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April 2018

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Compliance with Ethical Standards:

Funding: This study was funded by Social Science and Humanities Research Council Canada (Standard Research Grant 435-2012-0529 awarded to A. F. Hadwin; and Doctoral Fellowship awarded to E. A. Webster).

Abstract

Collaboration in an online environment can be a socially and emotionally demanding task. It requires group members to engage in a great deal of regulation, where favourable emotions need to be sustained for the group's productive functioning. The purpose of this cross-case analysis was to examine the interplay of two groups' regulatory processes, regulatory modes, and socio-emotional interactions that contribute to or are influenced by emotions and socio-emotional climate perceived in the group. Specifically, this study compared a group of 4 students unanimously reporting a positive climate to a group of 4 students unanimously reporting a negative climate after completing a 90-minute online text-based collaborative assignment. By drawing on two data channels (i.e., observed regulatory actions and socio-emotional interactions during collaboration and self-reported data about emotional beliefs and perceptions), four contrasting group features emerged: (a) incoming conditions served as a foundation for creating a positive collaborative experience, (b) regulation of emotions during initial planning, (c) negative emotions served as a constraint for shared adaptation in the face of a challenge, and (d) encouragement and motivational statements served as effective strategies for creating a positive climate. Implications for researching and supporting emotion regulation in collaborative learning are discussed.

Keywords: Cross-case analysis; Computer-supported collaborative learning; Regulation; Socio-emotional interactions; Emotions

Introduction

The ability to work well in a group is a highly valued and sought-after 21st century learning skill (Partnership for 21st Century Learning 2007). A growing emphasis on virtual teamwork in the workplace (Martins et al. 2004) makes learning to collaborate in online environments an important skill for university students to attain. Productive collaboration is a complex and challenging process requiring teams to leverage diverse expertise to optimize knowledge construction and output. Regulatory processes such as planning, monitoring, and adapting are touted as critical for facilitating productive collaborative learning outcomes (Hadwin et al. 2011). Furthermore, because these regulatory processes occur in a social context, interpersonal processes should also be taken into account when examining factors that contribute to productive collaboration (Barron 2003; Van den Bossche et al. 2006). Although performance is commonly used as an indicator of productive collaboration, another important indicator is group members' perceptions of their experience, as these perceptions are carried forward as beliefs and knowledge informing approaches to future collaborative work. This study aims to contribute to a growing literature examining both regulatory and social processes in the context of group work. We compare two groups with contrasting collaborative experiences, focusing on how socio-emotional interactions as embedded in regulatory actions contribute to each group's perceived socio-emotional climate over the course of an online collaborative assignment.

Regulating Learning in Collaboration

Regulatory processes. Theoretical frameworks describing regulation in the context of social learning are still at their nascent stage. With conceptions of self-regulated learning (SRL) as a foundation, researchers are beginning to define other social forms of regulation occurring in highly dynamic and interactive learning situations such as collaboration (Hadwin et al. 2011;

Järvelä and Hadwin 2013; Järvelä et al. 2008; McCaslin and Good 1996). For example, Hadwin et al. (2011) draw heavily from Winne and Hadwin's (1998, 2008) SRL model, in which regulation of learning is conceptualized as unfolding over four loosely sequenced and recursive phases: (a) task understanding, in which learners construct a mental representation of the task; (b) goal setting and planning, in which learners set goals and strategize to meet task demands; (c) task enactment, in which learners enact tactics to achieve goals; and (d) small- and large-scale adaptation, in which learners strategically adapt task perceptions, goals, and engagement within and across tasks. At the core of the recursive cycle is metacognitive monitoring—a process necessary to evaluate and make strategic changes to learning. In this paper, we refer to the actions of planning (encompassing the first two phases), enacting, adapting, and monitoring as fundamental *regulatory processes*, which are necessary for effective learning. Winne and Hadwin (1998, 2008) also emphasize each phase of SRL shapes and is shaped by five recursively cycling features referred to as a COPES (conditions, operations, products, evaluations, and standards). The COPES architecture, catalyzed by metacognitive monitoring, underlies each phase of regulation and guides transition across phases. Internal and external *conditions* provide a context for engagement in each regulatory phase. Internal conditions are comprised of factors internal to the student or group, such as prior knowledge, motivation, and emotions. In contrast, external conditions are comprised of factors external to the student or group, such as task demands, resources available, and time constraints. Students cognitively process or manipulate information through *operations*, resulting in *products* in each phase, which may in turn become conditions for the next phase (e.g., the product of task understanding in the first phase becomes a condition for setting goals in the second phase). Finally, students construct judgments or *evaluations* of the products by comparing them to set or perceived *standards*.

Modes of regulation. Contemporary perspectives of collaboration expand on prior work by emphasizing the role of three *modes of regulation* in productive collaboration, including self-regulated learning (SRL), co-regulated learning (CoRL), and socially-shared regulation of learning (SSRL; Hadwin et al. 2011; Hadwin et al. 2017; Järvelä and Hadwin 2013; Miller and Hadwin 2015a; Winne et al. 2013). SRL refers to a goal-directed process of planning, monitoring, and adapting cognitions, behaviors, motivation, and emotions in order to accomplish individual learning goals (Pintrich 2000; Zimmerman 1989, 1990). CoRL refers to individuals or groups temporarily supporting or influencing one or more team members' regulatory processes. Finally, SSRL refers to group members collectively negotiating and realigning or adapting group regulation processes in the service of a shared outcome. All three modes of regulation are vital in collaboration and can unfold in tandem while members are working alongside each other (Hadwin et al. 2011). Consequently, conditions, operations, products, evaluations, and standards (COPES) within collaborative contexts not only extend beyond an individual, but also dynamically interact across various regulatory modes. Importantly, the COPES-based model of regulation extended to co-regulation and shared regulation recognizes behavior, motivation, cognition, and emotions are conditions and products of regulation fueled by metacognitive knowledge, beliefs, and processes. Awareness or meta-knowledge of behavioral, cognitive, motivational, and emotional states as well as desired targets fuels regulatory action.

One underemphasized aspect of regulation in collaborative contexts is the regulation of motivation and emotion (Dillenbourg et al. 2009). Students assigned to work in groups can experience a range of emotions connected to themselves, the task itself, the task context or environment, one or more other group members, or the group's collective strategies as a whole (Järvenoja and Järvelä 2005; Wosnitza and Volet 2005). Regardless of the source, emotions may

facilitate or hinder the collaborative process and, ultimately, the cognitive, behavioral, and motivational outcomes of group work. Research indicates affect plays an important role in group work, with positive affect typically associated with beneficial outcomes such as engagement and higher levels of performance and satisfaction (Jehn 1997; Rogat and Linnenbrink-Garcia 2011; Volet et al. 2009). Negative affect, if strong and persistent, is typically associated with detrimental outcomes such as withdrawal and lower levels of performance and satisfaction (Chiu and Khoo 2003; Duffy and Shaw 2000; Linnenbrink-Garcia et al. 2011; Näykki et al. 2014). Thus, in addition to regulating cognitions and behaviors, the ability to regulate helpful or harmful emotions in a group setting may contribute to productive collaboration.

COPES in Group Regulation of Emotions

The COPES architecture described by Winne and Hadwin (1998, 2008) provides an ideal context for explaining how emotion regulation occurs within collaboration because the model takes into account micro-elements of regulation that are external and internal to the regulator. Figure 1 demonstrates where the constructs specific to this study can be found within an individual's or the collective group's COPES cognitive features. We first provide an overview of Figure 1, followed by a more detailed discussion of the main constructs examined in this study.

Overview. Individuals and groups enter each collaborative work session with a set of internal and external conditions, which set the stage for self-, co-, and shared regulation of learning. As individual members and groups as a whole move in and out of regulatory processes at the macro level (i.e., planning, enacting, and adapting), they create cognitive, behavioral, and affective products via the operations they engage. After being monitored and evaluated against set or perceived standards, these products then become conditions, influencing subsequent regulatory actions. In this study, we were specifically interested in the conditions and operations

that led to the emotional product and subsequent condition of socio-emotional climate. As shown in Figure 1, we posit conditions and operations should not be limited to affective processes. Rather, we extended our investigation to include cognitive and behavioral processes because these may also create emotional products. During collaborative learning, however, there may be situations that call for an increased focus on the emotional aspects of regulation. In these situations, individuals and groups may enact various strategies (instantiations of operations) to specifically manage their emotions and create or maintain a productive socio-emotional climate. In a text-based online environment, we view socio-emotional interactions among group members (e.g., politely acknowledging contributions) as observable operations; the products of manipulating these interactions may include renewed emotions and a positively or negatively enriched socio-emotional climate. Thus, in addition to a broader examination of the regulatory processes and modes engaged by the groups at the macro level, we specifically examined the nature of each group's socio-emotional interactions embedded within the micro elements of COPES. We view socio-emotional interactions as part of—rather than separate from—regulatory cycles because those interactions are assumed to serve the purpose of regulating emotions in social contexts. Finally, group members make judgments or evaluations of their emotional experiences during collaboration by comparing emotional products with perceived standards. Emotional products during and after collaboration play an important role in future collaboration (in this task or beyond; with this group or beyond) because they are conditions informing subsequent regulatory cycles.

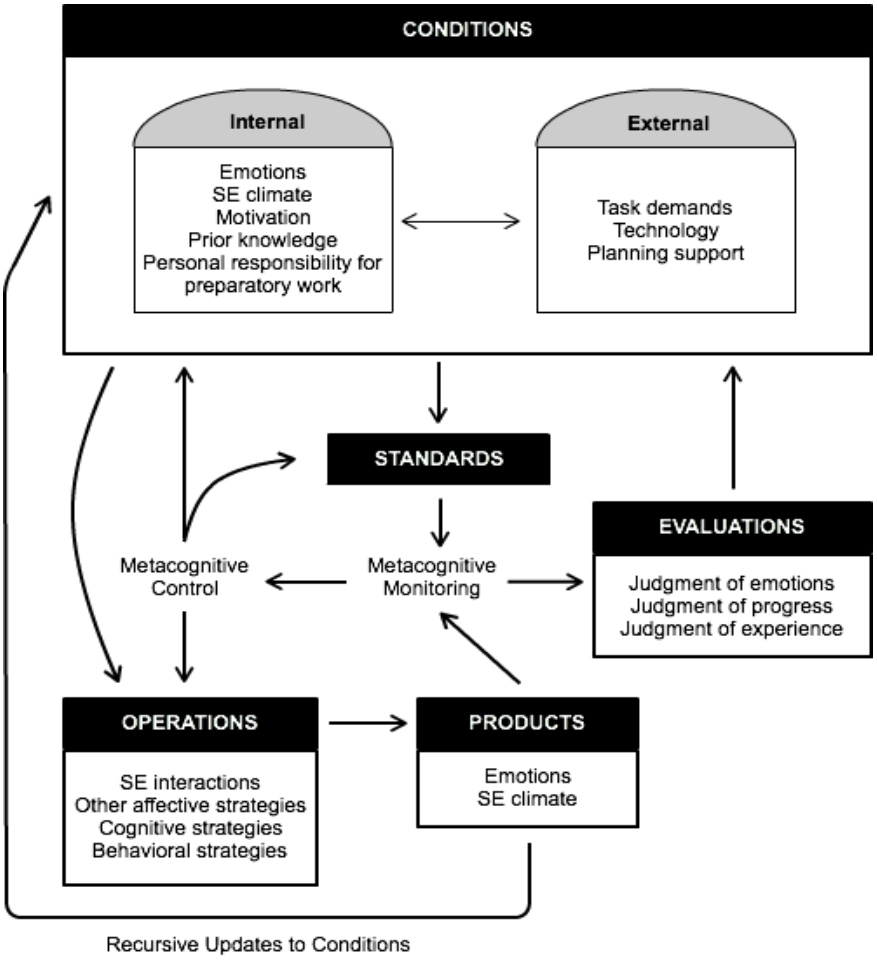

Fig. 1 Study constructs embedded within the COPES architecture. SE = socio-emotional.

