbolic would be learning without direct contact which Tyler clearly had.

Ross: Then I would say direct modeling. (*content monitoring*)

Rebecca: That's true. (*content monitoring*)

Ichabod: Agreed. (*content monitoring*)

Edgar: Yeah, first group consensus!! (*content monitoring*)

I provided more instances of requesting explanation or information. In Figure 15, Vivian posted the task response to the guiding question with reasoning to support her response. Ross asked a question to Vivian because Ross monitored her response and questioned her. I interpreted that Ross's inquiry implied his disagreement to Vivian's response. Furthermore, Ross's question made Vivian provide detailed reasons for her ranking. In this process, they bounced ideas off each other, regulating their learning together and seeking a task solution, allowing the group to more deeply process the information. As a result, this was high quality discourse of content monitoring.

Figure 15

High Quality Regulation of Content Monitoring 3

Vivian: The only reason I prefer D to A is that for A I feel like it's not enough to just repeat vocabulary back and forth.

Ross: Why do you rank A so low, Vivian? (*content monitoring*)

Vivian: I think there needs to be more learning going on in order to remember it better.

In conclusion, content monitoring was a key process to socially shared regulation. Through this process, all members monitored and verified task responses metacognitively and questioned other members' ideas and responses, as necessary. Members' task responses were monitored by others through expressing their agreement and providing further explanations. After members expressed their agreement/disagreement, they gave a reason why they supported or disagreed with a member's response. Through this process, members regulated the group's discourse by metacognitively monitoring each other and used higher order thinking skills to elaborate on their agreement. In addition, when they did not agree or understand the task response, they asked questions to the person who posted the task response. Through metacognitive monitoring of each other's responses

and exchanging ideas, the members cultivated and reached mutual agreement on the task solution.

Task Evaluation

In this study, each group checked whether all guiding questions were answered at the end of each discussion session. I defined this process as task evaluation. Task evaluation occurred because one of the guiding questions requested the group to review their answers, asking, “Did your group answer all questions?” This caused the group to reflect on the completion of all questions within the one-hour time limit.

I observed the co-occurrence of task evaluation with other regulatory processes. First, task evaluation emerged concurrently with task monitoring. For instance, one member checked the completion of the fifth guiding question while another member mentioned the completion of all of the guiding questions. Next, task evaluation emerged concurrently with content evaluation. An example was “Yes, we used the concepts and yes, we answered all the questions.” In this case, the member checked the completion of all guiding questions as task evaluation and the use of all relevant concepts from the theory they discussed as content evaluation.

I observed the emergence of task evaluation less frequently compared to task planning or task monitoring. It was easy for members to keep track of the completion of the guiding questions since they had them for each session. Accordingly, I assumed that the members skipped task evaluation processes. The CSCL environment also played a role. The chat rooms, where the members conversed, archived all messages the group posted so that they could view what they wrote in the past. Consequently, they did not need to confirm their task completion verbally within the archived chat rooms.

Unfortunately, most of the task evaluation instances I observed were of low quality regulation where they simply confirmed that the group answered all questions. For example, Lily said, “I think we touched on everything.” Abby replied, “Lily, I think we're good.” They simply assessed the completion of all questions; it was a superficial evaluation of task completion and characterized as low quality regulation of task evaluation.

Content Evaluation

The last socially shared regulatory process I observed was content evaluation. Online group members set the group goals according to the learning task at the beginning of each session because each task question and guiding questions requested the group to develop a common ground of task goals. Each group set situation-specific goals to attain each task's objective and discussed the case with guiding questions and eventually reviewed the attainment or solution. Eventually, the group collectively evaluated whether the group met the initial goal at the end of each session, which I defined as content evaluation.

There were two types of content evaluation in this study. First, members verified whether the group met the initial group goals. Similar to planning and goal setting, it began with suggestions and questions as a starter. For example, “What is our group task solution?” Members also began to evaluate whether their initial goals were met by revisiting the group's initial goal. Merrill reminded the group of the initial group goal, stating, “I think our group task solution was applying the theory of social cognitive theory to the given scenario.” Through questioning and revisiting of the initial goals, members reviewed the goal attainment. Second, they verified whether their task solution

included all appropriate course concepts since the goal of each task was to find the task solution with a particular educational psychology theory. This content evaluation process occurred because of the guiding questions, “Did your group meet your initial plan or goals? To what extent does your group understand the central concepts of a social cognitive theory?” An example of content evaluation was “I think we covered the aspects of cognitive theory that have to do with memory well.” In both cases, confirmation and agreement followed.

I identified high and low quality regulation of content evaluation. Low quality regulation of content evaluation involved superficial and broad statements without detailed explanation or reasons. For example, “Overall, I thought we definitely met our goal. We all have a good grasp on information learning theory.” This statement showed that goal attainment and the use of concepts were taken into account in content evaluation. Another example was “I thought we have hit all the key points for this question.” This statement regulated the group’s learning process to review their previous answers to the task questions and to evaluate the accuracy of their answers. However, it was not clear enough whether or not this superficial evaluation was a simple task response to the guiding question. I did not know the underlying assumptions or reasons behind their evaluation. This meant that the group’s content evaluation was not in-depth and did not accurately answer how much they understood of the given theory. Thus, this was recognized as low quality regulation.

Figure 16 portrays an instance of low quality regulation of content evaluation. Edgar restated the guiding question in his own words. This was a good example to show how this group understood the guiding question. Edgar evaluated that the group met the

goals. Esther, Ross, and Vivian simply agreed with Edgar. However, his evaluation and their responses were not well-defined evaluations but rather broad and simple. Next, Edgar asked the question to have everyone think of the use of relevant educational psychology concepts. This was an effective question to lead the group to go more in-depth in their content evaluation. Unfortunately, he failed to receive feedback from the other members. He stated, “Just here in the end of the chat it says.” He pressed the others for an answer by reminding them that his question was derived from the guiding question. Still, they were not responsive and ignored his question. The lack of response prohibited the group from going deeper. As a result, the superficial content evaluation and the lack of content evaluation resulted in low quality regulation.

Figure 16

Low Quality Regulation of Content Evaluation

<p>Edgar: So, did we do a good job? I think we answered everything using the knowledge that we had and the social learning theory. (<i>content evaluation</i>)</p> <p>Esther: Yeah, I think we did. (<i>content evaluation</i>)</p> <p>Ross: Yes. (<i>content evaluation</i>)</p> <p>Vivian: Yeah, I think we're pretty much done. (<i>content evaluation</i>)</p> <p>Edgar: Does everyone understand the central concepts of a social cognitive theory?</p> <p>Edgar: Just here in the end of the chat it says. (<i>content evaluation</i>)</p>
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One point that needs to be addressed is that prior to the instance in Figure 16, the group participated in a content regulation process. Rebecca asked, “Does anybody have any other big ideas to suggest before I start compiling a summary of our ideas?” Esther responded, “I think we've covered as much as we can consider the information given.” Edgar, Ichabod, Vivian, and Ross also contributed, but the quality of all of these instances was observed to be low. I assumed that from their previous content evaluation

processes, all members tacitly agreed that the content evaluation process was already completed.

I also believe that the unique environment of CSCL was the main reason for their lack of response. The group answered Edgar's question at first but ignored his second question. One reason may be that in CSCL, it is impossible to read all text messages concurrently because several messages are posted in the chat room at the same time. After Edgar posted his second question, Ichabod brought up another question and the other members began discussing this new topic. The lack of response to Edgar's question may have occurred because of the nature of CSCL where message strands can be unintentionally ignored due to the synchronous quality of the environment.

I observed the emergence of high quality regulation. Unlike low quality regulation, high quality regulation provided well-grounded and specific reasons for their evaluation. In Figure 17, Gina positively evaluated the group's goal attainment by providing a reason. The rest contributed to this evaluation process. All members provided a favorable evaluation to the group's work. Moreover, their evaluation was rich and specific enough to understand why they thought their goal was met and why their discussion was successful.

In terms of content evaluation, this group answered the task question, gauging the goal attainment. For example, Jimmy noted, "We definitely met our goal," and provided a detailed explanation to support his claim, "We all have a good grasp on information learning theory, like be organized in studying, use memory devices like elaboration, rehearsal is good but not in every aspect. Those are a lot of big points." He mentioned specific concepts the group discussed in the session, providing well-grounded reasons.

Camila and Lucio also evaluated the goal attainment with specific explanations and each posting had a reply. Thus, the instances of content evaluation in Figure 17 are of high quality regulation.

Figure 17

High Quality Regulation of Content Evaluation

Gina: Did we meet our initial goals? Well, yes, we ranked them all and used strategies. *(content evaluation)*
Lucio: I would say we did. *(content evaluation)*
Camila: Yeah, we went through everything step by step. *(content evaluation)*
Lucio: We ranked them in order and supported those rankings with cognitive theory concepts. *(content evaluation)*
Camila: We ranked, we evaluated, we thought of different ways to improve their strategies or lack of. *(content evaluation)*
 Gah! Stop stealing my words!! I wish this thing told you when someone was typing.
Jimmy: We could provide some specific answers to be more thorough. *(content evaluation)*
Jimmy: Overall though, we definitely met our goal. We all have a good grasp on information learning theory. *(content evaluation)*
Camila: Hahaha. Yay. *(content evaluation)*
Jimmy: Like be organized in studying, use memory devices like elaboration, rehearsal is good but not in every aspect. *(content evaluation)*
Camila: Team work.
Jimmy: Those are a lot of big points.
Lucio: Solid discussion guys. *(content evaluation)*
Jimmy: Yup! *(content evaluation)*
Gina: Top notch. *(content evaluation)*

Another example of high quality regulation in content evaluation was when the members checked whether the group missed any important and relevant concepts in the given theory. Interestingly, the question was generated not by the guiding question but by a member. Abby stated, “Ok, we've answered all the questions. Have we missed any concepts?” This led the group to regulate the content evaluation and check relevant but unmentioned concepts. All members jointly reviewed the relevant concepts one by one. Merrill checked the use of the concept “self-regulation” while Abby checked the concept

of “distributed practice.” Abby confirmed the use of the concept “self-regulation” in the group’s discourse, providing a clear example, “By making flashcards and picking out important events, A and D set goals for what they want to know for the test, that's forethought.” Merrill also checked the use of the concept by providing an example, “I suppose if the two partners in A got an answer wrong, the mechanism by which they would correct themselves would be self-evaluation.” Similarly, Louise said, “I would also say that D is reflection because they are constructing with what they already know.” The members attempted to apply the concepts (e.g., self-regulation) to the cases they discussed and ranked in the session. In conclusion, it was important for all members to review important concepts and find missing concepts the group skipped in their online chat. This process produced an emergence of high quality regulation in content evaluation.

Interestingly, I observed another instance of content evaluation. I asked each group to write a short summary of their online chat at the end of each session. The member assigned as summary writer in the planning and goal setting process posted a one or two paragraph summary in the chat room. In evaluating their group discussion, Lily wrote, “The main goal of our group discussion tonight was to use concepts of cognitive theory to analyze each student’s studying habits. Overall, our group was able to successfully relate to and elaborate on concepts of the cognitive theory to the issues raised in our task, and find solutions to enhance the students' studying methods.” However, I did not code content evaluation from the summaries because there was no feedback and, therefore, it was not associated with socially shared regulation.

In summary, the content evaluation process included assessment of the group's goal attainment and confirmation of its evaluation. I observed that all members participated in the regulation of their learning process in evaluating their final products. I defined high quality content evaluation as evaluation of core and profound task elements and low quality content evaluation as superficial evaluation of the completion of the task solution. Members attempted to account for how well the group reached the initial goal, leading to high quality content evaluation.

Summary

Overall, this study found the importance of shared plans and goals, and the process of content monitoring in CSCL. There was also variation in quality in each regulatory process. Table 8 presents a summary of the quality of variation seen in each regulatory process.

First, the focus was on the cognitive regulatory process within the socially shared regulation model. This study analyzed short exchanges of conversation and identified seven socially shared regulatory processes of planning and goal setting, scheduling, role assignment, task monitoring, content monitoring, task evaluation, and content evaluation in CSCL. Detailed guiding questions promoted the emergence of socially shared regulation in CSCL.

Most instances of socially shared regulation were observed in the content monitoring process across the 13 groups where members actively monitored each other's responses and gradually reached the group's task solution. However, despite the importance of shared goals and shared plans, they did not always emerge in CSCL. This

vital regulatory process was often missing or occurred in the form of other-regulation when one member directed the plans or goals for the session to the rest of the members.

Table 8

Examples of High and Low Quality Regulatory Processes

Regulatory Process	High Quality Regulation	Low Quality Regulation
Planning and Goal Setting	Discussed clear and detailed plans for the group discussion Monitored the group's goal and planned well-defined sub-goals Reached the mutual agreement on the goals and plans	Posted guiding questions as a plan or posted a restatement of task prompts Posted a simple confirmation without monitoring or no confirmation
Scheduling	Posted available time Negotiated to find the best time	
Role Assignment	Discussed the meaning of role assignment Negotiated the roles among members and reached a final decision	Posted roles without agreement/disagreement
Task Monitoring	Discussed task difficulty and task understanding Monitored their progress metacognitively based on the initial plans	Checked typos Monitored time Checked the completion of the each guiding question without negotiation or agreement

Table 8. Continued.

Task	Found more effective strategic actions	
Monitoring		
Content	Monitored the accuracy of task	Monitored other members' comments
Monitoring	response with analysis, comparison, reasoning and application	without explanation
	Questioned other members' comments for clarification and elaboration	Provided agreement/disagreement without reasons
	Reached mutual agreement of the task solution	
Task	Superficially checked the completion of all guiding questions without explanation	
Evaluation		
Content	Provided well-grounded and specific	Evaluated superficial goal attainment
Evaluation	reasons of goal attainment	and the use of concepts without detailed explanation or reasons
	Checked relevant but unmentioned course concepts	No response
	Provided confirmation	

Second, this study analyzed the quality of regulation. This study found high quality regulation related to questions, responses to other members' ideas, requests for further explanation, and agreement and disagreement, resulting in shared regulation as well as deep understanding of the theory being discussed. Low quality regulation was related to direct responses to the guiding question, responses to a group member's task

response as task monitoring, simple agreement but no further discussion, and checking for completion of all guiding questions. Shared goals, shared plans, shared meaning making, and deep processing of the task caused high quality regulation while simply checking for task completion produced low quality regulation. Moreover, this study found that high quality regulation can be called socially shared regulation in the true sense of the word because multiple members successfully involved their shared regulation by establishing shared plans, shared goals, shared monitoring, and shared meaning of their learning.

Chapter Five

Results and Preliminary Discussion for Three Different Group Regulations

This section answers research question 2 (What is the group's main regulation pattern – socially shared regulation or other-regulation?) and three sub-questions; (a) How do groups with different regulation patterns vary in their interaction? (b) Does socially shared regulation improve the quality of regulation and social interaction more than other-regulation? (c) How do students reflect on their group's main regulation pattern?

In the previous section, I discussed the occurrence of a group's regulatory process in terms of what was regulated in CSCL. This section identifies and compares the different group regulation patterns. I originally intended to identify each group's main regulatory process as either socially shared regulation or other-regulation. However, the analysis categorized three group regulation patterns that I termed socially shared regulation, mixed regulation, and other-regulation. To answer the second research question, I selected three groups that each represented a different group interaction pattern and discuss their quality of discourse by describing how each group maintained or changed its learning process from the first session to the third session.