Next, we further explain and distinguish three emotion constructs using the COPES typology: emotions, socio-emotional climate, and socio-emotional interactions.

Emotions as conditions and products. Emotions can be viewed as multi-componential entities made up of affective experiences or feelings, physiological responses, cognitive processes, behaviors or expressions, and/or action tendencies (Kleinginna and Kleinginna 1981; Scherer 2005; Solomon 2008). Although it is possible to distinguish among different affective constructs, such as mood and emotion (e.g., see Rosenberg 1998), we adopt a broader perspective in line with Boekaerts (2011) who indicates “the term ‘emotion’ is used in every-day

language to refer to affectively charged cognitions, feelings, moods, affect, and well-being" (p. 412). Other researchers have also treated constructs such as mood and emotions more or less interchangeably (e.g., Koole 2009; Pekrun 2006).

From the perspective of the COPES model (Winne and Hadwin 1998, 2008), emotion is viewed as both an internal condition that frames how individuals or groups engage in regulatory processes as well as a product of that same engagement. For example, as a condition, one member's anxiety may lead to poor monitoring of group work, and that low quality monitoring may result in the products of greater anxiety and a sense of dissatisfaction. As the cycle continues, anxiety and dissatisfaction become conditions for subsequent engagement. As shown in the Conditions box in Figure 1, we acknowledge that the internal condition of emotions may interact with external conditions such as task demands, technology, and/or experimental conditions (e.g., level of planning support). We also emphasize that a regulation of learning perspective focuses on learners' *perceptions* of their emotions rather than the physiological responses, of which learners' may or may not have metacognitive awareness. To reiterate, regulation of learning is fueled by metacognitive monitoring—without awareness of one's current and desired states, purposeful regulation will not occur. For instance, recognizing that anxiety adversely influences the quality of work enables the learner to deliberately select and experiment with strategies for decreasing that emotion.

Socio-emotional climate as a condition and product. The socio-emotional climate of a group is determined by the behaviors of and interactions among group members, such as when group members demonstrate reliability and support and encourage each other (e.g., Janssen at al. 2010; Kwon et al. 2014). The range of emotions experienced within a collaborative setting, collectively, can contribute to group socio-emotional climate (Järvenoja and Järvelä 2009;

Järvenoja and Järvelä 2013; Volet and Mansfield 2006). However, group members' emotional states (individually or collectively) are not synonymous with socio-emotional climate, but rather may influence the behaviors and interactions that determine perceptions of climate. The differences between emotions and climate can be viewed as analogous to the weather system, where emotions occur as events (e.g., rain or shine) and socio-emotional climate is the persistent pattern of shared emotions and behaviors over a longer period of time (e.g., temperate moist coastal climate). The relation between emotions and socio-emotional climate is likely reciprocal, with emotional reactions enriching the description of a climate and vice versa. For instance, when a group member perceives a positive climate of trust and support in his group, this may produce affective responses such as increased confidence and decreased anxiety. These responses may then promote further positive socio-emotional interactions, helping to maintain the positive climate.

In Winne and Hadwin's (1998, 2008) COPES framework, we view socio-emotional climate as a product impacted by incoming conditions and operations, subsequently becoming a condition for further regulatory processes. During collaboration, socio-emotional climate may be monitored and evaluated by group members, which may result in individual members or the group as a whole enacting strategies to create or maintain a positive working climate. Socio-emotional climate, thus, fits into the model the same way emotions do; however, we view climate as less malleable and more persistent because it involves aggregation over events and people, rather than being a situational, in-the-moment response like emotions.

Socio-emotional interactions as operations. Unlike the perceptions that comprise emotions or socio-emotional climate described above, socio-emotional interactions refer to the purposeful interchanges (often communication) among group members that shape perceptions of

emotions and socio-emotional climate, such as developing trust and cohesion, providing and seeking support, and building confidence and motivation (Kempler and Linnenbrink 2006; Kreijns et al. 2003; Marks et al. 2001). Ideally, socio-emotional interactions between and among group members are positive in character, encouraging harmonious group functioning and positive emotions during group work. However, it is possible for socio-emotional interactions to undermine group functioning, particularly when negative socio-emotional interactions persist (Rogat and Linnenbrink-Garcia 2011) or when students do not possess appropriate skills to navigate group work (Järvenoja and Järvelä 2009). Prior research demonstrates socio-emotional interactions are interconnected with other regulatory processes and play a role in regulation of emotions. For example, positive socio-emotional interactions have been linked to higher quality and facilitative forms of social regulation (Rogat and Adams-Wiggins 2015; Rogat and Linnenbrink-Garcia 2011), co-regulatory acts that activate discussion and metacognitive acts of evaluation (Lajoie et al. 2015), and conflict resolution and improvement in emotions and motivation (Ayoko et al. 2012; Linnenbrink-Garcia et al. 2011; Näykki et al. 2014). In contrast, negative socio-emotional interactions have been connected to less effective and more directive forms of social regulation (Rogat and Adams-Wiggins 2015; Rogat and Linnenbrink-Garcia 2011) as well as negative emotions and lowered motivation (Näykki et al. 2014).

When situated in the COPES architecture (Winne and Hadwin 1998, 2008), we posit socio-emotional interactions can be viewed as manifestations of operations, being influenced by internal and external conditions and contributing to the affective products of group members' emotions and socio-emotional climate. Thus, the regulation of emotional aspects of group work includes taking control of methods of communication that can induce or mollify positive or negative emotions, ultimately contributing to the group's productivity and socio-emotional

atmosphere (Järvenoja and Järvelä 2013; Kreijns et al. 2003). Note that both internal conditions and products include group members' individual and collective emotions as well as the emerging socio-emotional climate. As conditions and products, emotions and socio-emotional climate both influence and result from the operations of socio-emotional interactions. Indeed, it is likely the three constructs—emotions, socio-emotional climate, and socio-emotional interactions—continually interact with one another throughout a collaborative session, such as when frustration is provoked by a persistent negative atmosphere, calling the group to regulate that emotion by changing the tone of their interactions.

Section summary. In essence, the dynamic and multidimensional activities that occur in collaboration imply emotion regulation in such contexts should occur at both the individual and group level to ultimately create and maintain a positive group climate necessary for productive collaboration (Järvenoja and Järvelä 2009). More specifically, groups employ different modes of regulation where they (a) self-regulate their own emotional states, (b) co-regulate fellow group members to regulate their emotional states, and (c) socially share in the regulation of the group's emotional states (Hadwin et al. 2011). Research examining emotion regulation in collaboration is limited, but empirical evidence provides support for the use of both individual and group-level regulation to overcome socio-emotional challenges and maintain positive group functioning (e.g., Ayoko et al. 2012; Järvenoja and Järvelä 2009; Näykki et al. 2014).

Purpose

Although research examining the affective dimension of collaboration is growing, limited research examines the regulatory behaviors and actions that contribute to or are influenced by a positive or negative socio-emotional climate, particularly in the context of computer-supported collaborative learning (CSCL; Dillenbourg et al. 2009; Järvelä et al. 2015). Not only might

CSCL environments present different emotion-eliciting challenges than face-to-face environments, but the expression and regulation of emotions might also differ, particularly when group members are limited to chat-based communication where traditional non-verbal cues (e.g., facial expressions) are absent. In a review, Derks et al. (2008) found evidence to indicate intense negative emotions were expressed more frequently in online interactions than in face-to-face interactions, which the authors propose may be due to being unaware of the impact of one's negative emotional reactions on other participants. The finding suggests there may be a need for more or different types of regulatory actions to encourage harmonious group functioning during online collaboration. Although emotion regulation was not a focus of their review, Derks et al. posit emotions can be more easily regulated in online communications because (a) typing a message provides time to monitor and control one's emotional expression and (b) participants do not observe each other's non-verbal emotional expressions. We agree that chat-based interactions may facilitate self-control over one's emotional expressions, but it may also be the case that a lack of traditional non-verbal cues may impede co- and shared regulation of emotions because of the difficulty in noticing others' emotions. To our knowledge, research examining socio-emotional processes in the context of regulation has mainly relied on observations of these processes during video-taped face-to-face collaborative sessions (e.g., Lajoie et al. 2015; Näykki et al. 2014; Rogat and Adams-Wiggins 2015; Rogat and Linnenbrink-Garcia 2011), although investigations within online settings are beginning to emerge (e.g., Janssen et al. 2010; Kwon et al. 2014).

This study provides two important extensions to prior research. First, we performed an in-depth analysis of two contrasting groups' socio-emotional regulation embedded within their broader regulatory behaviors, triangulating our interpretations (see Pitman and Maxwell 1992)

by drawing on two data channels: (a) observed regulatory processes (i.e., planning, enacting, adapting, and monitoring), regulatory modes (i.e., SRL, CoRL, and SSRL), and socio-emotional interactions during online collaboration and (b) data about emotional beliefs and perceptions gathered through self-reports before, during, and after collaboration. Second, unlike past research, we drew heavily from Winne and Hadwin's (1998, 2008) model of SRL and current conceptualizations of self-, co-, and shared regulation (Hadwin et al. 2011; Järvelä and Hadwin 2013; Miller and Hadwin 2015a; Winne et al. 2013) to guide our investigation. Towards this end, our analysis acknowledged the possibility that regulation of emotions occurs at individual and group levels.

The purpose of this exploratory case study was to examine the regulation of socio-emotional aspects of collaboration demonstrated by two groups with contrasting socio-emotional climates (positive vs. negative). Three research questions guided the inquiry: (a) with what set of conditions did each group enter the collaborative task, (b) how did the observed regulatory processes, regulatory modes, and socio-emotional interactions fluctuate and interact in each group, and (c) what were group members' perceptions of the collaborative experience in terms of their emotional reactions? To answer these questions, we conducted a qualitative cross-case analysis of two groups of undergraduate students collaborating on an online case-analysis assignment. More specifically, we adopted Braun and Clarke's (2006) thematic analysis methods to draw dominant distinguishing features between the positive and negative climate group.