Data from the log files were analyzed through social network analysis and content analysis. The result of the social network analysis answered research sub-question 1 (How do groups with different regulation patterns vary in their interaction?) by confirming the existence of three different group regulation patterns as well as revealing differences in social interaction. The content analysis revealed a difference in terms of the quality of discourse and social interaction among the three regulation groups to answer

research sub-question 2 (Does socially shared regulation improve the quality of regulation and social interaction more than other-regulation?). A factor analysis of data from the students' self-report questionnaire answered research sub-question 3 (How do students reflect on the group's regulatory processes?).

This section includes three parts. First, a social network analysis (SNA) (Scott et al., 2005) performed with the Pajek program determined the social interaction patterns among group members in CSCL. This analysis revealed each group's main regulated learning pattern over time. Second, a content analysis performed with the Dedoose program indicated three group regulation patterns across the three sessions: (1) socially shared regulation group (SSRG): Group 10 in Table 2 maintained socially shared regulation, (2) mixed regulation group (MRG): Group 1 in Table 2 was categorized as a mixed group from one regulation type to another regulation type, and (3) other-regulation group (ORG): Group 13 in Table 2 maintained other-regulation across the three tasks. Third, the students' reflection on their group's regulatory process and social interaction were analyzed using data from the self-report questionnaire. This analysis compared results from the content analysis and SNA to the participants' point of view.

Social Network Analysis

The aim of this section was to investigate the social interaction among members in CSCL by examining who regulated the group's dialogue according to the group's main regulation pattern. The interaction patterns among members in the three groups were quantitatively analyzed using social network analysis (SNA) (Scott et al., 2005). This was intended to confirm my previous distinctions (i.e., socially shared regulation group, mixed group, and other-regulation group) and to reveal each group's interaction patterns in depth. Two measures, density and centrality, were used in this study.

Density: social interaction network/pattern

Density is the ratio of the number of connections between members in each group over the total number of possible connections between all pairs of members (Lowes et al., 2006). A density of 100% means that every member in the group perfectly interacted with everyone else. In the first session of the socially shared regulation group (SSRG), the density was 32%, which meant SSRG's network was fairly sparse but not dense such that each individual member did not always talk to everyone else in the first session.

Table 9 illustrates the densities of each session for each group. The percent total of one-to-one correspondence between members in SSRG was 32%, 29%, and 33% for sessions 1, 2, and 3, respectively. Correspondingly, SSRG had more dense connections between members than the mixed regulation group (MRG) and other-regulation group (ORG). The percentage of one-to-one correspondence between members in MRG was 17%, 19%, and 16% for sessions 1, 2, and 3, respectively compared to 9%, 8%, and 8%, respectively, in ORG. The percentage of one-to-one correspondence was shown to be very stable across the three sessions in the three groups. In particular, ORG showed

sparse connections between members. Consequently, the most active exchange of knowledge occurred in SSRG. These members provided the most feedback and the greatest number of comments to each other's postings. Throughout the three sessions and tasks, SSRG showed a similar social interaction pattern. Fewer exchanges of ideas and knowledge took place in ORG.

Among the three groups, SSRG's social interaction was the strongest, which meant all members tended to talk to each other equally. I interpreted SSRG's interaction to be strongly related to socially shared regulation. MRG showed the next strongest social interaction pattern among the three groups. MRG showed a consistent interaction pattern throughout the three sessions. This did not confirm that MRG's regulation pattern changed from other-regulation to socially shared regulation. The density measure revealed MRG's social interaction was less strong than SSRG but stronger than ORG. ORG's social interaction was the weakest, which I interpreted to be related to other-regulation.

Table 9

Density by Group and Session

	SSRG	MRG	ORG
Session1	32%	17%	9%
Session2	29%	19%	8%
Session3	33%	16%	8%

The socially shared regulation group (SSRG) showed the most frequent and complicated social interaction among its members. In other words, the frequency of one-to-one correspondence was highest in the socially shared regulation group, where all members contributed relatively equally to the group's discourse, and lowest in the other-regulation group (ORG). The mixed regulation group (MRG) had the second highest percentage of one-to-one correspondence between members. This group's social interaction was still an intricate network of relationships. The other-regulation group (ORG) revealed the least complicated social interaction pattern among members in CSCL.

Centrality: equal contribution vs. dominant contribution

In social network analysis, centrality revealed the social interaction pattern among members in CSCL and helped identify the most influential member in the group interaction and knowledge exchange, whereas density disclosed the overall group interaction pattern. Centrality was measured based on the number of comments and sending and receiving of feedback within the group. Centrality detected the presence of a dominant member in each group, which was essential in this study since the existence of a dominant member indicated that the group's regulation pattern was other-regulation.

Centrality is the frequency of one-member-focused dialogue. Higher centrality indicates a higher chance of a dominant member in the group discourse (Lowes et al., 2006). A centrality of 100% denotes that the group had one dominant member who talked to all members and was talked to by all members. In Table 10, the centrality of the three sessions in SSRG was 3%, 5%, and 6%, respectively. I interpreted this to mean that SSRG showed well-balanced contributions among its four members, where all four members had a similar contribution ratio throughout the three sessions. Moreover, no

dominant member was observed throughout the sessions. Thus, this group was categorized as a socially shared regulation group.

Table 10

Centrality: Three Groups' Equal Contribution

	SSRG	MRG	ORG
Session1	3%	9%	8%
Session2	5%	11%	14%
Session3	6%	11%	13%

Unlike SSRG, MRG and ORG had a tendency for dominant members (other-regulation). Still, there was no clear guideline for interpretation between the SNA results and the main regulation pattern. However, the SNA results can be interpreted to suggest that the chance of the existence of a dominant member ranked was lowest in SSRG and highest in ORG.

Centrality increased from the first session to the third session in all three groups, signifying that the reliance on one or two members tended to increase over time in CSCL. The dominant members gradually increased their engagement by providing instructional comments, suggestions, monitoring, and evaluation to the other members.

In MRG, Abby was the dominant member who exchanged the most dialogue with all members in the first session. She provided the most comments to Merrill, followed by Kate and Lily. Kate was the second most dominant person to send comments to the other members, providing the most comments to Merrill, followed by Abby, Lily, and Louise.

This reveals that there were two dominant members (Abby and Kate) in MRG and that members displayed other-regulation in the first session.

In the second session, Abby was the single dominant member to send comments to all other members. She exchanged dialogue with Louise, Lily, Merrill, and Kate. Similarly, in the third session, Abby was still the dominant member, sending and receiving the most messages. She sent fewer messages compared to the second session. Meanwhile, the frequency of participation increased for all other members. Therefore, MRG's group regulation was socially shared regulation in the last session.

SSRG's members maintained equally distributed contribution to the discussion across all three sessions, while there was an increase in unequally distributed contribution in MRG and ORG with one or two dominant members.

ORG showed the existence of a single dominant member, Keve, throughout the three sessions. In the first session, Keve and Emily provided the most comments. In the second session, Keve was the single dominant person while Emily's contributions were reduced. Along with the existence of a dominant leader, Emily, Nataly, Alena, and Tracy posted 44, 30, 26, and 26 messages, respectively. The remaining members' contributions were mostly balanced. Thus, Keve played the role of leader and the other members passively participated in the discussion. Similar to the second session, one dominant leader and four members were detected in the third session. Interestingly, all members decreased their number of verbal exchanges over time.

Content Analysis: Three Group Regulation Patterns

The aim of research question 2 was to identify different regulation in CSCL and to investigate any change in regulation over time and throughout the three tasks. After I

defined each group's regulation pattern, I conducted an in-depth descriptive analysis of each group's regulation pattern with content analysis and an analysis of responses from the survey questions.

Initially, I attempted to identify whether each group's regulation pattern was socially shared regulation or other-regulation. However, I found another pattern where a group shifted its main regulation pattern from other-regulation in the first session to socially shared regulation with time, which I labeled as mixed. While SSRG maintained socially shared regulation throughout the three sessions, MRG changed its primary regulation style from other-regulation (Tasks 1 & 2) to socially shared regulation (Task 3). As such, this group was categorized as a mixed regulation group. This group's main regulatory process was mixed between socially shared regulation and other-regulation; in the first session, more other-regulation and less socially shared regulation was used. However, in the second session, this group used more socially shared regulation and less other-regulation. By the last session, this group dominantly used socially shared regulation. Overall, this group's main regulation changed. Similar to MRG, ORG maintained other-regulation over time, and one dominant member led the group's discussion throughout the three sessions. SNA results verified my identification of these three group regulation patterns. Thus, I focused on a deeper understanding of these three group regulation patterns through content analysis.

Chapter 4 focused on a single instance of discourse, analyzing a short exchange among members and identifying the occurrence of the regulatory process. However, in Chapter 5, I focus on who regulated the group (socially shared regulation group or other-regulation group), the discourse from the entire session, and identify the group's core

regulatory process. I discuss each group's regulation and its change for an in-depth understanding of group regulation patterns.

Table 11

Frequency of Contribution and Regulation by Group and Session

Group	Name	Session 1		Session 2		Session3	
		#of	# of	#of	# of	# of	# of
		post	regulation	post	regulation	post	regulation
SSRG	Camila	78	69	65	56	108	52
	Jimmy	80	68	99	78	148	83
	Gina	85	77	75	68	111	56
	Lucio	70	62	58	54	82	58
MRG	Kate	48	27	30	20	41	26
	Lily	11	8	26	18	25	13
	Abby	61	39	69	45	63	42
	Merrill	48	24	40	19	51	19
	Louise	37	17	47	23	45	22
ORG	Emily	31	17	18	12	30	14
	Tracy	17	9	11	6	10	9
	Nataly	19	14	15	9	11	6
	Alena	25	13	14	9	23	11
	Keve	27	23	27	22	33	29

Notes: SSRG = Socially Shared Regulation Group. MRG= Mixed Regulation Group. ORG= Other-Regulation Group.

Table 11 illustrates each group member's frequency of contribution by presenting the number of posts in the chat room and the number of regulation moves each member

made within a group. In terms of the number of posts, the SSRG showed the most messages posted in the chat room, followed by the MRG. The ORG posted the lowest number of posts across three sessions compared to SSRG and MRG.

In the SSRG, Jimmy posted the most frequently, but the frequency of regulatory contributions from all members was balanced the three sessions. In the MRG, Abbey posted the most messages in the chat room and made the most regulatory moves across the three sessions while Lily contributed extremely little to the online discussion and made the fewest regulatory moves among members. In the ORG, regardless the number of posts, Keve's regulatory contribution was the highest across the three sessions. In terms of the length of each post, one post in the SSRG and MRG included one sentence while one post in the ORG included 3 to 5 sentences. Therefore, the descriptive statistic of "number of posts" does not reflect the entire length of the conversation.

Socially shared regulation group (SSRG)

In Table 12, a variety of cognitive regulatory processes occurred throughout the three sessions. The SSRG showed similar frequency of regulatory processes across the sessions. However, there were differences among the regulatory processes. This group spent much time on planning and goal setting and scheduling and role assignment. Members began their discussion to develop a common ground among members regarding the group's goals and plans for a particular session. Additionally, this group spent more time on content monitoring than task monitoring, and more time on content evaluation than task evaluation. The most frequently observed regulatory process was content monitoring, suggesting that this group focused on checking whether their answer to the guiding question was right or wrong.

Table 12

Instances of Regulatory Process in SSRG

Regulatory Process	Session1	Session2	Session3
Planning and Goal Setting	23	23	19
Scheduling and Role Assignment	25	9	15
Task Monitoring	12	10	17
Content Monitoring	37	35	22
Task Evaluation	3	2	1
Content Evaluation	7	11	11

I identified four features of the socially shared regulation group in CSCL. First, a notable feature of this group was that all members participated in all regulatory processes. Joint regulation included three phases. Initially, one or more members asked to discuss a topic by posting a guiding question or generating a question. Next, several members attempted to prompt answers. In this process, members exchanged ideas and tackled another member's idea. Thus, argumentation occurred. Finally, members voiced their agreement or disagreement by expressing their opinion. Once the group reached mutual agreement on their answers, they moved on to the next question. Making suggestions as a starter and mutual agreement on the correct answer match the definition of socially shared regulation.

Second, the socially shared regulation group spent much time planning and goal setting by discussing the group's objectives and clarifying its shared plans and goals. This group valued their planning and goal setting regulatory processes with members by posting many messages about their planning regulatory processes.

One feature of the socially shared regulation group in planning and goal setting was that high quality content planning occurred. Members attempted to involve not only a task planning process but also a content planning process. A notable part of planning was that content planning was generated not by guiding questions but by the members. Guiding questions did not ask members to review the important concepts in educational psychology theory. However, members in the socially shared regulation group reviewed the concepts and developed a common ground for further discussion.

Figure 18

Planning and Goal Setting in the SSRG

Camila: OK. Let's answer number 1! (*planning and goal setting*)
Jimmy: So let's just review now. We're here and waiting, so we might as well be productive. (*planning and goal setting*)
Gina: OK. Start it up. (*planning and goal setting*)
Jimmy: What are the four Mnemonic Devices? (*planning and goal setting*)
Camila: What's in chapter 5? (*planning and goal setting*)
Gina: Umm acronym and 3 others that i can't remember right now (*planning and goal setting*)
Camila: Right (*planning and goal setting*)
Gina: Well, this is a promising start! (*planning and goal setting*)
Camila: Woo! (*planning and goal setting*)

In Figure 18, Camila, Jimmy, and Gina each set forth a plan. All together, these three members contributed to the planning regulatory process. Jimmy suggested that members reviewed the theory they discussed that day. This is an instance of content planning, which rarely occurred in this study. After Jimmy suggested reviewing key concepts of information processing theory, he and Camila posted important concepts and

led the group discussion. Each member contributed to this regulatory process by providing suggestions or agreement. The content planning process was important because through this short exchange of conversation, all members shared the common plan for further discussion.

A second feature of the SSRG in the regulatory process of planning and goal setting was that goal setting occurred intentionally and played a role in developing the shared task goals among members. I observed the emergence of goal setting in sessions 2 and 3. Each task provided clear goals so that the group could pursue the correct task goal with or without discussing the task goals. However, the socially shared regulation group spared time to set their own task goals or to clearly articulate and confirm their understanding of the task goals. Goal setting did not occur in session 1 but in sessions 2 and 3. Gradually, more members contributed to the goal setting regulatory process. During the session, the task goals were elaborated from a list of task goals in the second session to negotiation among members in the third session. The number of instances also gradually increased. For example, in order to solve Task 2 in the second session, Jimmy stated, "Let's do the plan first," and Lucio initiated the goal setting process, saying "OK. Goals first." However, the members focused on discussing role assignments. Later, Lucio reminded the members to set up the group's goal again, asking, "So, goals?" This made all members focus on the goal setting process and, as a result, Lucio and Jimmy set up the group's goal for the second session. In the third session, Jimmy asked the group, "What are our goals?" This question worked as a starter. Gina's response, "To answer the questions using social constructivist theories," and Lucio's, "To answer the questions in the time period using as many terms as we can," contributed to a goal setting regulatory

process. Jimmy and Camila agreed on the task goal set by Gina and Lucio. The task goal, negotiated by all members, provided the standard that guided the group. In conclusion, I interpreted that the SSRG intentionally negotiated task goals so that all members shared a common standard and goal for the session.