Methods

Instructional Context

The broader context of this case study was a semester-long undergraduate course about learning processes and strategies for academic success. The purpose of this course was to equip

students with the skills to engage in strategic, reflective, and adaptive individual and collaborative learning. Among other graded and non-graded assignments, where students individually applied research from the learning sciences into their own studying, the course included two online collaborative assignments. The collaborative assignments together accounted for 30% of the final course grade and were introduced once in the middle and once towards the end of the semester. Given the exploratory nature of this study, only the first assignment data were analyzed.

The assignment included macro and micro scripts to help students navigate the collaborative process. At the macro level, students were guided through three broad phases of collaboration including (a) solo and group planning and preparation, (b) task enactment of a collaborative case analysis task, and (c) reflecting in order to adapt in future collaborative work. Each phase contained one or more supporting micro scripts. Figure 2 shows the specific macro-script steps guiding groups through the collaborative learning cycle. In Step 1 (Group Coordinated Individual Expertise), groups met briefly in an online chat room and were given a chance to familiarize themselves with the chat environment. Here, groups decided who would become the “expert” for each of four assignment topics: task understanding, goal setting and monitoring, self-regulated learning, and memory and learning processes. Each member was then responsible for preparing a one-page summary sheet related to his or her topic to be used as a reference tool during the collaborative case analysis task. Collectively, groups had a summary sheet for each major course topic necessary to solve the case.

In Step 2 (Solo Planning), group members completed a solo planning tool that guided and recorded their individual perceptions about the learning objectives of the task, personal goals, and plans they might share with their group before jumping into the collaborative case analysis

task. In Step 3 (Group Planning), groups completed a planning tool guiding them to discuss and jointly respond to questions similar to those in the solo planning tool. Both solo and group planning tools were an online form pre-stocked with similar questions and prompts. However, the framing of questions tapping into learners' perceptions of the learning objectives (i.e., what are you being asked to do and why) varied depending on the level of support provided to the group. Specifically, groups were assigned to one of four planning support conditions: (a) high-solo and high-group; (b) low-solo and high-group; (c) high-solo and low-group; and (d) low-solo and low-group. The high planning support contained pre-stocked selections of potential answers, whereas the low planning support contained open-text fields. During group planning, access to a collective summary of individual solo planning tool responses was provided.

Step 4 (Collaborative Case Analysis Task) consisted of a timed collaborative case analysis task that involved analyzing a 1-page case scenario about a fictitious student's learning behaviors. More specifically, groups were required to (a) analyze the student's strengths and weaknesses using the group's knowledge of theories and research in learning sciences introduced in the course, (b) identify and explain the root cause of the student's behaviors, and (c) recommend and justify strategies the student could use to improve learning. Group answers were recorded in a wiki page viewable by all group members but editable by only one member at a time. Groups completed the group planning tool and the collaborative case analysis task (Steps 3 and 4) during the same in-class 90-minute online session, where discussions were held in the same online chat environment introduced at Step 1. Specific for this timed session, each student was required to sign in to a computer located in one of the university's computer laboratories, supervised by at least one course instructor. Computer stations were randomly assigned to students. Students accessed the text-based chat tool, shared wiki, and case scenario in different

windows on their computer. No face-to-face conversations occurred during collaboration. Finally, in Step 5 (Solo Reflection), group members individually completed a solo reflection tool in which they reflected on the collaborative experience. Solo activities (Steps 1, 2, and 5) were individually completed outside of class time, but students were required to submit these activities before instructor-assigned deadlines.

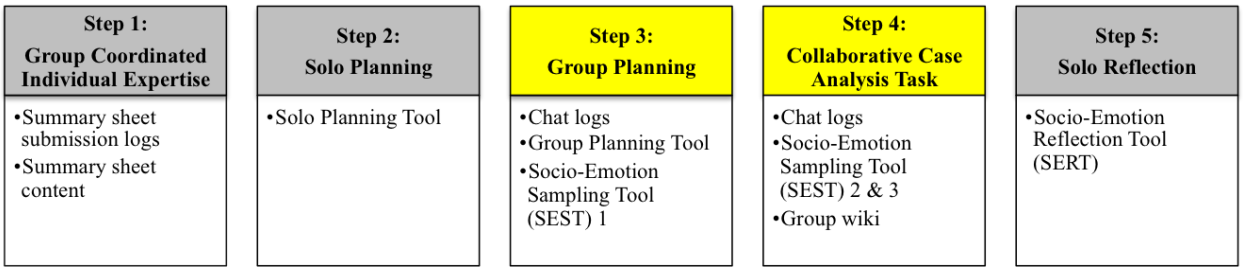

Fig. 2 Steps for collaboration in the first assignment are shown along with a list of data sources for each step. Yellow boxes indicate these steps took place in a timed online session.

All tasks in the collaborative assignment were delivered and completed via Moodle 2.4—learning management software familiar to students at the university. Students (N = 192 consenting students) worked in groups of three to five (48 groups in total) assigned by the course instructors. Course instructors did their best to make groups heterogeneous on the basis of gender, English as first language status, and prior knowledge as indicated by performance on the first course quiz. Because groups were assigned and students came from a wide array of programs and departments, group members were likely unfamiliar with each other personally beyond the course.

Data Sources

Figure 3 maps each data source onto the same COPES diagram presented earlier (see

Figure 1). Following this, we describe the data sources used to measure each construct.

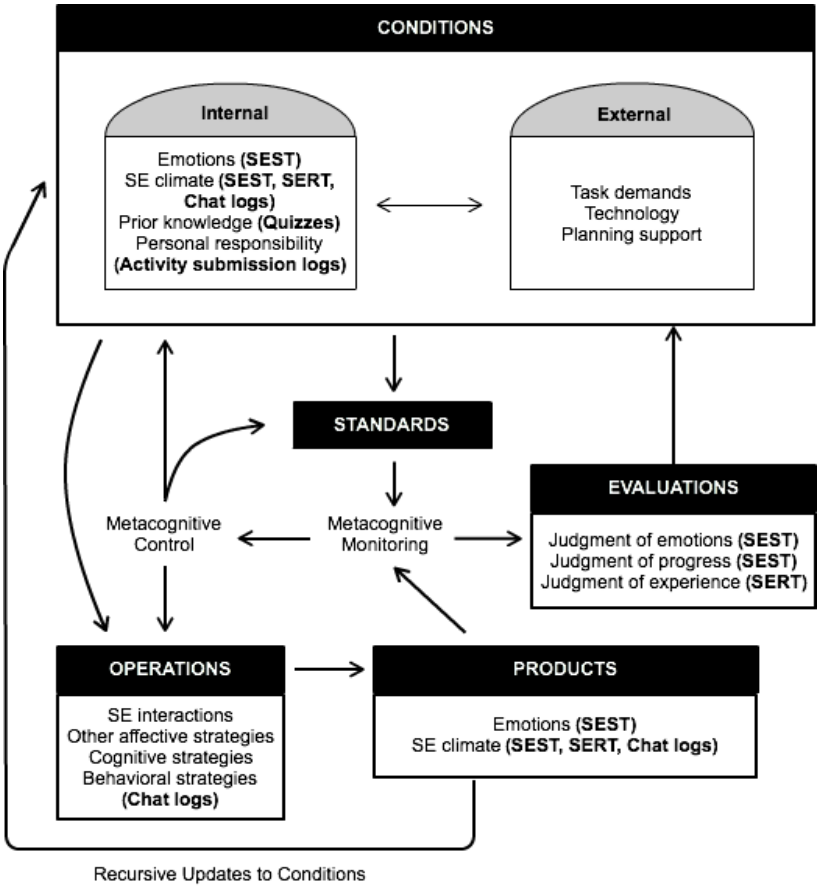

Fig. 3 Study constructs and data sources embedded within the COPES architecture. Data sources are listed in parentheses following the construct(s) they measure. SE = Socio-emotional; SEST = Socio-Emotional Sampling Tool; SERT = Socio-Emotional Reflection Tool.

Prior knowledge. This construct was measured by examining individual performance on three course content quizzes prior to collaboration (M_1= 70.0, SD_1=16.3; M_2= 78.4, SD_2=13.3, M_3= 69.6, SD_3=14.5), testing knowledge of four major topics covered in the collaborative assignment. Quizzes were developed and reviewed by a group of experienced course instructors and researchers in the area of regulation who ensured content validity of each quiz with respect to specific course topics and three levels of processing (understanding, connecting, and

extending). Each quiz contained 10 multiple-choice questions and was counted toward students' final grade. Cronbach's alpha coefficient based on the 30 quiz questions was .49.

Personal responsibility. A global judgment of personal responsibility demonstrated by individual group members prior to the task was developed by reviewing records of when group members submitted their summary sheet and solo planning tool (Steps 1 and 2 in Figure 2) along with the content of those activities.

Emotions. The Socio-Emotional Sampling Tool (SEST) provided information about individual group members' (a) current emotional states and plans for regulating those emotional states (internal conditions and products), (b) judgments of their emotional states (evaluations), and (c) satisfaction with the group's progress (evaluations). Group members individually completed the SEST at the beginning, middle, and end of the in-class collaborative session (Steps 3 and 4 in Figure 2). The SEST facilitated the construction of a self-narrative about students' salient emotion in the moment with respect to collaboration. Rather than including a set of isolated questions, the SEST was designed with drop-down menus embedded in first-person sentences, enabling students to quickly create a cohesive narrative of their current emotional state (see Figure 4).