A third feature of the SSRG was group cohesion. I observed the motivational regulatory process in SSRG even though I focused on the cognitive regulatory process in CSCL. Group cohesion occurred with group members' solicitude for each other. Examples of group cohesion were: "Just saying, what if something came up with him and he missed this?" and "I wouldn't want that to happen to me." I also observed an instance of perspective taking. The socially shared regulation group had difficulty scheduling the date and time. In Table 12, the number of scheduling and role assignment instances was high in sessions 1 and 3 because this group rescheduled both sessions.

Figure 19

Group Cohesion of the SSRG

Camila: Well, let's just start. (*planning and goal setting*)

Jimmy: I don't think we should start without him. It would kind of screw him. (*planning and goal setting*)

Camila: All right. Well, we only have an hour. (*planning and goal setting*)

Gina: I vote we start and then if he joins in on the chat we'll catch him up on what he missed. (*planning and goal setting*)

Jimmy: I mean, it's not due until Monday, I don't think. We could just talk to him in class tomorrow if he doesn't show and we could reschedule it. (*planning and goal setting*)

Camila: Good idea. (*planning and goal setting*)

Jimmy: Just saying, what if something came up with him and he missed this? I wouldn't want that to happen to me. What other times would you gals be available to reschedule? (*scheduling*)

Camila: I mean I can do tomorrow night. (*scheduling*)

Gina: My schedule is kind of hectic the next 2 days but I'm good with anytime Saturday or Sunday. (*scheduling*)

Camila: Sunday night would be preferable. (*scheduling*)

Gina: That's cool with me. (*scheduling*)

In Figure 19, one member missed the initially scheduled session. Therefore, the other three members discussed how to solve this problem and rescheduled their session to include the absent member. I observed that these four members usually formed a group together in class. I assumed their close relationship in class carried over to their online learning. My second assumption was the importance of Jimmy's suggestion to reschedule the session. This short conversation was evidence that this group developed solicitude and positive emotion.

The use of the word "we" was observed throughout the session. In particular, the most instances of the use of "we" occurred in evaluation processes. For example, Camila said, "Yes, we went through everything step by step" and Lucio said, "We ranked them in order and supported those rankings with cognitive theory concepts." Both Camila and Lucio viewed their discussion as a group task and evaluated the performance as a group by using "we."

I also observed an off-task discussion that cultivated positive emotion. SSRG began with an off-task discussion such as a midterm exam or an ice-breaking joke and smoothly transferred to a task-related conversation and/or from one guiding question to the next question. Their ice breaking conversation made all members contribute to online chatting and posting of ideas.

In conclusion, the occurrence of group cohesion in CSCL disclosed that members thought of themselves as a member of this online learning community while viewing each member as a part of this community. Caring and off-topic conversations created positive emotion, bringing all members out of their shells to actively participate in synchronous online conversations.

A fourth feature of the socially shared regulation group was high quality monitoring and evaluation regulatory processes. This group spent time reviewing and summarizing what they discussed, and all members participated in deciding when to go on to the next question. Thus, the transition from one guiding question to another was smooth through mutual agreement among the members.

Figure 20

Task Monitoring of the SSRG

Gina: Yes. OK. I think we covered this one pretty well. (<i>task monitoring</i>)
Jimmy: I think we should discuss the negative vicarious reinforcement Tyler's presence in the classroom presents. (<i>task monitoring</i>)
OMIT
Lucio: Alright I think we got 3 right? (<i>task monitoring</i>)
Gina: Yes, I think so. (<i>task monitoring</i>)
Jimmy: Did we list any advantages? (<i>task monitoring</i>)
Camila: Yeah we listed advantages in the beginning right? (<i>task monitoring</i>)
Jimmy: Can we quickly reiterate what they are? (<i>content monitoring</i>)
Lucio: Yea, collective efficacy. (<i>task monitoring</i>)
Jimmy: Yeah, but... (<i>task monitoring</i>)
Camila: He'll model behavior from the general ed students so he won't act up in class.
Lucio: He sees that the community (in this case the classroom) works better when we work together and what Camila said. (<i>content monitoring</i>)
Gina: Yes and vicarious reinforcement if the other students' behavior positively influences Tyler's. (<i>content monitoring</i>)
Camila: There you go! I was just going to say that. (<i>content monitoring</i>)
Jimmy: Hmmm, actually never mind. You're correct. (<i>content monitoring</i>) So then I guess we're ready to move on to number four? (<i>task monitoring</i>)
Camila: Is there anything else? (<i>task monitoring</i>)
Gina: Word.
Camila: Cool. (<i>Task Monitoring</i>)
Lucio: Yep. (<i>Task Monitoring</i>)

Figure 20 is an example of task monitoring in the socially shared regulation group. Gina confirmed that the group answered guiding question 3, stating, "Yes. OK. I think we covered this one pretty well." However, Jimmy suggested that they needed to discuss the notion of negative vicarious reinforcement. They discussed negative vicarious

reinforcement and Lucio confirmed with the group, “Alright I think we got 3 right?” and Gina agreed. The group then spent time summarizing what they discussed. Finally, all members agreed to move on to the next question. Accordingly, this group’s discourse on monitoring and evaluation regulatory processes was high quality regulation across the three sessions.

High quality monitoring and evaluation in the SSRG was attributed to metacognitive learning, various strategic actions, and high risk taking attitudes. This group’s learning process was metacognitive, in that they ascertained the completion of their task as well as the accuracy and quality of their answers. The dominant occurrence of content monitoring regulated processes throughout the three sessions proved that the members in the socially shared regulation group metacognitively checked and confronted each other’s perspectives, resulting in high quality regulation. Monitoring and evaluation regulatory processes were not regulated by a dominant member but by all members. By providing agreement and disagreement and presenting various views, members of this group learned more deeply. I observed that the members presented their disagreement as well as agreement many times as well as expressed their embarrassment. Along with a content monitoring regulated process, there was conflict among the members while solving the three tasks. This conflict was produced by the cognitive processes required for group discussion.

Next, the SSRG used various strategic actions to handle conflicts from different views and to delve deeper into their discussion. I observed this group to use elaboration, reasoning, and instruction throughout the three sessions. In terms of elaboration, this group connected various educational psychology concepts and terminologies they

discussed at the beginning of the discussion with the current guiding question. Therefore, SSRG applied what they learned from the class to the three tasks in CSCL. Elaboration was not limited to course concepts but also included the members' previous personal experiences, such as previous schooling experiences, student teacher experiences, and other education-related course content.

Examples of elaboration were presented as follows. In the first session, Lucio revealed his personal coaching experience as a teacher. Gina also shared her own observation experience regarding how modeling worked, stating, "I've been observing an elementary school class for introduction to education and this morning I was there and my observing teacher will compliment when other kids are doing right and this way the others see for themselves what behavior they need to be doing and shell also have them then pass a compliment onto another student who is behaving well so they can model for each other. It's ridiculously effective." Camila added her own observation experience, "I observed a special education elementary class and they would reinforce the students with food if they did something right." Most members applied their personal experiences as well as course concepts into their discussions. It improved the quality of discourse as well as regulation in CSCL.

Reasoning was also observed throughout the sessions. Figure 21 illustrates an example of reasoning in the socially shared regulation group. Task 2 required members to rank four students' learning strategies on a history exam. Jimmy presented his idea that rehearsal is not the strongest learning strategy while Lucio had an opposing view. Jimmy and Gina confronted Lucio's idea by asking a question and providing a different perspective from Lucio. Next, Lucio provided a reason and an example to support his

view. Also, Jimmy argued and corrected Lucio's view, noting that Lucio's example of "flash cards" is not an example of rehearsal but an example of elaboration. In this example, reasoning was the process of argumentation and decision making, where mutual agreement on the correct answer was eventually reached.

Figure 21

Reasoning in the SSRG

Lucio: Alright, so we agree on those (*content monitoring*), now let's evaluate them. Rehearsal, good or bad? (*planning and goal setting*)

Camila: You know it. (*content monitoring*)

Jimmy: Ooooh ok. I think the most effective is the elaboration start with A. Rehearsal isn't bad, but it's definitely not the strongest of them.

Lucio: I'd say it's a fine strategy for most people, its proven flash cards help people remember the material, but is it better for long-term memory?

Jimmy: Would that be a form of organizing material as well? (*content monitoring*)

Gina: I think that rehearsal is very effective for the short-term when studying for an exam. (*content monitoring*)

Jimmy: Gina is right. (*content monitoring*)

Lucio: I find in the past it was good for like a few weeks, then I kind of just moved on haha. Elaboration is better, like you said. (*content monitoring*)

Jimmy: I think we neglected that aspect, but in number five, lol, I mean in D, they said that they picked that information themselves that they used. (*Content Monitoring*)

Lucio: And what's your question? (*task monitoring*)

Jimmy: Would that be part of organizing notes? (*task monitoring*)

Gina: So what they studied was done effectively but the actual material might not have been. They can't accurately judge what is an important moment in history. They should be studying everything.

Jimmy: That's a really good point, I hadn't thought about that. (*content monitoring*)

Camila: Yeah, I agree. (*content monitoring*)

Lucio: Yes. (*content monitoring*)

High risk taking was observed, contributing to high quality regulation as well as high quality discourse. The members tended to easily take risks in arguing with or correcting others. Heated controversy was observed throughout the three sessions. It was not easy to present an opposing view in discussion because it could create anxiety or

discomfort among the members. However, they persisted in taking risks by presenting a different view or disagreeing. In Figure 21, Gina and Lucio thought rehearsal was an effective learning strategy for a short term period. Initially, Jim took a different perspective but he eventually changed his perspective because of Gina's and Lucio's explanation. Also, Lucio viewed "flash cards" as rehearsal, but Jimmy challenged his idea, arguing that "flash cards" are an elaboration as a form of organizing material. They kept challenging each other to go deeper, actively regulating each other's learning process. This conflict allowed members to consider several perspectives and eventually develop a shared task perspective.

This risk taking appeared to be related to group cohesion. The socially shared regulation group used the words "we, our, us," representing that they felt group cohesion as members of a learning community in CSCL. This group's members experienced many instances of risk taking and more self-disclosure of negative emotion and disagreement. In Figure 21, Jimmy confessed he had not thought about Gina's and Louise's proposed view. Interestingly, Jimmy stated, "We neglected that aspect" instead of "I neglected that aspect" and attributed this to the group's shared perspective instead of his own. This showed that he recognized the learning process as a shared problem solving process and identified himself as a member of this group. In conclusion, the members challenged each other easily, but did not feel that they were judged by others. Overall, this example proved that this group's learning processes were regulated collectively by all of its members because of a metacognitive process and strategic actions as well as high risk taking and group cohesion, which resulted in high quality regulation.

Mixed regulation group (MRG)

Similar to SSRG, the main regulation type for MRG was socially shared regulation. However, the main group regulation pattern shifted from other-regulation in the first session to socially shared regulation by the third session. A variety of cognitive regulatory processes occurred throughout the three sessions in MRG. Table 13 illustrates the overall cognitive regulatory processes MRG used for regulating their learning process in CSCL.

A notable feature of MRG was the focus on the group's planning regulatory process such as planning, goal setting, scheduling, and role assignment. In planning processes, MRG developed a common ground of task understanding and set shared group goals. However, this group's goal setting processes occurred in the form of restating the task assignment generated by the instructor, which is low quality regulation. In terms of monitoring, this group was more involved in content monitoring process than task monitoring, meaning that MRG focused on the answer to the guiding question. Members posted their task response and then others provided feedback as joint content monitoring. The number of the instances of task monitoring ranged from 8 to 10, meaning this group checked the completion of all guiding questions. Similarly, this group involved the process of content evaluation more, ranging from 5 to 9 instances, compared to task evaluation, which ranged from 1 to 4 instances. In other word, this group evaluated the accuracy of the task solution rather than of task completion. In most instances, this group smoothly moved from one guiding question to the next.

Table 13

Instances of Regulatory Process in MRG

Regulatory process	Session1	Session2	Session3
Planning and Goal Setting	17	28	9
Scheduling and Role Assignment	14	21	24
Task Monitoring	8	10	8
Content monitoring	40	28	29
Task evaluation	1	4	1
Content Evaluation	6	9	5

The reason to identify this group as a mixed regulation group, despite the occurrence of socially shared regulation, was the existence of a dominant and directive member, making it impossible for this group to be identified solely as a socially shared regulation group. MRG shifted its main regulation pattern from other-regulation, where two dominant members among members existed, to socially shared regulation, where all members shared regulation and equally participated across the three complex tasks. From the first session, all members equally regulated their learning process although two members attempted to dominantly regulate the entire group's learning process. I explain each session's main regulation in depth.

First, the main regulation of the first session in MRG was other-regulation. In the first session, MRG exhibited a variety of group interactions. I observed two dominant

members regulating and instructing the whole discussion process, similar to what a teacher does. In particular, the dominant members restricted the others' regulatory processes and engagement. For example, Abby, a dominant member, posted the guiding questions and decided to move on to the next question. However, Kate, the more dominant member, instructed the others on what to do. When Abby posted three guiding questions in a row, Kate stopped her from posting them, firmly telling her, "Time out! Let's take care of question 1 first." In this occasion, Kate played the role of leader as well as instructor by providing directions to follow.

Interestingly, this directive caused tentativeness in CSCL. Since this was a synchronous online discussion, members could not read each other's facial expression, but were still able to express a sense of tentativeness. Once Kate posted the directive instruction, "Time out! Let's take care of question 1 first". Abby apologized with "sorry". Similar occasions were observed throughout the first session. For example, in Figure 22, Kate instructed the other members to end their discussion because the group skipped the first guiding question and began discussing the second guiding question. When Merrill and Abby tried to discuss the second guiding question, Kate instructed, "No, I'm talking about the question about individual goals and group goals and roles and time and group summary." This comment made everyone pay attention to guiding question 1 regarding goal setting and role assignment. This was an instance of other-regulation, where one member, Kate, regulated the group's learning process while the rest followed her direction. This action limited the entire group's autonomy and freedom. Kate's comments occurred in the planning phase such as goal setting and role assignment were comparatively directive and caused the group's tentativeness.

Figure 22

An Instance of Other-Regulation in the MRG

Merrill: Allie said that he had never screamed before until after having been in a class with Marcus.

Abby: Right. (*content monitoring*)

Kate: No, I'm talking about the question about individual goals and group goals and roles and time and group summary. (*task monitoring*) What's our group goal? (*planning and goal setting*)

Kate's instructional comments were related to the group's planning and task monitoring regulatory processes. I observed that her instructive comments throughout the first session which regulated the group's learning process in CSCL. Kate posted an instructive message whenever the group moved on from one guiding question to the next. For example, "OK. Good, so we can answer question 2 now," "Let's start with advantages," and "What is our group task solutions?". Kate played the role of leader with instructional comments while the other members simply followed her instructions. These instructional comments in the first session were identified with other-regulation.

Although Kate posted many instructive messages and regulated the online group discussion, MRG's members made a constant effort to regulate their learning process jointly by asking questions, making suggestions, and voicing agreement/disagreement. As a result, I observed Kate's instructions gradually disappeared with time. It was very important for the members to cultivate the group's socially shared regulation despite the existence of a directive dominant member.

After completing planning and goal setting and role assignment regulatory processes, the group moved toward a discussion of Tyler's case, where Abby, Merrill, Louise, and Lily actively participated in the discussion. Although Kate dominantly regulated the group discussion in the first session, I observed several discourse instances

of socially shared regulation processes. Figure 23 illustrates an instance of socially shared regulation in MRG's first session. Lily began off discussing a disadvantage of placing Tyler in a normal classroom despite his dyslexia. Abby monitored Lily's idea and expressed her disagreement. All five members engaged in this discourse to exchange ideas and to monitor each other's comments.

Figure 23

An Instance of Socially Shared Regulation in the MRG

Lily: Yeah, but of course a disadvantage is that he doesn't necessarily get an attention for his dyslexia that he needs.

Abby: This is not entirely true. (*content monitoring*)

Louise: Another disadvantage is that he may feel more challenged then he should, causing lots of frustration.

Abby: He still leaves the room in the morning for individual help with reading.

Louise: I feel like he is more disadvantaged in the resource room, because the teacher has to care for multiple students that have behavior problems as opposed to a regular classroom where a teacher would only deal with Tyler's.

Merrill: He could actually become even more frustrated by his dyslexia if he were surrounded by students who had fewer difficulties reading.

Lily: That's very true. (*content monitoring*)

Kate: I think another possible disadvantage is that the other kids in the class could model his behavior. Modeling works both ways.

Louise: But it would also be another disadvantage to the other students if Tyler keeps misbehaving and disrupting the class, they might also begin to mock his behavior.

Merrill: True. (*content monitoring*)

Louise: I agree Kate. (*content monitoring*)

Louise: So how can we fix this? (*content monitoring*)

Interestingly, Louise's question, "So how can we fix this?" was of high quality regulation because it was not prompted by a guiding question but was generated on her own. This question led the group to voluntarily go deeper to solve Task 1. Therefore, the quality of socially shared regulation was high since the five members guided and confirmed appropriate expressions in CSCL and one member generated a high quality question that required the use of the group's higher order thinking skills, which

developed and maintained socially shared regulation in this discourse instance. Finally, the group shared the group's regulation processes. MRG also shared the task perspective on Tyler's impact in a normal classroom.

MRG showed smooth transition from the first session to the second session. Each member posted asynchronously the time and date he/she was available in the chat room between the first session and the second session. This scheduling was categorized as a socially shared regulatory process because all members were involved with the regulatory process. Luckily, this socially shared regulation in scheduling was followed by group cohesion in the second session.

Second, the main regulation of MRG in the second session was in between socially shared regulation and other-regulation. The second session showed more socially shared regulatory processes and less other regulatory processes than the first session. However, mixed regulatory processes still existed. Other regulatory processes came from by Kate. Similar to the first session, Kate's instructional comments, such as "Time out, let's talk about b," "What specific way do you have in mind, Louise?" and "I agree, so why do you (Louise) think that they have a theory to define them?" regulated the other members' learning processes.

Yet, the second session was more socially shared regulation overall because Abby, Merrill, and Louise contributed actively to the discussion and well-balanced participation across the members was observed. The atmosphere for MRG's second session was very friendly. The group attempted to work on Task 2 by starting with a plan. All members easily asked questions and suggested plans. Revealingly, Abby played the role of leader in the second session by providing suggestions because she initially posted a question as

a starter. Her postings were not a directive instruction but as a starter in an exchange of discourse. The other members also suggested plans and ideas.

All members actively regulated their planning, goal setting, and task and content monitoring processes jointly. In terms of a monitoring and evaluation regulatory process, all members made balanced contributions to their online discussion, demonstrating socially shared regulation. Although I observed instances of other-regulation, the second session moved towards socially shared regulation rather than other-regulation. Due to the occurrence of both socially shared regulation and other-regulation, I categorized MRG's second session's main group regulation pattern as a mixed regulation.

Figure 24

An Instance of Mixed Regulation in the MRG

Abby: Hey! Ok, so when everyone gets here we need a timer and a reporter to write the summary. *(role assignment)*
Lily: I'll write the summary! *(role assignment)*
Kate: I did it last time. *(role assignment)*
Abby: Ok awesome! I'll time and post questions :) *(role assignment)*
Kate: I meant someone else should do it since I did it last time. *(role assignment)*
Louise: Ok, I was going to say i could write the summary too, but Lily beat me to it!
(role assignment)
Kate: Oh, I didn't see Lily, never mind. *(role assignment)*
Abby: We should wait a few minutes for Merrill *(planning and goal setting)*, but here's the first one: Identify the employed memory strategies that each interviewee says that he/she used. *(planning and goal setting)*
Kate: So we're just waiting for Merrill? *(planning and goal setting)*
Lily: Haha while we wait for Merrill do you guys want to go over our goals for the night first? *(planning and goal setting)*
Kate: Sure. *(planning and goal setting)*
Abby: Yup! Good plan. *(planning and goal setting)*
Louise: Sounds good. *(planning and goal setting)*

Figure 24 shows the example of how, Abby led a discussion as a starter by prompting suggestions while the other members contributed to this planning process by splitting up the roles and asking questions. Abby suggested the plan to assign roles. This

planning regulatory process was regulated by Abby as well as Lily, Louise, and Kate, illustrating an instance of socially shared regulation.

However, Kate's instructional comment came up again. She said, "I did it last time" and "I meant someone else should do it since I did it last time." Her comment ordered the other members and regulated the discussion. However, in the second session, her comment did not restrict the other members' engagement or caused tentativeness.

A key feature of the second session in MRG was the coexistence of socially shared regulation and other-regulation. Another feature of this session was that less negative emotion was observed. In the first session, nine instances of tentativeness were observed, particularly related to Kate's directive comments. However, in the second session, only three instances of tentativeness were seen. Fewer instances of other-regulation and tentativeness suggested that MRG's members dealt with Kate's directive instruction more smoothly.

Third, MRG members regulated their online discussion jointly in the third session. The main pattern of the third session was socially shared regulation. All members got involved with all regulatory processes; for instance, four members participated in goal setting when Abby asked to discuss a group goal, three members (Abby, Louise, and Lily) presented group goals, and all five members (Louise, Merrill, Lily, Abby, and Kate) agreed and gave feedback. The goal setting process was regulated by all members equally so that this process was a socially shared regulatory process. In the first session, the most instances of other-regulation occurred in planning and goal setting and a directive dominant member ordered the rest of the members. Compared to the first session, no other-regulation occurred in the planning and goal setting process of the third session.

Here, I describe four notable changes I observed between the first session and the third session: strong group cohesion, complex social interaction, flexibility and risk taking. Unquestionably, the largest change was strong group cohesion, making socially shared regulation possible. Group cohesion was observed throughout the session. In particular, it occurred as a form of caring about a member's posting instead of ignoring it. For example, Merrill asked, "I think this is called procedural facilitation as well?" but no one responded. Later, Abby reminded the others of Merrill's question, by reposting his question. This instance illustrates that this group did not ignore one member's message. The CSCL environment is unique in that several members can post messages concurrently. Therefore, it is easy to ignore some messages because it is hard to catch up on all the messages. Abby's effort to get a response to Merrill's question was meaningful in the group learning process, illustrating members' care and sense of a learning community.

Second, complex social interaction was another instance of group cohesion, as displayed in Figure 25. Merrill did not understand Abby's question and Louise answered on behalf of Abby. Third, flexibility was observed in the third session, where an instructional comment was handled flexibly.

In Figure 25, Kate monitored MRG's task process when they skipped a question, noting, "We skipped 2c." Kate's informative task monitoring regulatory process was instructive. However, the others did not ignore Kate's instructive message or were regulated by her. Instead, they actively responded. For instance, Abby monitored whether this group missed one guiding question.

Figure 25

Group Cohesion in the MRG

Abby: How could you make this writing task and lesson even more social constructivist? (*planning and goal setting*)

Merrill: Was that a part of the assignment? (*task monitoring*)

Abby: What? (*task monitoring*)

Louise: Yea, That's question 3 Merrill. (*task monitoring*)

Abby: 3. How could you make this writing task and lesson even more social constructivist? (*task monitoring*)

Kate: We skipped 2c. (*task monitoring*)

Louise: I would say peer reviewing.

Abby: Oh we did. 2.c. What cultural tools are being taught within this assignment? (*task monitoring*)

Abby: It doesn't really mention any tools.

Merrill: Language, pencil, paper.

Kate: Brainstorming. That is, thinking creatively.

Louise: Writing and expansion of ideas.

Kate: Awareness of the senses.

Merrill: Could snow even be counted as one or at least weather? (*content monitoring*)

Lily: Past experiences? (hot chocolate after playing in the snow) because some are culture specific experiences?

Kate: I don't think weather counts because it was only one kid that wrote about snow but past experiences is definitely legit. (*content monitoring*)

Louise: Well snow is being used with "all the sense" so I think that it could. (*content monitoring*)

Louise and Abby said that they had already discussed that question. However, the members reviewed and monitored how accurate their previous answers were. In this process, MRG smoothly returned to Kate's comment and began discussing this topic. In the first session, whenever Kate posted a directive message, the rest simply followed. Therefore, I determined that MRG was regulated and monitored by all members. This group truly developed and maintained socially shared regulation in their online learning process.

Lastly, risk taking needed to be addressed. The members easily took a risk to express their embarrassment and to ask questions when they did not comprehend.

Additionally, they expressed their disagreement comfortably with each other. In Figure 25, Merrill suggested “snow” could be a cultural tool from a social constructivist perspective. Kate had an opposing view and confronted his posting. Louise disagreed with Kate’s view while agreeing with Merrill’s view. This short exchange proved that group cohesion was developed enough for the members to take risks.

In the beginning of the first session, MRG began as an other-regulation group but shifted to a socially shared regulation group by the third session. In the last session, all members took turns as leader by providing suggestions and asking questions, getting the group discussion delved deeper and deeper. The reason this group developed socially shared regulation and decreased other-regulation over time was that all members actively participated in their discourse and monitored each other’s messages.

Other-regulation group (ORG)

There were four features of the other-regulation group (ORG). The most notable feature was the existence of a dominant member. ORG’s three discussion sessions were dominantly regulated by Keve. Keve posted the most comments throughout the three sessions. Moreover, Keve posted twice as many comments as the rest of the members in the second and third sessions. Apart from the number of postings, Keve planned and the rest simply followed his plan.

The second feature of ORG was that the group’s discourse was co-constructed by all members, even though its main regulation pattern was other-regulation. ORG focused on constructing knowledge and, practically, answering to the guiding questions and finding final task solutions. Table 14 shows that most of the online postings were related to the content monitoring regulatory process. This group was unique because all members

attempted to collectively reach a common task solution by constructing shared knowledge.

Table 14

Instances of Regulatory Process in ORG

Regulatory Process	Session1	Session2	Session3
Planning and Goal Setting	14	10	11
Scheduling and Role Assignment	1	5	1
Task Monitoring	2	5	2
Content Monitoring	47	27	33
Task Evaluation	1	0	0
Content Evaluation	1	2	2

A third feature of ORG was the failure to develop socially shared regulation to regulate their learning process jointly. Keve acted like a teacher in setting the learning objective for the group, monitoring their learning and discussion process and submitting the group's summary report twice in the first and third sessions. The existence of directive dominant member kept the rest of the members to change in order to regulate the group's learning process.

Consequently, a fourth feature of the group was the lack of group cohesion. If observed, it was very weak. Aside from Keve, the rest of the members posted the answer to the guiding questions and checked whether they answered correctly or not. Thus, the

members failed to 1) develop a learning community to care for each other, 2) view the online group as “we”, and 3) take risks to disagree with other members’ ideas. Also, their log files were relatively brief compared to SSRG and MRG. These four features of ORG are discussed in detail with specific examples.

First, the existence of a dominant member prohibited the rest of the members to contribute in socially shared regulation. In the planning phase, one dominant member led the group’s planning, goal setting, and role assignment regulatory processes while the others rarely posted planning, goal setting and role assignment regulatory messages. If they did, it was in simple agreement to the dominant member’s plans, suggestions, or instructions. The influence of the dominant member’s instructive message on the planning process was clear when the three groups were compared in terms of the frequency of planning and goal setting, and role assignment. SSRG and MRG displayed more instances of planning, goal setting and role assignment than ORG, which exhibited other-regulation.

In Figure 26, Keve dominantly regulated and led the group’s discussion by instructing and deciding on all decisions on his own. Keve instructed the other members to voluntarily serve in the summary writer role. Nataly and Tracy responded to Keve’s message that they could not do it in this session. Four members exchanged discourse about who would summarize their discussion at the end.

By all appearances, this short exchange appears to be an instance of socially shared regulation because by definition, all members’ joint regulation was socially shared regulation. However, I defined this instance in Figure 26 as other-regulation. I focused on who regulated this short discourse. Keve initially posted a question as a starter. Next,

he responded to Nataly and Tracy's message. Alena then volunteered to write the summary and Keve agreed. Keve behaved, instructed, and responded as if he taught the group. He made the final decision in regards to the termination of the role assignment process, saying "We've settled question #1". Since this group's role assignment regulatory processes were regulated by Keve, I defined the short exchange of discourse, occurring as several role assignments regulatory processes in Figure 26, as an instance of other-regulation.

Figure 26

Planning, Goal Setting, Role Assignment in the ORG

Keve: Does anyone want to volunteer to write up the paragraph summary of the chat? (*role assignment*) I would be willing to do the next one (#3) if someone else could write this summary. (*role assignment*)

Nataly: I can do the next one, I don't have my book with me at home so I won't be able to do this one (*role assignment*)

Tracy: I can't write today's, like I said before, I'm at work. (*role assignment*)

Keve: Anyone else care to step up to the plate? You can always log on later tonight and write up a short summary. I waited a day to write up the last summary paragraph. (*role assignment*)

Alena: I'll write this one (*role assignment*)

Keve: Great, Alena! (*role assignment*) So, we should get started? (*planning and goal Setting*) We've settled question #1 (*task monitoring*), so let's move on to #2 onwards. What were the memory strategies used by each interviewee? Maybe we should just go to #4 and rank them in effectiveness and explain why, citing the memory strategies for test-taking effectiveness. (*planning and goal setting*)

Nataly: Okay, thank you! (*role assignment*)

Keve: I ranked them this way - D #1 (best), C #2, A #3 and A #4 (worst).

This group skipped the goal setting regulatory process in all three sessions. The only instance of goal setting was observed in Figure 26. However, Keve once again set the group's goal on his own. After he established the group's objective, saying "We should just go to #4 (*Planning*) and rank them in effectiveness and explain why, citing the memory strategies for test-taking effectiveness (*Goal Setting*)," he posted his ranking.

It is difficult to determine if the other members agreed or disagreed with Keve's plan and goal for this session since there were no further responses. The process of establishing shared goals among members was not observed.