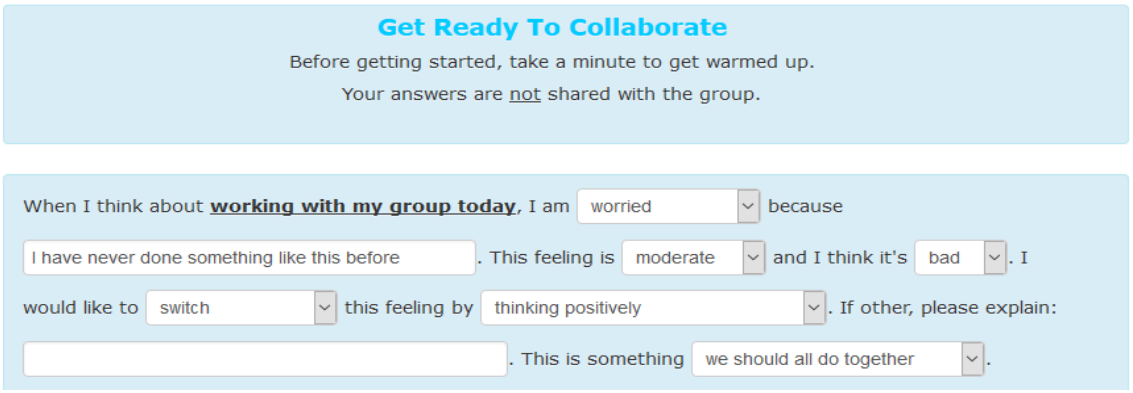

Fig. 4 Sample items from the Socio-Emotional Sampling Tool (SEST)

In particular, students indicated (a) a salient emotion they were experiencing related to working with their group from a drop-down list, (b) the source of their emotion in an open-text field, (c) the intensity of their emotion (from *very weak* to *very strong*), (d) whether their emotion was good or bad, (e) a goal for regulating their emotion (increase, decrease, switch, maintain, do nothing about), (f) a strategy they intended to use to regulate their emotion from a drop-down list, and finally, (g) if the strategy should be enacted individually or as a group. In the midpoint and final SEST, students also reported their level of satisfaction with progress (from *not very* to *extremely* satisfied). The drop-down list of emotions included six positive emotions (excited, optimistic, confident, happy, focused, calm) and six negative emotions (anxious, worried, stressed, doubtful, frustrated/angry, disappointed). There is little prior research on the specific emotions students experience during collaboration. These 12 emotions were chosen because they represented a balance of positive and negative emotions, were among frequently reported emotions in other data we have collected from students about their emotions during independent studying, and were relevant for a collaborative context. The drop-down list of strategies included eight strategies: creating a good plan, changing the plan or approach, focusing on the task, changing thoughts or beliefs, thinking positively, talking to others in the group, taking deep breaths and/or relaxing, accepting it and carrying on. This list was developed from existing theory and research in both individual and collaborative contexts (Gross 1998; Järvenoja and Järvelä 2009; Schutz et al. 2004; Webster and Hadwin 2014). Students also had the option to "do nothing about" their emotion or indicate they would do something else not on the list. The aim in developing the drop-down list was to include a limited number of strategies for students to choose from that met the following three criteria: (a) the strategies were appropriate for the

context; (b) the strategies were specific enough to be useful, but also adaptable to the student's particular situation; and (c) the list covered the major types of strategies identified in theory and research.

Individual perceptions of socio-emotional climate. Two measures provided information about group members' perceptions of the socio-emotional climate: (a) the midpoint and final SEST (described previously) contained one item assessing perceptions of the atmosphere (positive, negative, or neutral) and (b) the Socio-Emotional Reflection Tool (SERT) contained two items targeting perceptions of the collaborative experience. Preliminary examination of SEST data of the full sample of groups showed that very few students (3.1%) reported a negative atmosphere. This may be indicative of an unwillingness to report a problem in the group *during* the collaboration. The SERT was completed as part of the solo reflection tool (Step 5 in Figure 2). By prompting students to reflect on a positive or negative experience that occurred during the in-class collaborative session, the SERT aimed to build awareness of successes or difficulties so students could more effectively plan and prepare for future collaborative situations. Students were first asked to describe a salient experience in an open text field and then select from a drop-down menu whether the experience was positive or negative. This information was used as the first data point for selecting cases for analysis as described in the next section.

Socio-emotional interactions and observed socio-emotional climate. Chat logs provided evidence of outward instantiations of socio-emotional interactions and informed our perceptions of the socio-emotional climate as a product and a condition. ZohoChat—a synchronous text-based chat tool that contains a running record of all chat history and allows students to enter the chat where it was left off—was used to host and record collaborative

discussions during the timed online session.

Regulatory processes and modes. The chat logs described above were used to examine groups' regulatory processes (planning, enacting, adapting, monitoring) and regulatory modes (SRL, CoRL, SSRL) used to carry out the processes. Processes and modes occur at the macro level, where they can be aimed at taking control of cognition, behavior, motivation, and/or emotions.

Case Sampling Strategy and Case Descriptions

Extreme case sampling (Miles et al. 2013) was used to identify two maximally contrasting groups in terms of the overall socio-emotional climate during collaboration. We intentionally blinded ourselves to the planning support condition assigned to each group because we did not want the condition to bias our perceptions of the groups' socio-emotional climate. Judgments of socio-emotional climate were drawn from three main data sources: (a) rating of a salient affective event as positive or negative (SERT), (b) text based descriptions of a salient affective event that was positive or negative (SERT), and (c) overall positive or negative tone of the group chat discussion reflected in field notes recorded by two independent researchers (chat logs). Based on ratings of a salient affective event in the SERT, cases were narrowed down to six potential cases wherein (a) all four group members reported a salient affective event they rated as positive (four groups in total) or (b) all four group members reported a salient affective event they rated as negative (two groups in total) after collaboration. For all six groups, we confirmed that the affective event described in an open text field by each individual was consistent with that person's rating of the event as positive or negative. This collection of responses was used as an indicator of the group's global judgment of the overall socio-emotional climate of the group. Importantly, these reflection data were used as a starting point to select our cases because

retrospective reports reveal emotional perceptions or beliefs that are products of collaboration and likely serve as a condition informing future collaboration. It is possible during a collaborative task students experience a range of emotionally charged events, but the emotional memory that stands out for them—as reported in their reflections—is an important condition for future collaboration.

Finally, chat logs for each of the six groups were independently reviewed by two researchers tasked with documenting holistic impressions and observations in open field notes. Field notes particularly attended to overall tone and climate. Field notes were used to choose one of the four groups reporting a positive affective event and one of the two groups reporting a negative affective event. The two groups chosen represented maximal variation in the overall holistic impressions of tone and climate recorded in field notes. Herewith, we refer to one group as the positive climate group and the other as the negative climate group.

The positive climate group was consistent throughout their open-ended descriptions in the SERT describing a positive and supportive group that worked well together. Field notes about chat discussions corresponded with individual reports, noting polite and respectful exchanges and deliberations throughout the task. In contrast, the negative climate group reported running out of time as a salient negative event during collaboration. One member also noted the group did not know how to collaborate, suggesting the group struggled to function productively. Field notes about chat discussions noted multiple points of frustrations and tensions negotiating roles and contributions. Table 1 summarizes demographic information of the individuals comprising each group. All students were in their first semester of university. Hence, it is likely these students had little, if any, previous experience with university-level collaborative work at the point of data collection.

Table 1 Summary of participants' demographic information

	Positive climate group	Negative climate group
Group members	Tom *(male; non-ESL)* Jessica *(female; non-ESL)* Angie *(female; non-ESL)* Suparna *(female; ESL)*	Jay *(male; non-ESL)* Steve *(male; ESL status not reported)* Seiko *(female; ESL)* Jing *(female; ESL)*
Mean age (years)	17.8	18.0

Note. All names used in examples are pseudonyms. ESL = English as a second language.

Chat Transcript Coding

Chat transcripts were coded on three dimensions: (a) regulatory processes, (b) modes of regulation, and (c) socio-emotional interactions. Drawing from Barbour (2001), we acknowledge that in the context of an in-depth cross-case analysis where complex processes and interactions are coded by two researchers, "concordance between researchers is not really important; what is ultimately of value is the content of disagreements and the insights that discussion can provide for refining coding frames. The greatest potential of multiple coding lies in its capacity to furnish alternative interpretations... Such exercises encourage thoroughness, both in interrogating the data at hand and in providing an account of how an analysis was developed" (p. 1116). With this in mind, we conducted multiple reviews of both the coding scheme and the coded data and engaged in discussions with other knowledgeable researchers in the field to reveal alternative interpretations and insights. Coding for each dimension progressed in a similar manner. First, an initial coding scheme was developed from existing theory and research. Second, the coding scheme was applied to the data by independent coders including the first two authors. The team then reconvened to discuss and revise the coding scheme to better reflect the data. Rather than dividing the chat into episodes and coding at the episode level, each utterance in the chat was coded. An utterance could expand across multiple chat lines by the same student as long as all

lines pertained to the same thought. This second step was repeated until code descriptions were agreed upon. The second author then applied the final coding schemes to all chat data. Initial Krippendorff's alpha between the first two authors for 20% of the data was .67 for regulatory processes, .62 for modes of regulation, and .69 for socio-emotional interaction codes. Finally, all codes were reviewed by the first two authors, who discussed any disagreements until a consensus was reached.

Regulatory processes. Table 2 presents the final version of the coding scheme for regulatory processes. Informed by an extended version of Winne and Hadwin's (1998) self-regulated learning model described by Miller and Hadwin (2015a), regulatory processes coded in this study included the acts of (a) planning, where learners construct task understanding and set goals, (b) enacting, where learners employ strategies for achieving task goals, and (c) adapting, where learners make changes in response to a perceived challenge. The authors not only describe how the three processes occur at an individual level but also take into account regulation that occurs at the social level. These regulatory processes—planning, enacting, adapting—can target cognition, behavior, motivation, emotions, or a combination of these facets of learning. In this study, coding of regulatory processes was not exclusive to emotion regulation; instead, we aimed to examine the emotional products and subsequent conditions that arise from engaging the regulatory processes (e.g., anxiety that follows ineffective planning and becomes a condition for task enactment).

In line with the SRL model, we included a code for metacognitive monitoring and evaluating, which fuel regulatory processes. On the basis of earlier iterations of coding, we also added orienting as a distinct subcode of monitoring, keeping it as a separate subcode because of its high occurrence. Orienting represents low-level coordinating statements where the main

purpose is to situate the group member(s) in terms of the environment and task (e.g., monitoring who is in the chat or what question is being worked on). Orienting differed from other forms of monitoring—such as monitoring progress—in its lack of connection to plans, goals, or standards. For example, establishing whether everyone is looking at the same question (coded as orienting) simply allows the group to move forward with their work, whereas stating the question needs to be completed in five minutes (coded as monitoring) is a form of monitoring progress against time standards.

Modes of regulation. The coding scheme for modes of regulation (Table 3) was informed by Hadwin and colleagues' (Miller and Hadwin 2015a; Hadwin et al. 2017) descriptions of self-regulated learning (SRL), co-regulated learning (CoRL), and socially-shared regulation of learning (SSRL). In addition to the three codes of SRL, CoRL, and SSRL, we included a code for co-regulatory requests where individuals requested support for their own regulation (Hadwin et al. 2017). The act of co-regulation (providing support) may or may not have occurred in response to these co-regulatory requests.

Because it is possible for regulatory processes to occur at individual and group levels simultaneously and for an individual to promptly switch from individual to group regulation within one speaking turn, codes for modes of regulation could overlap. For example, when a group member announced what he was individually working on (monitored his own progress) and asked for an update from his group (monitored his group's progress), this statement was coded as both SRL and CoRL. Furthermore, when a group member acted in response to co-regulatory support provided by another group member, the response was coded as both SRL and CoRL to indicate the transfer of regulation. The addition of this round of coding helped to decode the social nature of regulation, which includes the dynamic interplay between an

individual, others, and the group. For instance, a less supportive group may display fewer co-regulatory acts that are positive in nature.

Socio-emotional interactions. Outward instantiations of emotion regulation observed in the form of socio-emotional interactions were examined at this level. The coding scheme for socio-emotional interactions (Table 4) was informed by several pre-existing socio-emotional coding schemes in the literature (e.g., Ayoko et al. 2012; Lajoie et al. 2015; Linnenbrink-Garcia et al. 2011; Näykki et al. 2014; Rogat and Adams-Wiggins 2015; Rourke et al. 1999). Similar to modes of regulation, it was possible for turns to receive more than one socio-emotional code. In line with previous research, positive interactions included apologizing, humor or laughter, encouraging members' participation and motivation, and promoting trust and cohesion among group members. Negative interactions included discouraging participation and motivation, low cohesion (emphasizing the individual over the group), and pressuring others. Because text-based chats often involve the use of emoticons and symbols to express and emphasize emotions, we included a code for expressing emotions, which was also applied to the use of emotion language. We did not categorize expressing emotions as a positive or negative socio-emotional interaction because (a) regardless of what emotions are being expressed, the act of expression itself could be beneficial or detrimental to the discussion and (b) some symbols could be ambiguous with respect to what emotion the group member is intending to convey.

Table 2 Coding scheme for regulatory processes

Code	Description	Examples[a]
Planning	Defining task perceptions, setting goals, and making plans for cognitive, behavioral, and/or affective aspects of the task.	**Task perceptions** *Angie:* ok so it seems like in the first one the majority of us think that our task is to analyze the scenario, identify srl strengths and weaknesses, come up with a solution and back up our answers with examples **Making plans** *Jay:* So whos going to be the editor? Shoty not *Steve*: I would prefer not to *Jay*: I only want to opt out because I am not a super fast typer
Enacting	Indicator of strategy use. Purposefully adopting and adapting tools and strategies to attain goals and standards and mediate challenges. Also includes stating domain-related knowledge or content for the task product.	**Strategies for thinking / understanding** *Jay [making use of distributed expertise]:* Im having trouble seeing [domain concepts]... Seiko, this is your specialty. what do you think? **Strategies for behavior / task / team engagement** *Tom:* easily fixable for you Angie, just some cut and pasting *Jing [after realizing they are running out of time]:* don't spend too much time on the plan, we need to focus mainly on the challenge part, haha **Domain / content contribution** *Jing:* Brian does not pay attention in class, because he thinks that reading the textbook will get him good marks in the exam. He does not understand the connections between the concepts and the teacher's examples.

Monitoring and/or evaluating	Monitoring and/or evaluating task understanding, progress, and products in relation to behavioral, cognitive, or affective goals and standards.	**Task perceptions / plans** *Tom:* I didn't know we had to study the diagrams for this *Suparna [evaluating the correctness of the plan]:* Yeah thats what I was thinking too / everyone agree? *Angie:* yes me too **Task product or progress** *Jay [when not getting much response from group members]:* more contributions? *Suparna:* lol I just saw it before I came *Tom:* I think you got it Suparna
Orienting (subcode of monitoring)	Situating or positioning self or others in terms of the group, environment, and task. Low-level coordinating statements / announcements where the main purpose is to situate or move things along.	*Jay [while members are logging on to the chat]:* hey guys, are we all in the chat? *Angie:* Ok should we look at the group summery now then?
Adapting	Making a purposeful change to task perceptions, goals, plans, or behavioral / cognitive / affective strategies to overcome a challenge in the current task or in future tasks. Always a secondary code in relation to what the change is about. Often preceded by monitoring.	*Tom:* so I think only one person can edit at a time. *Angie:* yes / Samir copy and paste wht you wrote into chat and I will put it in? *Jay:* were really running out of time!! *Jing:* who is responsible for B / let's divide the last things
Off-task	Off-task statements and social greetings.	*Jing:* hello!

	Seiko: Who typed all caps hahaha
Uncodable	Partial statements and/or statements where the meaning is not clear.

[a]Chat excerpts have not been corrected for grammatical errors, formatting, etc.

Table 3 Coding scheme for modes of regulation

Code	Description	Examples
Self-regulation	Individual deliberately plans, monitors, and/or regulates their own cognitions, behaviors, motivation, and emotions in the joint task.	*Seiko:* I am working on my answers. I will post them when I check it. *Seiko:* Still working on it. For strength, I have this so far.
Co-regulation	Individual or group supports or influences one or multiple members' individual regulation processes or the group's shared regulation processes. These regulatory processes can target cognitions, behaviors, motivation, and/or emotions. Co-regulation creates affordances and constraints for productive self-regulated learning and/or shared regulation of learning.	*Angie:* Sorry guys where are we here? *Tom:* Number 6 *Jessica:* Its #2 in the personal part but in the thing you're filling out it is Number#6. I think. *Angie:* oh right sorry yes I'm doing #6 too.
Co-regulatory request	Individual requests support for regulation.	*Angie:* Sorry guys where are we here? *[This is a request to the above co-regulation example]*

Socially-shared regulation	Group members collectively negotiate and realign or adapt group regulation processes targeting cognition, behavior, motivation and/or emotions. Shared regulation is transactive in that multiple individual perspectives contribute to the joint effort to take control of the task.	*Angie:* ok so it seems like in the first one the majority of us think that our task is to analyze the scenario, identify srl strengths and weaknesses, come up with a solution and back up our answers with examples. *Angie:* Does that sound about right? *Jessica:* I agree *Suparna:* Yeahh. They all have more than 75 % *Tom:* Agreed

Table 4 Coding scheme for socio-emotional interactions

Code	Description	Examples
Positive interactions		
Apologizing	Apologizing to another member / the group in response to a perceived challenge (e.g., confusion, making a mistake, taking too long, etc.). Could be considered a strategy to promote positive emotional reactions or to reduce or avoid negative emotional reactions.	*Suparna:* I am almost done / sorry *Jing:* im sorry Jay should have told you earlier :(
Humor / laughter	Using humor or laughter to potentially ease tension or create a positive atmosphere.	*Tom:* who's editing? not me because I lost this debate haha
Encouraging participation / motivation	Encouraging or facilitating others' participation by seeking feedback or contributions, promoting openness, providing positive feedback, making a polite request or suggestion, or providing reassurance. Also	**Seeking feedback** *Jessica:* I think that the root of his problem must be [domain contribution]. Do you agree? Then we can discuss how it impacted the rest?

	includes motivational or enthusiastic statements.	**Providing positive feedback** *Tom:* you did a great job with the planner **Polite request** *Jessica:* Samir, could you put what is complete into the page and save it so that we can read them more easily and then add anything we think is needed? **Providing reassurance** *Suparna:* I am almost done / sorry *Angie:* no worries **Enthusiasm** *Jing:* :D lets get started!
Promoting trust / cohesion	Promoting trust and cohesion by appealing to external factors (e.g., task or instructor directions) to potentially ease tensions or using "we" statements to imply the group is working together or should work together.	**Appealing to external factors** *Tom:* [instructor] says we should be starting our scenarios shortly **"We" statements** *Jessica:* thanks everyone i think we did a really good job
Negative interactions		
Discouraging participation / motivation	Discouraging participation and undermining task contributions by criticizing another's work, ignoring feedback or questions, or rejecting contributions. Also includes undermining one's own or the group's abilities (low efficacy) and avoiding commitment to the task.	**Undermining another's contribution** *Jay [after another member has submitted an answer]:* are we not supposed to use past tense? **Low efficacy / commitment** *Jay:* I only want to opt out [of being editor] because Im not a super fast typer

Low cohesion	Statements that imply the group is not working together or that emphasize the individual over the group. Includes taking personal credit for or emphasizing one's own ideas.	*Jay:* WE DON'T DISCUSS UNTIL WE HAVE ANSWERED EVERY QUESTION IN THE CHALLENGE, in my opinion?? That was what I intended when we wrote the plan of attack
Pressuring others	Telling another member / the group what to do without asking, suggesting, or being polite. Includes overruling interactions where the member makes a decision for the group or rushes the group to move on without seeking more input.	*Angie:* group plan isnt being graded lets move on! *Jay:* lets goo people / I need your answers>>?
Expressing emotions	Expressing emotions by using emoticons, emphasis (e.g., caps lock, ??), or emotion language / expressions.	**Emoticon** *Jay:* I can be editor I guess.... :/ **Emphasis** *Jay:* whos the last person in our group and where are they?? **Expression** *Jay:* our supervisor said we should be done!! Ahh

Analysis and Findings

Analytical Approach

Loosely guided by Braun and Clarke's (2006) thematic analysis, we primarily used a data-driven technique to generate important themes describing the differences between the positive and negative climate groups. We began by documenting general observations of each data source, collected from the beginning to the end of the collaborative assignment. Next, using inductive and deductive approaches, we constructed and refined the coding schemes for the observation data (i.e., chat logs). Upon completion of coding, we examined the fluctuation in codes over time and the convergence between and among categories of codes to generate potential themes. Using all data sources, we iteratively reviewed and defined emerging themes until we reached an agreement that the final list of themes best reflected the differences in the two cases.

Code fluctuations over time. To examine the fluctuation of each code over the course of the online collaborative session, we broke the session into equal time segments and calculated code frequencies occurring in each time segment (for total frequencies across the whole session, see Table 7 in the Appendix). For regulatory processes and modes (Figures 5 and 6), we broke the session into three 30-minute segments with a fourth time segment representing overtime (i.e., the time group members stayed beyond the original 90-minute time limit). For socio-emotional interactions (Figure 7), we broke the session into six 15-minute segments plus overtime. A smaller time interval was selected because socio-emotional interactions were more dynamic, with codes changing relatively quickly over fewer turns—a characteristic that was less apparent with a 30-minute time interval. Examining the fluctuation in code frequencies allowed us to look for patterns that differentiated the groups in terms of (a) how actively each group demonstrated

the various regulatory processes, regulatory modes, and socio-emotional interactions and (b) how their actions changed over the course of the session.

As this was an exploratory study, our main purpose was to pinpoint differences warranting further research. We focused on frequencies because groups were given the same amount of time (90 minutes) to work on the task. No count statistics were performed to determine statistically significant differences. Rather, we were primarily interested in examining the nature of code transitions over time, which is in line with our assumption that regulation is a recursive and adaptive process that unfolds across phases. For example, a typical pattern of transitions in a productively regulating group might include a higher prevalence of planning early in the task, a higher prevalence of enacting in the middle of the task, and a higher prevalence of monitoring towards the end of the task (Winne and Hadwin 1998; Zimmerman 1989). We would also expect to see a productive group concurrently engaging in SRL, CoRL, and SSRL, with the latter two modes more prominent as groups work toward a joint outcome (Hadwin et al. 2011). Finally, given that we view socio-emotional interactions as operations within regulatory cycles, we examined the fluctuation of socio-emotional interactions over time in relation to the emotional products of emotions and socio-emotional climate. For example, negative socio-emotional interactions that occur early and persist throughout the task would likely have a debilitating effect on groups' socio-emotional climate (e.g., Näykki et al. 2014).

Overlapping codes. To demonstrate the interplay between and among regulatory processes, regulatory modes, and socio-emotional interactions, we graphed the co-occurrences of these codes for each socio-emotional climate (Figure 8).