The failure to develop shared goals later accounted for the group's superficial content evaluation. At the end of the session, the members were involved with content monitoring regulatory processes. Three members contributed to this process, but their evaluation was not meaningful. Figure 27 is an example of content evaluation regulatory processes observed in ORG. The guiding questions asked, "Did your group meet your initial plan or goals? To what extent does your group understand the central concepts of a cognitive theory (Information processing theory)?" However, this group did not quite answer these questions. I hypothesized that ORG did not agree on the group's shared goal and, therefore, their evaluation on their overall discussion and the final task solution did not compare their initial goals to the final task solution, resulting in superficial and low quality content evaluation.

Figure 27

Content Evaluation in the ORG

Keve: I think we've done a pretty good job on this task. (*content evaluation*)

Alena: I believe I have everything I will need :) (*content evaluation*)

Emily: I think we had a great discussion too! Great job, everyone! See you all in class tomorrow! (*content evaluation*)

Second, ORG co-constructed shared knowledge even though their regulation was not shared regulation but other-regulation. As previously mentioned, the main feature of ORG was a focus on the process of content monitoring. This group was barely involved in task monitoring and task evaluation regulatory processes. Instead, Keve decided when to move on to the next guiding question. Although other-regulation occurred consistently,

ORG answered all guiding questions. Not all members participated in goal setting, task monitoring, task evaluation and content evaluation regulatory processes, but this group actively monitored each other's message to decide whether the answer was right or wrong.

The use of strategic actions such as elaboration and reasoning was observed. I observed members in ORG contributed to the co-construction of knowledge by cognitively regulating their discourse and metacognitively checking the accuracy of their answers to the guiding questions. Members argued with each other by providing their reasons to support his/her perspective and persuade others. In this process, they used reasoning, elaboration, and instruction. Through knowledge exchange, ORG gradually developed shared knowledge. However, this group did not reach mutual agreement through negotiation on their final task solution.

The quality of discussion was neither too high nor too low. The members attempted to apply their prior knowledge or previous experience to the problem solving. For example, Nataly contributed her background knowledge in history to the group discussion, stating, "I think that D is the best way because, as a history major, I think it is best to understand how the events of history are influential and the way they have an impact on the overall history of America, it makes it easier to understand and remember." Likewise, Tracy brought up her personal experience, mentioning, "One of my teacher's in high school used this strategy to illustrate what would occur during protests in the 60s. He taught us how to properly get arrested. I think it definitely added something to the lesson. I do remember it after all this year." Alena attempted to take into account various

perspectives and situations. In order to solve Task 2, each member used high order thinking skills such as elaboration, self-reflection, and metacognition.

There were two reasons this group failed to develop socially shared regulation in CSCL. First was Keve's role as a leader in regulating the group's learning process in many instances. More importantly, Keve's instructive and directive comments literally ordered the other members around. Although all members actively contributed to the discussion, Keve interrupted and limited the others' thinking with instructional comments.

In Figure 28, the members found the solution to help Tyler, a dyslexic student, by having a reading specialist in the classroom. Emily tried to discuss a real-life challenge that the school budget would not allow for a reading specialist.

Figure 28

Directive Other-Regulation in the ORG

Emily: I also agree with Tracy's suggestion as well to have an assistant that focuses on helping Tyler learn, but I feel like the school budget and funding also becomes a part of that. What if the school can't afford to have teacher assistants in the classrooms? (*content monitoring*)

Keve: Emily, are you talking about how to include Tyler in activities given his reading problems, but how does SLT (social learning theory) and vicarious reinforcement/punishment fit into this? These are all good ideas, (*content monitoring*) but question 4 is about application of SLT and it seems to me that it doesn't have much to say about that. (*task monitoring*)

Keve noted that Emily's question was good but went beyond the basic requirement of the task. He said that the group should not talk about Emily's question. He dominantly regulated and limited the learning process so that the group did not go deeper than the guiding question. Furthermore, Keve's instruction kept the other members from taking a risk by posting any ideas or disagreeing with his instruction. As a result, this

group failed to develop socially shared regulation. Additionally, Keve's instruction resulted in fewer postings compared to SSRG and MRG.

Forth, group cohesion was not observed. When Keve suggested or instructed, he used the word, "we". For example, since ORG did not develop group cohesion, each member focused on answering the guiding question. Therefore, the members checked whether they answered each question correctly or not. However, discourse did not go beyond the task requirement. The length of their log files was relatively short compared to SSRG and MRG. As mentioned above, ORG focused on answering the task prompts.

Nevertheless, Keve's instructive comments were helpful in assessing task accomplishment in several ways. First, his comment made the group develop a shared task perspective. He suggested defining the theory, asking, "Perhaps we should define what constitutes social constructivism first?" His comment made the group have a common ground of the theory. His feedback was very useful in this case. Second, he constantly posted feedback to each member's messages. For instance, Keve responded to Tracy, posting, "Tracy - exogenous and endogenous are other forms of constructivism based on IP and Piagetian theory - social constructivism emphasizes Vygotsky a lot more." I observed many instances of a dyad made up of Keve and another member. Even in a group discussion environment, these instances were not related to dynamic group interaction but to dyad interaction. However, the dyad interactions and Keve's directive categorized this group's main regulation as other-regulation because they kept the members from developing group cohesion and equal status.

Keve's dominant participation caused negative emotion such as tentativeness. For example, Keve responded to Emily, saying "Emily, No. Not a disadvantage. I think that I

convinced myself that the step process actually does involve lessening cognitive load on working memory. It's when we brainstorm and write down the results that we can then go back to work with the ideas that we have generated.” Emily expressed her tentativeness, posting, “Oh! Okay, sorry. I was a little confused.” This instance occurred as a dyad interaction and brought negative emotion to the group. In conclusion, ORG failed to develop group cohesion and did not regulate its members’ motivation and behavior.

Voice from Members: Self-Reflection of the Group’s Regulatory Processes

In the previous sections, I identified three different group regulation patterns through content analysis and social network analysis of their log files. However, to understand how students reflected on their group’s regulatory process, data from the self-report survey completed by all the members after each session were analyzed to provide further confirmation. This analysis revealed how students reflected on their group’s main regulation pattern.

Descriptive statistics for the self-report questionnaire

Table 15 shows the descriptive data of the 13 groups’ self-report questionnaire for session 1, 2 and 3. Since the current study used three scales, Table 15 presents each scales’ descriptive statistics. The means of scale 1, 2, and 3 in session 1 were 4.29, 4.26, and 4.18 respectively. The standard deviations of scale 1, 2, and 3 in session 1 were .92, .95 and .84 respectively.

The means of scale 1, 2, and 3 in session 2 were 4.31, 4.34 and 4.22 respectively. The standard deviations of scale 1, 2, and 3 in session 2 were .92, .87, and .87 respectively. The means of scale 1, 2, and 3 in session 3 were 4.39, 4.34 and 4.19

respectively. The standard deviations of scale 1, 2, and 3 in session 3 were .64, .75 and .81 respectively.

Table 15

Descriptive Statistics of 13 Groups

Scale	Session 1		Session 2		Session 3	
	M	SD	M	SD	Mean	SD
	(n=54)		(n=53)		(n=46)	
1	4.29	.92	4.31	.92	4.39	.64
2	4.26	.95	4.34	.87	4.34	.75
3	4.18	.84	4.22	.87	4.19	.81

Note. Scale 1= *the Perceptions of the Quality of Group Interaction*;
Scale 2= *the Quality of Socially Shared Regulation*; Scale 3= *the Social Loafing*.

Three groups self-report questionnaire results

Socially shared regulation group

Table 16 shows the descriptive data of the SSRG's self-report questionnaire results at session 1, 2 and 3. Since the current study used three scales, Table 16 presents each scale's descriptive statistics in the socially shared regulation group.

The means of scale 1, 2, and 3 in session 1 were 4.63, 4.40, and 4.29 respectively. The standard deviations of scale 1, 2, and 3 in session 1 were .40, .86 and 1.07 respectively. The means of scale 1, 2, and 3 in session 2 were 4.31, 4.44 and 4.00 respectively. The standard deviations of scale 1, 2, and 3 in session 2 were .64, .52 and 1.07 respectively. The means of scale 1, 2, and 3 in session 3 were 3.83, 4.08 and 3.86 respectively. The standard deviations of scale 1, 2, and 3 in session 3 were .44, 1.11 and 1.15 respectively.

Table 16

Descriptive Statistics of SSRG

Scale	Session 1		Session 2		Session 3	
	M	SD	M	SD	Mean	SD
	(n=4)		(n=4)		(n=3)	
1	4.63	.40	4.31	.64	3.83	.44
2	4.40	.86	4.44	.52	4.08	1.11
3	4.29	1.07	4.00	1.07	3.86	1.15

Note. Scale 1= *the Perceptions of the Quality of Group Interaction*;
 Scale 2= *the Quality of Socially Shared Regulation*; Scale 3=*the Social Loafing*.

Mixed regulation group

Table 17 shows the descriptive data of the MRG's self-report questionnaire results at session 1, 2 and 3. Table 17 presents each scale's descriptive statistics in the mixed regulation group.

Table 17

Descriptive Statistics of MRG

Scale	Session 1		Session 2		Session 3	
	M	SD	M	SD	Mean	SD
	(n=5)		(n=4)		(n=3)	
1	4.10	.50	4.38	.44	4.42	.58
2	4.05	.50	4.31	.81	4.50	.58
3	3.89	.58	4.39	.35	4.29	.64

Note. Scale 1= *the Perceptions of the Quality of Group Interaction*;
 Scale 2= *the Quality of Socially Shared Regulation*; Scale 3=*the Social Loafing*.

The means of scale 1, 2, and 3 in session 1 were 4.10, 4.05, and 3.89 respectively.

The standard deviations of scale 1, 2, and 3 in session 1 were .50, .50 and .58 respectively.

The means of scale 1, 2, and 3 in session 2 were 4.38, 4.31 and 4.39 respectively. The standard deviations of scale 1, 2, and 3 in session 2 were .44, .81 and .35 respectively. The means of scale 1, 2, and 3 in session 3 were 4.42, 4.50 and 4.29 respectively. The standard deviations of scale 1, 2, and 3 in session 3 were .58, .58 and .64 respectively.

Other-regulation group

Table 18 shows the descriptive data of the ORG's self-report questionnaire results at session 1, 2 and 3. Table 18 presents each scale's descriptive statistics in the other-regulation group.

Table 18

Descriptive Statistics of ORG

Scale	Session 1		Session 2		Session 3	
	M	SD	M	SD	Mean	SD
	(n=5)		(n=5)		(n=4)	
1	4.20	.67	4.50	.72	4.25	.83
2	4.20	.83	4.55	.61	4.31	.74
3	3.97	.58	3.91	.94	3.82	.63

Note. Scale 1= *the Perceptions of the Quality of Group Interaction*;
Scale 2= *the Quality of Socially Shared Regulation*; Scale 3= *the Social Loafing*.

The means of scale 1, 2, and 3 in session 1 were 4.20, 4.20 and 3.97 respectively. The standard deviations of scale 1, 2, and 3 in session 1 were .67, .83 and .58 respectively. The means of scale 1, 2, and 3 in session 2 were 4.50, 4.55 and 3.91 respectively. The standard deviations of scale 1, 2, and 3 in session 2 were .72, .61 and .94 respectively. The means of scale 1, 2, and 3 in session 3 were 4.25, 4.31 and 3.82 respectively. The standard deviations of scale 1, 2, and 3 in session 3 were .83, .74 and .63 respectively.

Reliability

I estimated the internal consistency reliability with Cronbach's correlation coefficient (α) since it was a commonly used measure of scale reliability (Table 19). Alpha value of the 15-item scale was estimated .87, indicating good reliability with confidence (Nunnally, & Bernstein, 1994)

Table 19

Reliability

Item	Cronbach's Alpha if Item Deleted
1 My group enjoyed working together.	.85
2 We all worked well together.	.85
3 My group cared about what each person thought	.85
4 The students in my group read each other's postings	.85
5 We read the discussion task and guiding questions carefully before we began online group discussion	.85
6 As we were working on online group discussion, we paid attention to our progress.	.85
7 As we were working, we made sure we were answering all of the questions.	.85
8 After we finished our online group discussion, we checked over our responses.	.85
9 Members of our group did not contribute equally to the discussion.	.86
10 I stopped typing what others in my group were saying.	.88

Table 19. Continued.

11 I let the other students in my group figure out how to solve the problems.	.87
12 I was not involved in helping my group solve the tasks.	.87
13 Members of the group did not do their fair share	.86
14 I tried to get the other students in my group to do the hard parts.	.86
15 I did not take part in my group.	.86

Open-ended question: perceptions of the quality of group interaction

The open-ended question, “What is the main challenge your group encountered on this task?” was analyzed using a consensual qualitative research (CQR) method to integrate multiple viewpoints from all members in each group (Hill, Thompson & Williams, 1997).

Survey results revealed that SSRG regulated their learning process as a socially shared regulation and its members reflected a similar perspective toward the group’s difficulty. In the first task, SSRG agreed that they took into account other members’ thoughts and that all members equally contributed. Interestingly, four members viewed the main challenge SSRG encountered on the first task differently. In the second task, SSRG had a different perspective. Two members thought it was difficult to rank the studying strategies. Two other students thought there was no challenge. One member stated that it was hard to communicate with each other because several members posted different aspects of the task together, which made things confusing. In Task 3, three members expressed a common challenge that they had difficulty listening to each

member's input. With time, the members changed their focus from the task to collective regulation as a group. All members reflected that they needed to read other members' postings before adding their own response or moving on to another topic.

The nature of a synchronized online chat is the fact that all members can post messages concurrently. Therefore, the members did not read and understand all of the messages before the next message was posted. Also, two members talked about one topic while the other members discussed another topic, but all messages were posted at the same time in the chat room. Thus, they had difficulty discerning who gave feedback to whom and could not keep one coherent thought process going. According to members in SSRG, the disadvantage of synchronous online discussion is that it prohibited formation of a learning community to regulate their discussion together. For example, one member said that they needed more time to develop their discussions as a group rather than just voicing opinions and then quickly moving on without really acknowledging everyone's ideas.

In MRG, each member had different thoughts about the main challenge they faced across the three tasks. MRG gradually focused more on the group's regulatory process and the development of a common ground of shared knowledge instead of the task difficulty. In the first task, all members pointed out different challenges the group encountered. One member viewed her personal problem as the main challenge. Another thought that it was difficult to read because he needed to discern who was responding to whom. Someone else expressed that Task 1 was not easy to solve within an hour's time. One member thought there was unequal contribution to the discussion while two members thought all members equally contributed. For the second task, all members

viewed the main challenge differently. One complained about scheduling. Another had difficulty understanding the task. Someone else complained that several members posted several things at the same time so the discourse did not focus on one coherent thought process. Similarly, the members had different views on the main challenge of discussion for Task 3. One member mentioned the difficulty of synchronous online discussion while another had trouble understanding the task.

Overall, all members in MRG indicated that they all participated in the group discussion equally. They attempted to read other members' postings. However, they sometimes failed to read all messages posted because they did not stop typing. Nevertheless, the self-reflection of the members in MRG revealed that each member attempted to regulate the learning process and enjoyed the discussion due to the development of strong group cohesion.