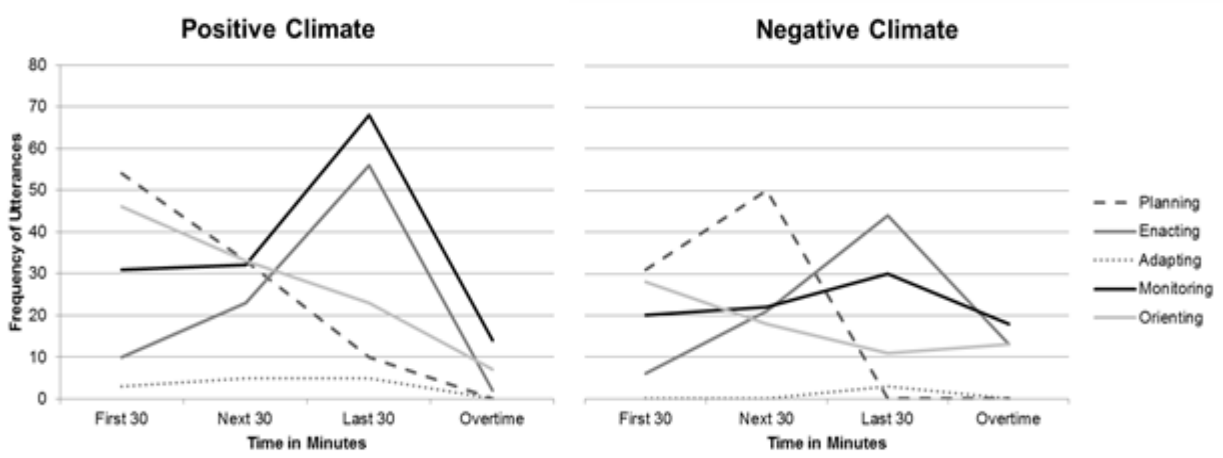

Fig. 5 Regulatory processes over time

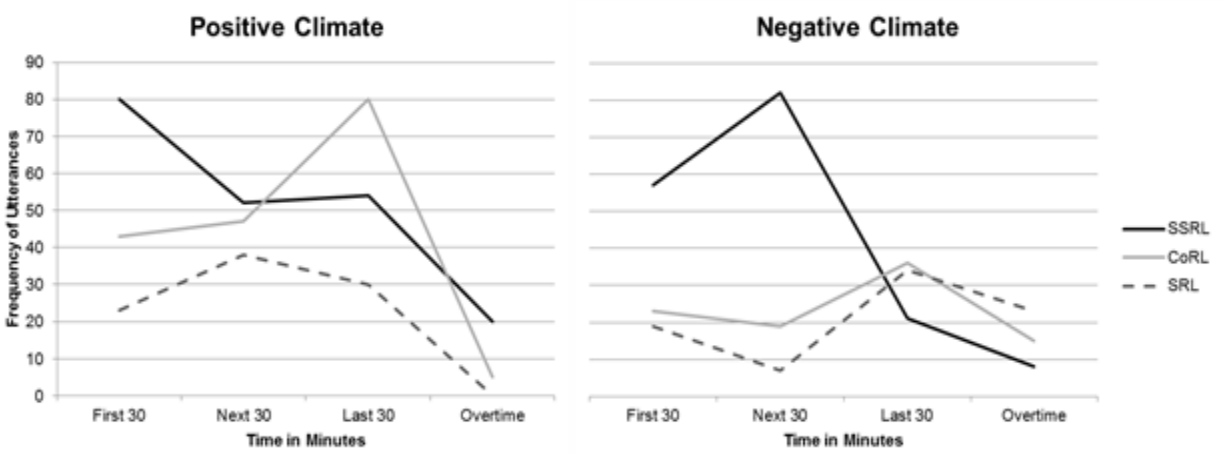

Fig. 6 Modes of regulation over time.

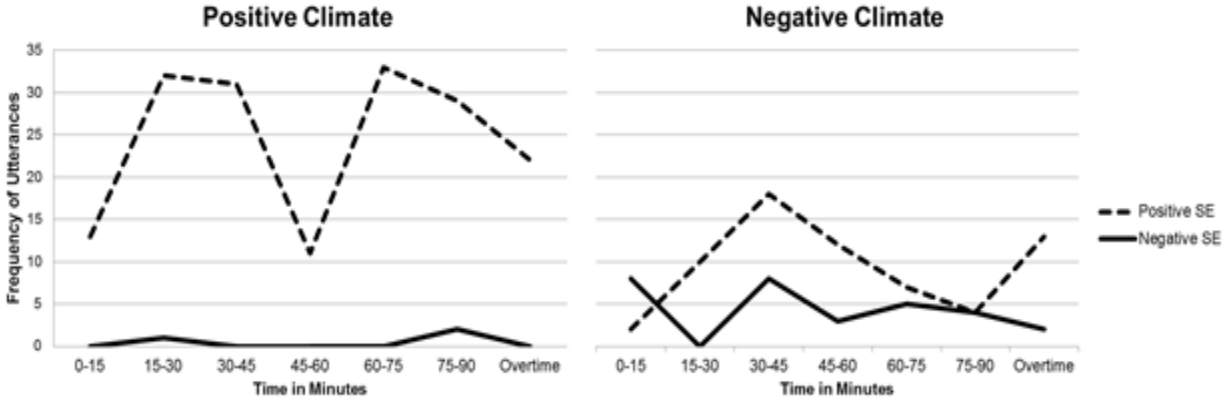

Fig. 7 Socio-emotional interactions over time

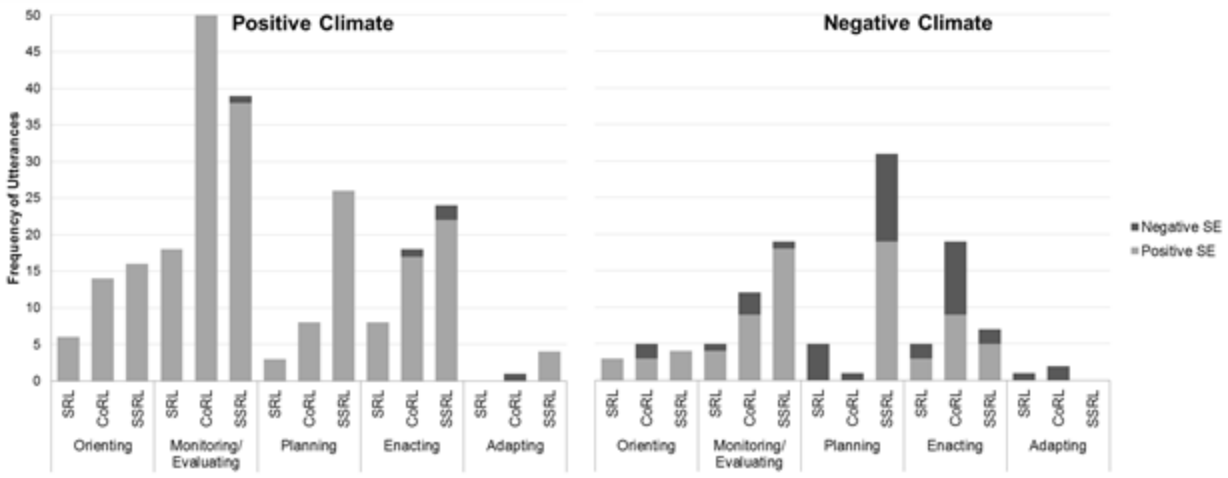

Fig. 8 The degree of overlap between socio-emotional interactions, regulatory processes, and regulatory modes in both groups expressed in frequency. SE=Socio-emotional interactions.

Overall, Figures 5 to 8 above demonstrate interesting interplay between regulatory processes, modes, and socio-emotional interactions. Informed by this pattern of interactions and corroborated by other data sources gathered at several points of the collaborative process, our analysis culminated in four broad themes that distinguished the two groups: (a) incoming conditions as a foundation for creating a positive collaborative experience, (b) regulation of emotions during initial planning, (c) negative emotions as a constraint for shared adaptation in the face of a challenge, and (d) encouragement and motivational statements as an effective strategy in sustaining a positive socio-emotional climate.

Theme 1: Incoming *Conditions* as a Foundation for Creating a Positive Collaborative Experience

In the COPES architecture of SRL (Winne and Hadwin 1998, 2008), incoming conditions are data upon which students base regulatory evaluations, judgments, and decisions in each phase of regulation. In our study, upon entering the collaborative online session, group members

carried a set of conditions with the potential to influence their cognitions, behaviors, and affect for group planning and task enactment. Our examination of a subset of those conditions (summarized in Table 5) suggests the following two factors may contribute to a positive collaborative experience: (a) overall better preparation in terms of prior knowledge of expertise topics and personal responsibility for submitting individual planning activities, likely influenced by differences in implicit guidance tools introduced at solo planning (Step 2, Figure 2) and (b) plans for shared regulation of emotions.

Table 5 Entering conditions for each group

Conditions	Positive climate	Negative climate
Prior knowledge		
Mean quiz scores for assignment topics	70.8%	68.3%
Range of prior knowledge	53.3% - 93.3%	56.7% - 80%
Preparation and personal responsibility		
Solo planner completed by deadline	3 students	3 students
Mean task understanding score for solo planner	62.5%	52.5%
Task understanding score for group planner	70.0%	80.0%
Summary sheet completed by deadline	4 students	2 students
Summary sheet contained adequate information	3 students	2 students
Responses on first SEST		
Positive emotion reported	1 student	3 students
Negative emotion reported	3 students	1 student
Plan to self-regulate emotion	1 student	4 students
Plan to regulate emotion together	3 students	0 students

Individual preparation. Individual preparation in the positive climate group differed from the negative climate group in three main ways. First, students in the positive climate group excluding Tom had better prior knowledge of course concepts related to their assigned expertise (summary sheet) topics as indicated by their individual course quiz grades (Table 6). Second,

students in the positive climate group were better prepared in terms of submitting summary sheets on time and including adequate course concepts on the summary sheets. Taken together, these data suggest members of the positive climate group knew the topic they had taken responsibility for and were in a good position to create a summary sheet with adequate information.

Table 6 Group members' expertise topics and quiz scores (%)

Group member	Expertise topic	Quiz 1	Quiz 2	Quiz 3	Mean
Positive climate					
Tom	SRL	**40.0**	60.0	60.0	53.3
Jessica	Task understanding	**90.0**	100.0	90.0	93.3
Suparna	Goal setting & monitoring	100.0	**80.0**	50.0	76.7
Angie	Memory & learning processes	50.0	50.0	**80.0**	60.0
Negative climate					
Jay	SRL	**70.0**	90.0	80.0	80.0
Seiko	Task understanding	**70.0**	70.0	80.0	73.3
Jing	Goal setting & monitoring	80.0	**50.0**	60.0	63.3
Steve	Memory & learning processes	50.0	70.0	**50.0**	56.7

Note. Bolded quiz scores indicate the quiz corresponding to the group member's expertise topic.

The third difference related to the level of individual planning support provided to each group. In particular, members of the positive climate group completed the highly guided individual planning tool containing questions with pre-stocked answer fields, whereas members of the negative climate group completed the loosely guided individual planning tool containing questions with open-ended answer fields. There was no difference between groups with respect to the level of support for group planning, with both groups receiving the highly guided group planning tool. Previous research using similar sets of tools revealed that, regardless of the level of individual support, a high level of group support was associated with more accurate group task

perceptions (Miller and Hadwin 2015b). Consistent with this finding, the positive and negative climate groups were similar in their group-level task perception scores (70% for the positive climate versus 80% for the negative climate; M = 63.3%, SD = 20.5). However, the high level of individual guidance provided to members of the positive climate group at solo planning seemed to improve the accuracy of their individual task perceptions as indicated by the range of scores in the group (mode of 70%). Having mostly high task understanding may have contributed to better preparation and higher levels of confidence in the positive climate group members' ability to perform the task. In contrast, although the negative climate group had a comparable average individual task perception score (M = 52.5% vs. M = 62.5%), the range of scores in this group was rather large, with two members scoring very low (10% and 20%) and two members scoring very high (80% and 100%). The two low-scoring members were the same individuals that submitted late summary sheets with relatively inadequate information, suggesting these two group members may have been less motivated or engaged prior to collaborating.

Emotions and planned strategies prior to collaboration. The groups also differed with respect to their SEST responses at the beginning of the online collaborative session (see Table 5). Of note was the contrast in emotions and planned mode of regulating those emotions. Emotions reported by the positive climate group prior to collaboration were predominantly negative (3 of 4 members), originating from group members' concerns regarding how well the group would work together, whereas emotions reported by the negative climate group prior to collaboration were predominantly positive (3 of 4 members), reflecting perceptions of confidence and being individually prepared for the collaborative task. It is possible that experiencing negative emotions prior to collaboration with a new group set the stage for a different approach to planning for collaboration in the positive climate group. Data indicated the positive climate

group planned to share responsibility for regulating emotions with their group, reporting “this is something we should all do together.” In contrast, the negative climate group planned for a more individual approach for regulating emotions, with two members indicating “this is something I should do” and two members indicating “this is something each of us should do.” Perhaps influenced by this individual approach, the group may have paid less attention to the nature of their interactions, ultimately creating the observed negative socio-emotional climate. Of particular note, one group member (Jay) who was dominant in setting the observed negative tone appeared to be working toward the goal of maintaining his own focus on the task. Focusing on an individual goal may have come at the expense of creating a positive working environment.

Summary. Taken together, data gathered about groups’ incoming conditions point to two important factors for establishing a positive socio-emotional climate. First, engaging in adequate preparation or self-regulation prior to the task helps set the stage for a positive collaborative experience. Second, planning to share the responsibility of regulating emotions may be necessary for the group to successfully manage any negative emotions that might be harmful to the group’s productivity during collaboration. Accordingly, the positive climate group was observed regulating productively and interacting positively (described in the next section) despite perceiving negative feelings at the beginning of the task. On the other hand, when group members are less prepared and focused more on individual regulation during collaboration, they may be less successful in regulating the emotional aspects of collaboration, resulting in negative emotions that persist throughout the task, as demonstrated in the next section.

Theme 2: Regulation of Emotions (*Operations*) During Initial Planning

In line with research conducted by Fransen et al. (2011), initial group affect set the stage for more complex collaborative processes, such as building shared task perceptions, to take form.

Within initial stages of collaboration, it is important for group members to build trusting relationships as a foundation for effective group functioning. According to Van den Bossche at al. (2006), interpersonal trust is built when team members believe the group is ready to interdependently exist and each member has confidence the group can succeed (see also Williams 2007). Our analysis of the initial stages of collaboration indicated the positive and negative climate groups differed with respect to (a) productivity and conflict during initial planning and (b) valence of emotions experienced after initial planning.

Interactions during initial planning. Our examination of code fluctuations revealed that, in the first 15 minutes (initial planning phase), positive interactions dominated the positive climate group's discussion, whereas negative interactions dominated the negative climate group's discussion (see Figure 7). The initial planning session of the positive climate group was found to be brief and productive; Angie quickly volunteered to edit the group's wiki, allowing the group to move through the planning phase at a relatively faster pace. Whereas the negative climate group was still engaged in high levels of planning in the second 30-minute time interval (see Figure 5), the positive climate group had begun to analyze the case. Having more time to solve the case may have allowed the positive climate group to engage in a higher frequency of monitoring, particularly in the last 30 minutes of collaboration, when the negative climate group was still more highly engaged in enacting the task (see Figure 5).

The initial planning session for the negative climate group was lengthy with back-and-forth orders among members to take up the editor role. Compared to the positive climate group who chose an editor within 3 minutes, the negative climate group took almost 10 minutes to identify an editor, delaying progress on the task itself. While deciding the editor, two group members who were ESL speakers stated concerns with difficulties in communicating due to

language barriers, and thus avoided being the editor of the group wiki. The other two members—Steve and Jay—avoided the role on the basis of a lack of ability to type fast. It is possible being less prepared (see Theme 1) may have redirected the negative climate group's efforts away from establishing a productive socio-emotional climate towards focusing more on individual competency. Due to time constraints, the editor role was delegated to Jay, who used an emoticon to express disappointment or apprehension regarding the decision. Group members did not overtly acknowledge Jay's emotional reaction, but instead promptly suggested they begin the task, indicating a lack of co-regulatory support when faced with an emotional challenge. The lack of commitment and negative tone portrayed early in the negative climate group may have been pertinent in establishing the climate for the group.

Emotions after initial planning. Coinciding with each group's regulatory actions in the earlier phases of collaboration, by the midpoint and through to the end of collaboration, valence of emotions demonstrated in the emotion check-ins was reversed between the two groups. Positive emotions dominated the positive climate group (3 of 4 members), and negative emotions dominated the negative climate group (3 of 3 reporting members), with one member in the negative climate group failing to complete the final two check-ins. In the positive climate group, the only negative emotion was expressed by the editor, Angie, who was anxious about time and feeling rushed. Recognizing Angie's concern for time, the other group members attempted to co-regulate her anxiety by re-assuring her the group was doing well for time and apologizing for the amount of work she was responsible for as editor. The positive climate group concluded the assignment with 3 of 4 members feeling confident they had performed well. Angie, however, continued to feel anxious, reporting in her final check-in *"I felt really rushed in my parts and I was unable to look over what the others were doing so I was unable to help and monitor."*

Despite her feelings of anxiety, Angie expressed very high satisfaction with assignment progress and reported a positive atmosphere at the midpoint and end of collaboration, suggesting she held a positive perception of the collaborative experience. These positive evaluations were echoed by the rest of the group, who were extremely satisfied and perceived a positive atmosphere at both times.

In contrast, with one member ceasing to report emotions at the end of collaboration, the negative climate group reported negative emotions ranging from moderate to very strong in intensity. As one member put it, "*[the group] did not get off to a good start*" (Sean, SEST2). As demonstrated in Figure 7, group members may have attempted to improve the negative atmosphere by also engaging in positive socio-emotional interactions after the first 30 minutes had passed (i.e., during the 30- to 45-minute time interval). These attempts, however, appeared unsuccessful as negative interactions persisted (see Figure 7) and appeared to adversely affect group members' satisfaction with progress, with reports in the midpoint and final SEST of being not very or only moderately satisfied. Furthermore, the negative climate group was unable to fully complete the task. At the end of the collaborative session, group members reported feeling frustrated/angry, doubtful, and disappointed with the quality of their work.

Summary. Overall, the negative climate group's functioning was characterized by a downward trajectory starting with a predominance of observed negative interactions in the early phase of collaboration leading to strong negative emotions in some members. The lack of evidence for co-regulatory support in this initial phase—where members should ideally recognize and attend to others' negative feelings—may have intensified the negative emotions and thwarted later attempts at amelioration. On the other hand, the smooth beginning observed in the positive climate group may have created a foundation of interpersonal trust ideal for sharing

the management of emotions and group work—an observation that is consistent with our next theme.

Theme 3: Negative Emotions as a Constraint (*Condition*) for Shared Adaptation in the Face of a Challenge

Examining groups' regulatory behaviors during challenging episodes provides opportunity to distinguish effective from ineffective regulators (Järvelä et al. 2013). One design-based challenge of this online collaborative task was time constraints. When time becomes limited, execution of task-related activities may need to be adapted to the time constraint. Unfortunately, the negative climate group appeared to be unsuccessful at adapting under time pressure. Although they recognized the need to come up with a new plan—reported at midpoint check-in—the group failed to negotiate a new strategy and mitigated the situation by conceding to the editor's co-regulatory prompts and concentrating on individual work. In their rare moments of re-strategizing or adapting, the negative climate group was confronted with cohesion issues. In the following excerpt, Seiko's suggestion for re-strategizing by dividing the last questions was ignored by her group. Instead, Jay took over and told the group what to do, leaving little room for a group discussion about how to change their plan.

Jay:	were really running out of time!!
Seiko:	who is responsible for B let's divide the last things
Jing:	me *[responding to Seiko's question]*
Jay:	I'm just throwing something together for A.. you guys move on and we'll come back if theres time
Seiko:	ok
Steve:	i'm already working on memory and learning for when we get there
Jay:	good
Seiko:	so im in E
Jay:	give answers when youre ready

Towards the end of the collaborative session, the negative climate group switched to

completing their work more individually than as a group (see Figure 6), demonstrating little evidence of a collective effort in adapting to task constraints.

In contrast, under time pressure, the positive climate group reconvened and re-examined their plan of attack as a team. When adapting their task-execution strategies, group members typically discussed details of the strategy, and enactment of a new strategy was often dependent upon group members' agreement to the delivery of that strategy. The excerpt below provides an example of how group members collectively planned and adapted their plan for enacting part of the assignment. The discussion was prompted when Jessica indirectly sought feedback by posing her suggestion for their strategy as a question. About halfway through the excerpt, Jessica noted an issue with the strategy, which prompted the group to adapt their plan.

Jessica:	I think for the next portion and for the reading we should all try to focus mostly on our core concept?
Angie:	Yes i think so..
Suparna:	Yeah sounds good
Angie:	But mine is memory so where does that fit in?
Jessica:	Memory is section C
Tom:	See if he has trouble moving from sensory to working to long term memory
Angie:	Oh right thank u! Ok let's do that then
Jessica:	There's more sections than us though. we have to write 6 things mine is A
Angie:	I have 2
Suparna:	Mine is B
Angie:	And e is just in general
Tom:	I have D and we collaborate on E
Suparna:	We can work on those at the end
Tom:	Yeah, whoever has C does two
Suparna:	Yeah.
Angie:	Yes

When individual reports regarding planned approaches to regulating emotions were inspected (SEST data), a consistent theme was observed. The positive climate and negative

climate groups differed in two important ways. First, members of the positive climate group were well aligned in terms of plans to regulate their emotions by focusing on the task, with 3 of 4 members planning this strategy at the beginning and midpoint of the task. In contrast, members of the negative climate group planned a variety of strategies at the beginning of the task. By midpoint, creating a good plan was identified as a strategy for all three reporting members, suggesting something was not working and needed to be changed. However, members of the negative climate group seemed to have different ideas about what a "good plan" was as evidenced in the chat—Jing wanted to divide the remaining work and Jay wanted members to focus on completing their already assigned work. Second, when reporting who should enact the strategies, the majority of responses in the positive climate group indicated the group should enact the strategies together, whereas the majority of responses in the negative climate group indicated the strategies should be enacted by the individual group member alone or each group member individually. It was not surprising to find the negative climate group lacking evidence of co- or shared regulation for decreasing negative emotions or maintaining/increasing positive emotions, as their plans for regulation were not viewed as part of the group's responsibility.