Unlike SSRG and MRG, ORG had one dominant leader, Keve, who reflected that he let the other members figure out the solution to Task 1. The others disagreed with this and thought each of them contributed to the problem solving process. For Task 1, five members each presented different challenges the group faced.

In Task 2, all members besides Keve responded similarly that that it was difficult to come to an agreement in ranking the different study strategies. They believed the group came to agreement through explanation and analysis. Meanwhile, Keve had a different perspective. He thought he was prepared to discuss this task using information-processing theory, complex cognition, and self-regulation concepts while the others were not since they did not know those concepts precisely. Keve's self-reflection revealed that

he felt responsible for leading the group because he was the only person who was ready for discussion.

In Task 3, the members viewed the main challenge to be figuring out the notion of “cultural tools” because they were confused. Aside from Keve, the other members continuously viewed the main constraint of the discussion as difficulty in task comprehension or the co-construction of knowledge. They did not take into account the equal contribution or regulation of their learning process such as monitoring, evaluation, motivation, or group cohesion. However, Keve complained that there was unequal contribution to the discussion. Furthermore, he reflected that he had to get involved in task monitoring and content monitoring to evaluate the others’ contributions. The survey results similarly suggest that ORG was dominantly regulated by one member.

Summary

Overall, SNA results confirmed three group regulation patterns, which were identified as socially shared regulation, other-regulation and mixed regulation.

Content analysis revealed that the frequency of planning and goal setting regulatory processes in SSRG was higher than that in the MRG and ORG. This indicates that the members in the SSRG concentrated on setting the group’s goals and plans for their discussion more so than the other two groups. This focus on the group’s common goals and plans resulted in a higher frequency of task monitoring. Thus, the SSRG continually monitored what they discussed at the end of each guiding question or topic. These tendencies were continuously observed during task and content evaluation regulatory processes. Similarly, members in the MRG were actively involved with task monitoring as well as task evaluation and content evaluation. In terms of task monitoring,

task evaluation and content evaluation, the most notable difference was found in the ORG. This group was as rarely observed to monitor their task completion across the three sessions. In addition, this group skipped task evaluation across the three sessions and only a few content evaluation instances were observed.

The self-report question confirmed the findings of the content analysis. In particular, SSRG and MRG members viewed their groups interacted each other and regulated their discussion together. In contrast, the dominant member in ORG viewed himself as a teacher or leader and complained about the rest of the members.

Chapter Six

Discussion

The first aim of this study was to examine the occurrence of socially shared regulatory processes in the context of synchronous online chats within a regularly scheduled undergraduate class. The first research question was “How do students jointly regulate their learning in CSCL (CSCL)?”

In terms of who regulated the group’s learning, three different regulation patterns- socially shared regulation, mixed regulation, and other-regulation - were evident in the targeted groups. As a result, the second aim of this study was to investigate these three group regulation patterns. First, differences in group interaction among the three groups were examined with social network analysis. Second, in terms of the three groups’ main regulation patterns, the quality of regulation and social interaction were analyzed with content analysis. Third, group members’ reflections on their group’s main regulation pattern from a self-report questionnaire were analyzed in order to verify the findings from the content analysis.

In this section, a summary of the findings related to each research question are presented, followed by a discussion of the findings in relation to current literature. The study’s limitations and theoretical and practical significance are also discussed.

Main Findings Related to Research Question 1

The first research question asked how students regulate their learning in computer-supported collaborative learning environments (CSCL), where the focus was on the emergence of socially shared regulatory processes. Socially shared regulation, developed from a social constructionist perspective, is defined as the process by which all

members jointly regulate their collective learning processes (Hadwin & Oshige, 2011; Järvelä & Hadwin, 2013; Järvelä et al., 2008; Järvelä et al., 2010; Vauras et al., 2003) and shared knowledge as the desired product of collaborative learning (Greeno et al., 1998, 2006). This study's findings provided empirical support for the definition of socially shared regulation in the CSCL environment. Socially shared regulation occurred in the form of equal contributions and joint regulation of the learning process where members developed and maintained shared goals, planning, monitoring, and evaluation processes. Members in collaborative learning managed their use of time, adjusted their strategic actions to attain their goals, and monitored their learning process cognitively and metacognitively.

Hadwin and Oshige, (2011) noted that “socially shared regulation in CSCL is examined through studies on group regulation in which the group members co-develop collective regulatory processes (p. 256)”. This study did not focus on how individual members co-constructed their shared knowledge or how the group influenced an individual member's self-regulatory activities. Instead, the current study focused on how online group members jointly regulated their collective learning process.

Results demonstrated that socially shared regulation in CSCL was developed and maintained in three phases. The first phase of the emergence of socially shared regulation in CSCL began with posting a question or suggestion. A question worked as a starter and promoted shared task perspectives. Members sometimes began with posting a task response to the guiding question. However, the rest of the members were able to trace where they were because of the guiding questions provided by the instructor. It was observed that even without a question or suggestion, posting a task response worked as a

starter to discuss the topic. The second phase was to post responses to the question/suggestion. Members posted their answer to the guiding question and, at the same time, monitored each others' answers metacognitively. The last phase was to reach mutual agreement by posting their agreement/disagreement to the final answer to the guiding question.

This study illustrated the difficulty in developing socially shared regulation within CSCL. Järvelä and Hadwin (2013) claimed that socially shared regulation does not occur spontaneously although the occurrence of socially shared regulation is important because if the group fails to co-construct joint regulatory processes, collaborative learning may not be successful or may be less effective than hoped for. They suggested providing targeted support or guidance in order to promote successful collaborative learning in CSCL. Similarly, Azevedo and Hadwin (2005) summarized past research findings that, without guidance, members in CSCL would have unsuccessfully regulated their learning. Therefore, this study provided specific guiding questions to promote the emergence of socially shared regulation in CSCL. These guiding questions aimed to foster five targeted regulatory processes in CSCL; (1) planning and goal setting, (2) role assignment, (3) content monitoring, (4) task evaluation, and (5) content evaluation. Regardless of the guiding questions, instances of both socially shared regulation and other-regulation were observed across all groups. Most postings were related to a task response to the guiding questions and content monitoring related to the task response. Thus, in most instances, members focused on finding the task solution and as a result, co-constructed shared knowledge. Similar to previous findings (Azevedo & Hadwin, 2005), this study supports

the importance of task prompts or guidelines for the promotion of socially shared regulation in CSCL.

Emergence of socially shared regulatory processes

Overall, this study identified seven socially shared regulatory processes of planning and goal setting, scheduling, role assignment, task monitoring, content monitoring, task evaluation, and content evaluation in CSCL. The focus was on cognitive regulatory processes within the socially shared regulation model. Five targeted regulatory processes and two additional regulatory processes of scheduling and task monitoring were identified. Detailed guiding questions promoted the emergence of socially shared regulation in CSCL.

First, the development of shared goals and plans were important to promote the emergence of socially shared regulation in CSCL. Among the seven socially shared regulatory processes, shared planning and goals was the most important regulatory process. The importance of shared task perceptions, shared goals, and shared strategies has been previously discussed (Järvelä & Hadwin, 2013). In this study, online group members were presented a clear task goal for each session and guiding questions to promote discussion. Thus, it was hypothesized that members still shared the same task goals for the session whether they discussed explicitly a group goal or not. Nevertheless, this study supported that it was vital for all members to articulate the group's task goals and online discussion plan explicitly. The members reached mutual agreement on the group's task goal for the session and, as a result, increased their number of postings and dynamic social interaction. The findings support previous research on goal acceptance, which explains that effort involvement in terms of goal setting plays an important role in

acquiring successful goal achievement among members (Erez & Zidon, 1984; O'Neil & Drillings, 1994). In addition, shared goals and plans were closely related to the regulatory processes of content monitoring and content evaluation. Shared plans and goals allowed the group to compare their initial task goals to their task solution as a product of their online discussion and goal attainment. As a result, the group was involved with high quality regulation in terms of content evaluation.

Second, discussions related to scheduling, role assignment, task monitoring and task evaluation were not closely related to the final group answers/products, but helped foster the development of socially shared regulation. Originally, the goal of the online group discussion was to co-construct shared knowledge through discourse. However, it was hypothesized that socially shared regulation helps members increase their social interaction in CSCL and, as a result, promotes shared knowledge. Discussion related to scheduling, role assignment, task monitoring, and task evaluation were not observed to be closely related to the final group answers/products because these regulatory processes were only task-related. However, these regulatory processes promoted group cohesion by providing an opportunity for all members to interact with each other and take care of each other. This social interaction resulted in positive emotion among members. Despite their non-direct impact, these were important in their learning.

Third, the most frequently observed socially shared regulatory process was content monitoring across all groups. Content monitoring had dual functions. The first function was to develop socially shared regulation while the second function was to co-construct shared knowledge. Socially shared regulation occurred in CSCL when members posted task responses to the guiding question as answers and monitored the task

responses metacognitively. Although all members posted their task responses to the guiding question, these were not analyzed since it was beyond the scope of the study. Once task responses were posted, members monitored themselves metacognitively based on whether their task response was accurate or not. Members posted further questions to clarify the task response or posted a detailed explanation to support their answer. The discourse exchange through feedback fostered socially shared regulation as well as shared knowledge.

Fourth, questions to request further explanation or reasons to support a member's response should be encouraged in CSCL. Questions and suggestions generated by members were related to high quality socially shared regulation, rather than the guiding questions provided by the instructor. In spite of the existence of guiding questions, members requested further explanation and tackled each other's response through questions and suggestions. A question or an explanatory statement promoted the members' engagement and eventually resulted in high level social regulation (Volet et al., 2009). Questions or suggestions played important roles to promote the emergence of socially shared regulation as well as high quality regulation. High level regulation of shared plans, shared goals, shared monitoring, and shared evaluation was most frequently followed by posting questions and suggestions. Similarly, Volet et al., (2009) realized of the importance of a question or an explanatory statement.

The concurrent nature of the CSCL environment restricted the group's collective regulation. Not all messages were responded to and read by the members. Some messages were ignored by the group as they could not read and respond to all messages concurrently posted in the chat room. This likely resulted in the members selectively

choosing what to read. The concurrent nature of the CSCL environment may jeopardize members' engagement.

The quality of regulation

High quality regulation was characterized by questions, responses to other members' ideas, requests for further explanation, and agreement and disagreement, resulting in shared regulation as well as deep understanding of the theory being discussed. Low quality regulation was characterized by direct responses to the guiding question without negotiation or agreement, responses to a group member's task response as task monitoring without explanation, simple agreement with no further discussion, and checking for completion of all guiding questions without explanation or reasons.

The quality of regulation was not related to the co-construction of knowledge in CSCL. Contrary to previous research (Rogat & Linnenbrink-Garcia, 2013; Volet, Summers & Thurman, 2009) that found high quality regulation is strongly associated with high content understanding, the current study discovered that regardless of the quality of regulation, both high and low quality regulation in CSCL produced similar products as a result of online discussion since all groups engaged in the co-construction of knowledge. This finding suggests that the quality of regulation is associated with the emergence of socially shared regulation, rather than with the development of shared knowledge.

Socially shared regulation and other-regulation

This study examined who regulated collective regulation based on two social regulation patterns - socially shared regulation and other-regulation (Hadwin & Oshige, 2011; Salonen, Vauras, & Efklides, 2005; Vauras, Iiskala, Kajamies, Kinnunen, &

Lehtinen, 2003). Short exchanges of conversation were analyzed and the social regulation types were identified based on the existence of a dominant member and the number of members who participated in regulating the group's learning process in CSCL. Although the socially shared regulation model presents theoretically two different regulation types based on who is regulating the group's collective learning process, this study was not capable of clearly differentiating between the two from the discourse analysis. The nature of discourse depends on the context-specific situation. Thus, some discourse occurred in the form of other-regulation but was useful in cultivating the group's socially shared regulation. One implication is that socially shared regulation and other-regulation should be investigated not just at the level of short exchanges of discussion but in longer exchanges of discussion such as an entire discussion session or several sessions together.

This study's results support the existence of other-regulation in the socially shared regulation model (Hadwin & Oshige, 2011; Järvelä & Hadwin, 2013; Rogat & Linnenbrink-Garcia, 2011, 2013), conceptualizing other-regulation as one dominant member temporarily instructing and directing the rest of the members' learning process and temporarily facilitating the joint activity and others' understanding in CSCL. This study distinguished other-regulation in the socially shared regulation model from a social constructionist perspective (e.g., Hadwin & Oshige, 2011) and other-regulation in co-regulated learning from a social cultural perspective (e.g., Hadwin et al., 2005; Kirschner et al., 2006). Other-regulation in the socially shared regulation model occurs during student-student interaction (Rogat & Linnenbrink-Garcia, 2011, 2013) while other-regulation in co-regulation emerges during teacher-student interaction (Hadwin, Wozney, & Pantin, 2005). Thus, this research extends the current literature on socially shared

regulation from a social constructionist framework by suggesting that other-regulation in the socially shared regulation model means the existence of a dominant member although all members contribute to the collective regulation.

Shared goals and shared plans are important socially shared regulatory processes associated with socially shared regulation, not other-regulation. Most instances of socially shared regulation were observed in the content monitoring process across the 13 groups where members actively monitored each other's responses and gradually reached the group's task solution. However, despite the importance of shared goals and shared plans, shared goals and plans did not always emerge in CSCL. These vital regulatory processes were often missing or occurred in the form of other-regulation when one member directed the plans or goals for the session to the rest of the members. One implication is that interventions to support the emergence of socially shared regulation should focus on the development of shared plans and shared goals.

In summary, the current study found seven socially shared regulatory processes in CSCL, showing that socially shared regulatory processes in face-to-face collaborative learning environments (Rogot & Linnenbrink-Garcia, 2011, 2013) also emerged in socially shared regulation in CSCL environments. Furthermore, the current study suggests the importance of guidance to promote socially shared regulation (Azevedo & Hadwin, 2005), where guidance should focus on the promotion of shared goals and shared plans among members because the goals need to be internalized from an instructor-assigned goal into goal acceptance among members through negotiation (Erez & Zidon, 1984; O'Neil & Drillings, 1994).

Main Findings of Research Question 2

The second research question asked what the group's main regulation pattern was. Although the focus was on two main regulation patterns (socially shared and other), three main regulation patterns were identified. Previous studies on collaborative learning prescribed social regulation ranging from socially shared regulation, defined as multiple members' regulation of their learning to other-regulation, defined as a member's direct regulation of the group's learning (Rogot & Linnenbrink-Garcia, 2011; Volet et al., 2009). I categorized the groups by the frequency in what type was observed. The group's main regulation pattern was defined by the extent to which members shared their regulation or were instructed by one member. Thus, the group's main regulation pattern was identified as either socially shared regulation or other-regulation. In two groups, it was difficult to determine whether the group's main regulation pattern was socially shared regulation or other-regulation because instances of both regulation patterns were observed. Interestingly, apart from the two patterns, change in the group's main regulation pattern over time was observed.

Three different group patterns in terms of collective regulation to sustain online discussions were identified: Socially shared regulation group (SSRG), mixed regulation group (MRG), and other-regulation group (ORG). To answer the three sub-questions, three groups were selected to represent three different group regulation patterns. Their log files and self-report questionnaires were analyzed with social network analysis and content analysis.

The SNA results answered research sub-question 1, "How do groups with different regulation patterns vary in their integration?" Overall, SSRG's social interaction

was more dynamic than MRG and ORG. MRG's social interaction was mostly dynamic but occasionally dyadic between a dominant member and another member. ORG's social interaction was most commonly dyadic between a dominant member and another member or between a dominant member and the rest of the group members. The existence of a dominant member was observed in MRG and ORG.

Two dimensions, group interaction type (dynamic or dyadic) and the existence of a dominant member in CSCL, accounted for the group's main regulation pattern. Social network analysis revealed that SSRG maintained social interaction with multiple members across the three sessions. Its social interaction was fairly dynamic, but a single dominant member did not exist in SSRG. SSRG's members posted an equal amount of messages such that multiple members participated in socially shared regulatory processes.

Like SSRG, MRG maintained dynamic social interaction with multiple members. Members in SSRG and MRG were very interactive because instances of multiple members' talk prevailed. However, the instances of dyadic interaction between two members were occasionally observed in MRG. The SNA results revealed MRG's social interaction was less dynamic and interactive than SSRG's, but more dynamic than ORG's. The difference between SSRG and MRG was the existence of a dominant member. In particular, one or two dominant members existed in MRG during the first and second sessions.

Results show the development of socially shared regulation over time in MRG. Previous studies (Järvelä & Hadwin, 2013; Rogot & Linnenbrink-Garcia, 2011) divided social interaction in the collective learning process into two regulation patterns-socially shared regulation or other-regulation. However, this study found that the group's main

social interaction pattern could change over time from one regulation pattern to another. Socially shared regulation is not fixed but evolves over time. The existence of dominant members who post questions as a starter was observed in the first session. However, members developed flexibility over time. Instructional comments were a challenge, but they handled them flexibly by reviewing their responses and jointly planning the group's next step. In the first session, they simply followed instructional comments without objection. Over time, the group cultivated risk taking skills, resulting in equally distributed participation and deep information processing. This finding sheds a light on our understanding of the growth of socially shared regulation in CSCL.

This study points to the importance of all members' shared ownership to their collective learning process. Despite the existence of a directive dominant member, members in MRG still shared equal responsibilities to regulate their collective learning, negotiate shared goals and shared regulations, and, more importantly, respond selectively to the dominant member's directive instruction. This study suggests that equally shared ownership among members is vital to becoming a socially shared regulation group in CSCL.

More importantly, ORG showed dyadic social interactions and the existence of a single dominant member. ORG exhibited a single dominant member across all three sessions where instances of dyadic interactions between the dominant member and the other members were prevalent. Consequently, the most postings converged on the dominant member. The dominant member gradually increased his contribution over time.

A notable finding was the role of a dominant member who regulated the group's learning in ORG. The existence of a dominant member led to instances of other-

regulation. In particular, directive comments (e.g., remind, suggestion, or instruction) by a dominant member regulated the group's learning process, resulting in preventing the emergence of socially shared regulation and instead fostering the emergence of other-regulation. As a result, despite the interactive nature of synchronous online chat, the group decreased their dynamic interaction. Instead, the members gradually increased their dependence on the dominant member and the group's interaction was dyadic. Eventually, the number of postings decreased over time in ORG.

In addition to social interaction, the quality of regulation needs to be discussed. The quality of regulation in SSRG and MRG was higher than ORG. Previous research (Guiter, 2011; Hernandez, Gonzalez, & Munoz, 2014) suggests that initial planning and goal setting regulatory processes are vital in influencing an online group's functioning in CSCL. Earlier findings address the relation between social interaction and quality regulation (Rogat & Linnenbrink-Garcia, 2011; Rogat & Adams-Wiggins, accepted; Volet et al., 2009). For example, Volet et al. (2009) found that shared task-relevant knowledge improves high level social regulation because it helps members to engage in discussions. Rogat and Linnenbrink-Garcia (2013) found that high quality content planning included shared task related knowledge reviewed by all members while high quality task planning included mutual agreement to definite plans and goals for carrying out. Given the importance of a content planning regulatory process, this study found that members in SSRG successfully developed shared plans and shared goals through a content planning regulatory process, generated not by guiding questions but by the members. In line with previous research, this study revealed that SSRG's members

contributed to high quality content monitoring processes as well as high quality task planning processes

Members in MRG were involved mostly with high quality task planning processes but the coexistence of high and low quality planning and goal setting were found. Instances of low quality planning and goal setting process were related to directive instructions. Interestingly, some instructive comments produced high quality regulation because they facilitated members' involvement and fostered the development of shared plans and shared goals through discourse exchange.

Unlike SSRG and MRG, ORG was regulated by one dominant member's directive comments. Therefore, ORG failed to develop shared plans and shared goals through negotiation among members. Thus, ORG's planning and goal setting process was mainly low quality regulation. In addition, the amount of planning and goal setting of ORG was lower than that of SSRG and MRG.

The results also point to the significance of collective interaction in terms of high quality regulation in that multiple members' contributions played a role to improve the quality of planning and goal setting regulation. The findings also suggest the importance of shared plans and shared goals through members' negotiation since mutually agreed plans and goals were closely related to the quality of the evaluation regulatory process. More content evaluation occurred in SSRG and MRG than in ORG. These findings support previous research findings (Guiter, 2011; Hernandez, Gonzalez, & Munoz, 2014), which reveal the importance of socially shared planning and goal setting regulation and expands our knowledge to the interplay between planning and goal setting regulation and content evaluation regulation. Unlike SSRG, ORG's content evaluation regulation was

low quality because without initial shared goals, ORG superficially evaluated the group's goal attainment.

The results indicate that the social interaction patterns did not account for the quality of shared knowledge as a product of group discussion in CSCL. Intergroup differences were not found in content monitoring. All three groups' members actively posted their task responses and monitored each others' responses. Thus, not only SSRG and MRG but also ORG involved high quality task solutions. The purpose of the online group discussion was to find the task solution and to answer all guiding questions and all members actively participated in this process. Here, high quality task solutions were analyzed based on what the group understood as the task relevant theory and how they applied the theory to a particular student's learning context. The task solution as a product of group discussion in CSCL was answered in all groups.

A question and request for further explanation generated by the group members were prevalent in SSRG and MRG; however, it was rare in ORG for a question to be posted to promote deep learning since the dominant member hindered divergent thinking and deep learning. A question or an explanatory statement promoted members' engagement and eventually resulted in high level social regulation (Volet et al., 2009). Questions or suggestions generated by the members rather than the guiding questions played an important role in the occurrence of socially shared regulation in SSRG and MRG. Although ORG's task solutions through discussion were accurate, this group's discourse did not go deeper. Argumentation or explanation rarely emerged in ORG. Requesting further explanation or questions were cut down by the dominant member, who viewed answering the guiding questions as enough for the session. Thus, ORG's

members failed to expand their discourse beyond the guiding questions or task requirements.

The results show that the primary focus of members, participating in online group discussion, was to find task solutions and answer the questions. Similarly, Hoadley and Linn, (2000) found that members in CSCL were task-oriented and monitored all members' postings in order to find a task solution. In the three groups, all members actively engaged in the content monitoring regulatory process. Members in CSCL were concerned with addressing all guiding questions and coming up with accurate task solutions, according to an analysis of their self-report questionnaires.

Limitations

One limitation of this study was that the participants in SSRG, MRG, and ORG were taught by three different instructors. The instructor played a role in developing socially shared regulatory processes; however, this study did not take into account the instructor in influencing online group learning. The second limitation was the focus on only cognitive socially shared regulatory processes even though Vauras et al. (2003) suggested that motivational aspects as well as cognitive aspects need to be considered to investigate socially shared regulation. In this study, the guiding questions were targeted to the emergence of cognitive regulatory processes because they were the primary focus, but motivational regulatory processes were also detected during data analysis, indicating that motivational and behavioral aspects should also be taken into account.

The small sample size is another limitation of this study. The case study of three groups analyzed only 14 students' log files, making it impossible to compare the three groups quantitatively. Another limitation was the classification of socially shared

regulation and other-regulation based on the members' social interaction, where a group was simply identified as socially shared regulation when most instances involved all members' engagement. Yet, two mixed groups were also detected in this study because of the unclear standard in categorizing the groups as either socially shared regulation or other-regulation.

Another limitation of the study is the platform for online synchronous discussion. This study used the chat room of the Sakai website where several students concurrently posted messages. In the chat room, students had trouble reading several messages concurrently, responding to all messages, and recognizing who gave feedback to whom. The synchronous online discussion in Sakai prohibited the effectiveness of students' conversation.

Future Direction

There are three important directions for future research on socially shared regulation in online group discussion. First, it would be interesting to examine the role of guiding questions in terms of how they scaffold and support the emergence of an online group's socially shared regulation. In this study, guiding questions facilitated socially shared regulation. Instead of a teacher or a facilitator, guiding questions provided directions and fostered all members' engagement and the occurrence of all regulatory processes. Guiding questions fostered the emergence of content monitoring and task monitoring in particular since discussion mainly focused on answering those questions. Guiding questions did not support the emergence of planning and goal setting. Moreover, the existence of guiding questions failed to prevent the emergence of other-regulation in CSCL. Therefore, future research should investigate how to encourage planning and goal

setting in online collaborative learning and to design specific guiding questions or task prompts to prohibit the emergence of other-regulation and promote the emergence of socially shared regulation. Also, this study did not investigate the influence of different instructors, and group members' friendships in class. Thus, future research should explore how personal relationships influence online discussion.

Second, this study focused on cognitive aspects in the emergence of socially shared regulation. Previous studies attempted to understand the interplay among regulatory processes and also investigated emotional aspects and engagement. While this study was limited to cognitive socially shared regulatory processes, future research should investigate motivational and behavioral aspects as well as cognitive aspects on socially shared regulation.

Third, one limitation of this study was related to the analysis of shared knowledge because this study mainly focused on the occurrence of socially shared regulation rather than on the product of discussion as shared knowledge. This study assessed the group's shared knowledge based on only the accuracy of task solutions. Further research is needed to examine the quality of shared knowledge with implied questions, implied suggestions, or further explanation requests.

Fourth, this study used content analysis to examine the log files. However, socially shared regulation mainly occurred through group members' negotiation of shared plans, shared goals, task monitoring, content monitoring, and content evaluation across all three tasks. In order to examine socially shared regulation in depth and more accurately, future research must include various methodology. A future study should

examine the social interaction among members and interview group members to investigate how they reflect on their regulatory process.

Fifth, this study used the chat room of the course website for online synchronous discussion. However, the chat room did not provide the information that someone was typing. Thus, in the future, I would like to use other platforms for online synchronous discussion such as google docs. Also, future study needs to establish norms around participating in synchronous chats such as wait time, responding to everyone, and creating an orderly way to engage everyone.

Theoretical Significance of This Study

The main purpose of this study is to provide educators and researchers with in depth understanding of an online group's collective regulation, specifically socially shared regulation. This study is significant because it uses a social constructionist perspective to investigate socially shared regulation, allowing for new focus on a group's collective regulation. From a social constructionist perspective, socially shared regulation is the group's collective self-regulated learning (Hadwin & Oshige, 2011). Previous studies built upon social-cognitive perspectives and social regulation of group learning (Rogat & Linnenbrink-Garcia, 2013) and situated learning (Volet et al., 2009). This study extends the current literature in terms of a new theoretical framework (e.g. Hadwin & Oshige, 2011) claiming importance in understanding shared regulation (e.g. shared goals, shared plans, shared monitoring, and shared evaluation), that is separate from individual self-regulation in collaborative learning. Thus, results of this study will benefit educators and researchers in viewing a group's learning in CSCL as collective activities.

This study is significant since it attempted to identify a group's main regulation pattern based on the degree to which the group's regulation is socially shared or other-regulation. Other-regulation was developed from a social cultural perspective and defined as a teacher's directive instruction to regulate students' learning process (Hadwin, Wozney & Pontin, 2005). Previously, other-regulation was viewed as a transitional process from a teacher's ownership of learning to students' responsibility of regulation. However, this study found that the existence of a dominant member, dyadic interaction, and directive instructions resulted in the emergence of other-regulation in CSCL. These results imply that a group's main regulation pattern cannot be defined as one regulation pattern because instances of both socially shared regulatory and other regulatory emerged in all groups in CSCL.

Practical Significance of This Study

This study's findings will be useful for educators in designing future online or hybrid courses. Given the increase of online courses and online discussions, it may be difficult for educators to facilitate effective online learning. Past research (Järvelä & Hadwin, 2013) has found that in order to successfully learn in CSCL, the group needs to develop and maintain socially shared regulation. Despite the importance of the development of socially shared regulation in CSCL, educators still face practical problems in fostering collective regulation among group members. Results of this study provide practical pedagogical knowledge in the design of online courses in terms of guiding questions. In particular, educators need to develop guiding questions to facilitate shared plans, shared goals, shared monitoring and shared evaluation through negotiation. This study also points to the importance of the group members' collective interaction as

well as questions and suggestions to request further explanation generated by group members as part of their content monitoring process, leading to developing and maintaining socially shared regulation. Thus, educators should ask more detailed and clear questions to facilitate student generated questions, resulting in discourse going beyond the task requirements.

Online group discussions are an essential part of both online and hybrid courses. The success of online group discussion relies on discourse exchange. This study's findings suggest that students in synchronous online group discussions faced difficulty in reading through all concurrently posted messages and some messages were ignored or left unread. Moreover, members in CSCL only attempted to meet the task requirements. These findings suggest that educators need to set appropriate and practical discussion rules to support successful synchronous online discussions.

APPENDIX A

Task1

Throwing Tantrums

Although Tyler Lipton is listed on the roster of Allie Schenk's third-grade class, he spends most of each day in Sharon Osmer's resource room. Concerned that Tyler is so often segregated from his classmates, Allie has arranged a meeting with Sharon Osmer, Principal Cecelia Dawson, and Tyler's parents.

Allie begins the meeting: "I'm uncomfortable with the fact that Tyler is away from my classroom as much as he is. He's missing many of our instructional activities, and he has few opportunities to make friends with the other children in the class."

"Our son is severely dyslexic," explains Mr. Lipton, Tyler's father. "He's already repeated first grade, and now he's repeating the second-grade reading curriculum as well, yet he still can't read. I'd like him to spend as much time with Ms. Osmer as he possibly can."

"I worry about his behavior, too," Ms. Lipton adds. "Sometimes Tyler gets so frustrated that he throws horrible temper tantrums. It would never work to have him in a classroom with 25 other students. He needs as much individual attention as he can get."

Sharon Osmer is quick to agree. "Yes, Tyler's in my room so that we can address both his dyslexia and his behavior problems. I've had him for 2 years now, but his behavior is becoming even worse than it used to be. For example, he breaks pencils and tears his paper to shreds when he's frustrated or angry. Sometimes he screams when he doesn't want to do his work."

“Didn’t Tyler’s screaming start at about the same time that you start working with Marcus?” Allie asks.

Sharon thinks for a minute. “Well, yes, now that you mention it, that’s true.”

“Who’s Marcus?” inquires Ms. Lipton.

“Marcus is a boy with autism who’s in my room all day long.” Sharon replies.

“He frequently screams and flaps his arms, especially when he’s frustrated. Such behavior is pretty typical for a child with autism.”

“What do you do when Marcus screams?” Allie asks Sharon.

“Well, as you know, I almost always have several students in my room at the same time, and each one of them is likely to have different academic needs. I usually give them individual assignments and put them at separate workstations around the room, then I circulate and give everyone a few minutes of one-on-one instruction. When Marcus gets too noisy, I pass out earplugs so the other students can concentrate on what they’re doing. Then I try to find out why Marcus is so upset. He usually settles down after I’ve spent a little time with him.”

“This meeting’s about Tyler,” Principal Dawson reminds the group. “I think we should keep Marcus out of the discussion.”

“Well, let me explain why I brought Marcus up,” Allie says. “I talked with Kendra Westover, who had Tyler in her classroom 2 years ago, and she doesn’t remember him ever screaming in her classroom. She told me that he was placed in the resource room only for his reading problems, not for any behavior problems. So I’m

wondering... could it be that Tyler has learned to scream in your classroom, Sharon?

After being with Marcus so much, he may think it's OK to scream when he's frustrated."

"Hmmm...that's an interesting idea," Ms. Lipton says. "Now that I think about it, I realize that Tyler's temper tantrums didn't really start until this year. Before that, he usually just talked to us when he was upset about something."

"I've been attributing his screaming more to his decreasing self-confidence," Mr. Lipton says. "Tyler's 9 years old, and yet he still has trouble reading even the simplest words. He certainly doesn't feel good about that."

"I've been worried about his self-esteem as well." Sharon replies. "I've tried to boost it a bit by assigning him tasks that are easy for him. You know, completing color-by-number worksheets, listening to stories-things he can do successfully by himself. Yet his screaming seems to have increased rather than decreased."

"Sharon, you do wonderful things with the children you have in your resource room," Allie tells her. "But it sounds to me as if Marcus's behavior is rubbing off on Tyler. I'd like to suggest that we move Tyler back into my classroom for most of the school day. Perhaps you could give me some ideas about how I could help him with his reading skills."

"But you're forgetting about Tyler's behavior, Allie," Cecelia Dawson points out. "Tyler's a very disruptive kid, and his presence in your room would be a great distraction. You must remember your other students. After all, they have a right to a classroom environment in which they can reasonably get some work done."

“It seems to me that Tyler needs to see how normal children behave.” Allie observes. “I have a really good group this year-not a serious behavior problem in the bunch. How is Tyler ever going to learn appropriate classroom behavior when he’s in a room with kids like Marcus all day?”

“I think you’re being unrealistic, Allie,” Cecelia says. “Tyler may feel ostracized when you put him with children who can read and write. By putting him in your classroom all day, we might destroy what little self-esteem he has.”

“But there are many things Tyler would be perfectly capable of doing in my classroom. For example, he could participate in science experiments. The children conduct the experiments in pairs, and he could certainly contribute. During reading times, he could listen to the other students read aloud and get involved in group discussions. And I see no reason why he shouldn’t participate in physical education, art, and music along with his classmates.”

Seeing that Allie is getting a bit hot under the collar, Cecelia tries to calm her down. “Now, Allie, I wasn’t intending to ruffle any feathers. I’m just trying to point out that the approach you’re suggesting might not be as easy as you think it will be.”

Allie turns to Mr. and Ms. Lipton. “I have no idea what I can or cannot do for your son.” She tells them bluntly. “I’m certainly no miracle worker. But it’s clear that Tyler needs to learn to deal with his frustrations appropriately, and he can do that only if he interacts with regular kids on a regular basis. All I’m asking for is a chance to work with him. Will you at least think about it?”

Mr. and Ms. Lipton do think about it, and in a formal staffing later that month, the decision is made to place Tyler in Allie Schenk's room for most of the school day. For a half-hour each morning, when his classmates are meeting in their reading groups, Tyler will go to the resource room to work with Sharon Osmer on his reading skills.

In the 3 weeks since Tyler joined Allie Schenk's class, he has neither screamed nor torn up his work. He still can't read or write at the same level that his classmates do—a continuing source of frustration for him. But he's making many new friends and cooperating well with others during group activities.

When Allie asks Tyler why he used to scream in Ms. Osmer's class, his response is quite revealing: “Well, wouldn't you get pretty upset if you had to do the same stupid worksheets and listen to the same dumb stories all day-every day-while everyone else in your class gets to do new and exciting stuff?”

Source: Adapted from Ormrod & McGuire (2006)

Group Task1: Identify the main cause of Tyler's tantrum and find how to advance his learning? Explain your answer using **a social cognitive theory**.

*Please answer all the questions. After your group discussion, submit your group solution and the main points raised during the discussion. Your summary reports will be prepared at the end of discussion for a few minutes.

Guiding Questions

1. <Plan> Before starting the task, plan your online group discussion such as what are individual goals and group goals and how to assign each member's role (e.g., who will manage time? or who will write and submit the group summary report?)

2. <Social Cognitive Theory> How has Tyler acquired the screaming behavior? Which course concepts are used to answer this question?

3. What advantages and/or challenges are there in placing Tyler in Allie Schenk's classroom for most or all of the school day from a social cognitive perspective?

4. <Social Learning Theory> If you were Tyler's teacher, what strategies grounded in a social cognitive theory might you use to advance his learning in the mainstream classroom?

5. <Monitor> Did your group use all appropriate and related concepts from a social cognitive theory in order to answer questions? Did your group answer all questions?

6. <Evaluation> Did your group meet your initial plan or goals? To what extent does your group understand the central concepts of a social cognitive theory?

7. Please draft a paragraph summary of your group discussion and include it at the end of your chat. The group summary report includes your group task solution and the main points raised during the discussion.

APPENDIX B

Task 2

A researcher interviewed four fifth-grade students about how they study for social studies tests.

A.

Researcher: How do you study for your history tests?

Student: My friend and I get together and quiz each other on the vocabulary.

Researcher: Tell me more about what you do exactly.

Student: Well, I give a definition, and she says the word. Or I tell the word, and she explains what it means. And then we switch.

Researcher: When you say what the word means, what kinds of things do you say?

Student: Like, she says “Civil Rights Movement,” and I say “The organization of local and national events protesting the unequal treatment of African Americans.”

B.

Researcher: How do you study for your history tests?

Student: I study.

Researcher: What do you do when you study?

Student: I don’t know. I just study.

C.

Researcher: How do you study for your history tests?

Student: I reread the chapter, and then I usually try to think what it would be like. My teacher said that's a good way to study history.

Researcher: Tell me more about that. What do you do exactly?

Student: Like, I read it, and then after I read a page, I try to imagine what it was like. I mean, back then. Like, what the houses were like, and the people I'm reading about, what kind of people they were.

D.

Researcher: How do you study for your history tests?

Student: Well, our teacher always gives us some practice games. So me and my friend, we each pick out some good questions, and we test each other.

Researcher: When you say you pick out good questions, how do you do that?

Student: We look for something that something that was really important in history.

Researcher: OK, and when you say you test each other, how do you do it.

Student: So, it's like, I give the practice games our teacher gave us to Romy, and Romy tells me what happened, and why she thinks the event would be important in American history.

Source: Adapted from Chinn (2012)

Your Group Task2: Rank above four academic strategies from the best to the worst.

Explain your ranking using connections to **Cognitive Theory (Information Processing Theory), Learning Strategies and Self-regulated Learning**).

*Please answer all the questions. After your group discussion, submit your group solution and the main points raised during the discussion. Your summary reports will be prepared at the end of discussion for a few minutes.

Guiding Questions

1. <Plan> Before starting the task, plan your online group discussion such as what are individual goals and group goals and how to assign each member's role (e.g., who will manage time? or who will write and/or submit the group summary report?)
2. Identify the employed memory strategies that each interviewee says that he/she used.
3. Evaluate the quality of students' employed learning strategies.
4. **How would you rank the quality of these student's strategies?**

A_____ B_____ C_____ D_____
5. What criteria did your group use for ranking?

 Why were these criteria selected? Which course concepts play a role in your discussion?
6. What might explain differences in students' employed strategies? Consider student characteristics as well as the role of the task and instruction.
7. Describe what improved strategy use would look like.

8. <Monitor> Did your group use all appropriate and related concepts from a cognitive theory in order to answer questions? Did your group answer all questions?
9. <Evaluation> Did your group meet your initial plan or goals? To what extent does your group understand the central concepts of a cognitive theory (Information processing theory)?
10. Please draft a paragraph summary of your group discussion and include it at the end of your chat. The group summary report includes your group task solution and the main points raised during the discussion.

APPENDIX C

Task3

SNOW

A fourth-grade class is studying strategies for descriptive writing. In one lesson, the teacher asks students to pick a particular object or event and brainstorm ways of describing it using their five senses: feeling, tasting, looking, smelling, and hearing. Students then draw on their brainstormed ideas to write a rough draft of a descriptive composition. The following day, they edit their rough drafts and create a final, polished piece. Ten-year-old Shea uses these three steps to write a description of snow, as shown on the following three pages.

Source: Adapted from Ormrod (2003)

Snow

Sometimes smooth, sometimes lumpy
hard to drive in, makes everything
look beautiful, soft, or wonderful to
play in, day off from school, time with
friends, snowball fights, injuries, fun
with dad, hot chocolate after playing
in it, very wet, not always fun, cause
accidents, make

feel ✓

taste ✓

look ✓

smell ✓

hear ✓

Version 2

Snow

Snaps

Snow makes everything look like
 a fairy kingdom in the winter.
 Snow ^{sometimes} sometimes looks as smooth
 as a desktop, sometimes snow
 looks as lumpy as a pillow after
 a pillow fight. # Snow is as soft
 as a cloud, and is just as wet as
 a cloud ^{one} ~~precipity~~ is. # Snow does not
 taste very good, but the hot choco-
 late you get after playing in it
 does. ^{taste good} # Snow does not have a smell
 when it is alone. ^{strongly} When it is by
 pine trees though it absorbs their
 fresh smell. # Snow does not sound
 like anything, neither does season
 winter. This how I describes snow
 using ~~my~~ five of my ^{senses} senses.

Note: Assume the edits is teacher feedback.

Describing Snow

Snow makes everything look like a fairy kingdom in the winter. Snow sometimes looks as smooth as a desktop; sometimes snow looks as lumpy as a pillow after a pillow fight.

Snow is as soft as a cloud and just as wet as one.

Snow does not taste very good, but the hot chocolate you get after playing in it does taste good.

Snow does not have a smell when it is alone. When it is by pinetrees it absorbs their fresh smell.

Snow does not sound like anything ^{neither} does the season winter.

This is how describe snow using five of my senses.

Your Group Task3: Analyze a student' artifacts and develop instructional design.

Explain your answer using **a social constructivist theory (social constructivism)**.

*Please answer all the questions. After your group discussion, submit a summary of your group's solution and the main points raised during the discussion. Your summary reports will be prepared at the end of discussion for a few minutes.

Guiding Questions

1. <Plan> Before starting the task, plan your online group discussion such as what are individual goals and group goals and how to assign each member's role (e.g., who will manage time? or who will write and submit the group summary report?)
2. What about this writing assignment and this process of writing is social constructivist? Try to include many terms and principles from this theory.
 - a. In what ways has the teacher scaffolded the writing tasks?
 - b. What are the advantages of breaking a creative writing task into such steps? In identifying advantages, your group can also draw on what you have learned about cognition and memory (i.e., information processing theory).
 - c. What cultural tools are being taught within this assignment?
3. How could you make this writing task and lesson even more social constructivist?
4. <Monitor> Did your group use all appropriate and related concepts from social constructivist theory in order to answer questions? Did your group answer all questions?

5. <Evaluation> Did your group meet your initial plan or goals? To what extent did your group understand the central concepts of a social constructivist perspective (social constructivism)?
6. Please draft a paragraph summary of your group discussion and include it at the end of your chat. The group summary report includes your group task solution and the main points raised during the discussion.

APPENDIX D

Self-Report Questionnaire

ASSESSMENT SURVEY

This is a checklist to find out more about your group discussion. Read each sentence and indicate how much you agree by putting a circle in the box.

	Question	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	My group enjoyed working together.	1	2	3	4	5
2	We all worked well together.	1	2	3	4	5
3	My group cared about what each person thought.	1	2	3	4	5
4	The students in my group read each other's postings.	1	2	3	4	5
5	We read the discussion task and guiding questions carefully before we began online group discussion.	1	2	3	4	5
6	As we were working on online group discussion, we paid attention to our progress.	1	2	3	4	5
7	As we were working, we made sure we were answering all of the questions.	1	2	3	4	5
8	After we finished our online group	1	2	3	4	5

	discussion, we checked over our responses.					
9	Members of our group did not contribute equally to the discussion.	1	2	3	4	5
10	I stopped typing what others in my group were saying.	1	2	3	4	5
11	I let the other students in my group figure out how to solve the problems.	1	2	3	4	5
12	I was not involved in helping my group solve the tasks.	1	2	3	4	5
13	Members of the group did not do their fair share	1	2	3	4	5
14	I tried to get the other students in my group to do the hard parts.	1	2	3	4	5
15	I did not take part in my group.	1	2	3	4	5

16. What is the main challenge your group encountered on this task?

APPENDIX E

Coding Scheme 1: Socially Shared Regulatory Process

Code	Definitions
Planning and	1. Presenting a question as a starter for the group's plan or goal
Goal Setting	2. Posting the guiding questions as a starter
	3. Discussing plans and goals
	4. Expressing agreement
Scheduling	1. Setting a time for the online discussion session
Role Assignment	1. Discussing plans about assigning roles
Task Monitoring	1. Verifying the progress or the completion of each guiding question
	2. Checking the time
	3. Correcting typos
Content	1. Checking the accurate use of educational psychology concepts,
Monitoring	principles, and terms to solve the task
	2. Checking the accuracy of the task responses
	3. Providing a reason to support the responses or ideas
Task Evaluation	1. Checking the completion of all the guiding questions (e.g., inclusion of relevant terms)

Table Continued

Content	1. Checking whether the group met its initial goals
Evaluation	2. Checking the use of all relevant educational psychology concepts
	3. Evaluating understanding of concepts and quality of discussion
	4. Evaluating the content to answer the task

APPENDIX F

Coding Scheme 2: High and Low Quality Regulation

Quality Variation	Definition
High Quality Regulation	<p>Prompting suggestions or questions to discuss the guiding question</p> <p>Responding to a group member's task response</p> <p>Providing detailed rationale and explanation of agreement or disagreement to another member's response</p> <p>Reviewing and summarizing the group's task solution or answer as monitoring the completion of each guiding question</p>
Low Quality Regulation	<p>Without prior steps, jumping into posting a task response to the guiding questions</p> <p>Not responding to a group members' task response</p> <p>Responding to a group members' task response with simple agreement or disagreement</p> <p>Simply monitoring the completion of each guiding question as task monitoring</p>

APPENDIX G

Coding Scheme 3: Regulation Pattern

Regulation Pattern	Definition
Socially Shared Regulation	Multiple individuals share and exchange ideas and reach mutual agreement.
Other-Regulation	<p>One dominant member regulates the learning process by directly instructing or teaching.</p> <p>One member sets a goal or plan without any agreement.</p> <p>All members simply follow one member's idea or response.</p>

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