The above contrasting features suggest intentions and efforts to collectively execute a strategy are crucial in collaboration, particularly when the group encounters a setback. Furthermore, attempts to adapt to task constraints should not be communicated in a negative tone as that could create friction leading to dissolution of collective effort among members.

Theme 4: Encouragement and Motivational Statements as an Effective Strategy (*Operation*) for Creating a Positive Climate

A neglected aspect of instruction in collaborative learning is how students should be interacting with each other, particularly with respect to the socio-emotional dimension (Johnson

and Johnson 1991; Kreijns et al. 2013). Often, the focus is on how students interact with the material presented in collaborative work or how group members interact with each other within the cognitive dimension or task context. Our examination of the co-occurrences of codes revealed that, within all three modes of regulation, the positive climate group demonstrated a higher frequency and proportion of positive socio-emotional interactions (see Figure 8). Closer inspection of the positive interactions in the positive climate group revealed that these interactions were comprised primarily of encouraging participation and motivation (f = 136), with 42.6% in the form of co-regulatory supports or requests for maintaining engagement in the task. Such encouraging interactions were not common in the negative climate group (f = 46), with a smaller proportion (28.2%) in the form of co-regulatory actions, possibly because the group was less proficient at engaging in such conversations, especially in the presence of one domineering group member. The excerpt below is an example of how members in the positive climate group encouraged each other. The conversation began with Jessica asking for feedback on her answer. The group then acknowledged Jessica's ability to construct a strong answer.

Jessica:	Is that good?
Tom:	Just bang out what you were just saying
Jessica:	True yeah brilliant
Suparna:	Yeah everything that was mentioned before was good.
Tom:	I think Jessica has a good grasp on this.

The consistent supportive actions observed in the positive climate group were also acknowledged by the individual group members. In the SERT, all four members described a positive and supportive working atmosphere, in which they communicated and worked well together. In describing that atmosphere, group members reported positive emotions of happiness or confidence, with the exception of Angie, who recalled feeling stressed. Angie's stress,

however, was likely related to her role as editor and did not reflect the positive atmosphere she perceived in the group. Angie thought her group was unaware of her stress, but predicted the group would have been supportive if they had known. On the other hand, members in the negative climate group recalled feeling negative emotions of stress and doubt. Seiko indicated the group did not know how to collaborate, which was consistent with the negative socio-emotional interactions observed in the chat logs.

Summary of Findings

The preceding themes describe the prominent factors that may contribute to a positive or negative socio-emotional climate. Figure 9 demonstrates how the findings might be embedded in the COPES model. Given the dynamic nature of COPES, it is important to note these figures represent a snapshot of COPES that may be observed at one time. Theoretically, the items listed in each box are continuously changing and shifting between boxes as groups move through the collaborative task. For example, the products of positive or negative emotions become conditions as groups move into the next iteration of regulation. From our findings, we posit incoming conditions set the foundation for a positive or negative collaborative experience, with these conditions contributing to the group's ability to regulate their emotions during the initial phase of collaboration. The emotions produced during early collaboration then become conditions influencing future regulatory actions, such as shared adaptation in the face of a challenge. Finally, our observations of the groups' socio-emotional interactions throughout the whole session highlight the importance of communicating in a positive tone and minimizing negative interactions. Although both groups engaged in more positive than negative socio-emotional interactions, the frequency and proportion of negative interactions was higher in the negative climate group compared to the positive climate group (see Figure 7 and Table 7 in the

Appendix). This suggests that, despite attempts to interact positively, the presence of persistent negative interactions may have detrimental effects, which can be seen in the negative emotions and lower satisfaction reported by members of the negative climate group.

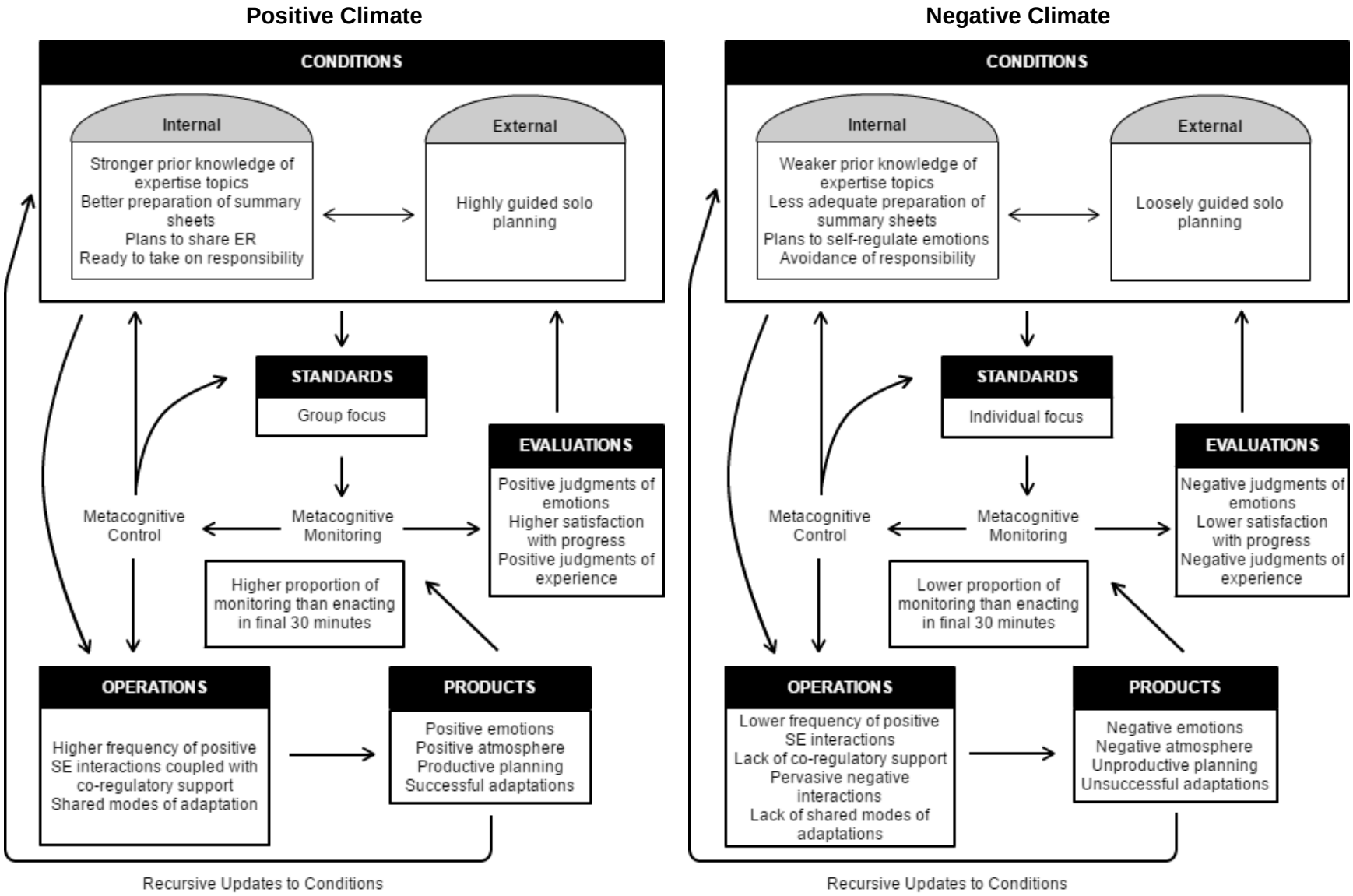

Fig. 9 Example of COPES occurring in each group.

Implications and Future Directions

This study set out to examine the regulation of socio-emotional aspects of collaboration in two groups with contrasting socio-emotional climates (positive vs. negative). Our in-depth analysis of various data sources led us to identify four emerging themes: (a) incoming conditions as a foundation for creating a positive collaborative experience, (b) regulation of emotions during initial planning, (c) shared adaptation in the face of a challenge, and (d) encouragement and motivational statements as an effective strategy in sustaining a positive socio-emotional climate.

Overall, these findings lend support to theoretical accounts positing emotion regulation in collaboration as an active dynamic process unfolding across the individual and group level, where a multitude of conditions, operations, products, evaluations, and standards continuously interact over time (Hadwin et al. 2011; Järvelä and Hadwin 2013). The fluctuation and interaction of regulatory processes, regulatory modes, and socio-emotional interactions within the online environment (see Figures 5 to 8) contributed to the groups' contrasting socio-emotional climates in interesting ways. Our careful analysis demonstrates that a positive socio-emotional climate is possible when individual members accept personal responsibility to prepare for the task, actively engage in recognizing and supporting emotions that are experienced within the group, and collectively maintain shared responsibility to conquer challenging circumstances.

Several areas of research should be further examined. First, this study indicates that instructional supports for members' *self*-regulation of learning in the service of the shared process are necessary for the group's productivity. This finding also suggests that creating a positive socio-emotional climate is not necessarily dependent upon establishing a strong social connection among group members outside of the task as argued in previous research (e.g., see Kreijns et al. 2013). The role self-regulation plays in collaboration aligns well with recent

research by Panadero et al. (2015), who found that individual regulatory skills (SRL) positively predicted group regulation (SSRL). Hence, support tools in collaborative contexts should not only be geared towards supporting the collective group, but should also support individual work within the group.

The current study also demonstrated the initial planning phase was a crucial window of time in the online collaborative session, indicating that appropriate scaffolds in the early stage of collaboration should be further examined. In this study, to support the development of shared and accurate task perceptions among group members, groups were provided an implicit guidance tool summarizing individual members' responses to the solo planning tool. No guidance tool was, however, targeted towards groups' motivation and emotion. We argue that awareness of in-the-moment emotions can be useful for members to promptly respond to unfavorable emotions within the group, ultimately taking joint control of the group's emotional climate. Therefore, guidance tools introduced in the initial phase of group planning should not only include members' perceptions of the task, but should also include other socio-emotional variables, which together can promote conversations about priorities, expectations, and motivations prior to engaging in the collaborative assignment (e.g., Järvelä et al. 2015).

In a similar vein, findings from this study point to the potential effect individual planning support can have on collaborative groups' emerging socio-emotional climate. In particular, we found the two groups differed in terms of the level of individual planning support they received. To follow up on this, we compared the conditions assigned to all six groups who met our initial selection criterion. Of the four groups who met the criteria for a positive climate (all reporting a positive experience), two groups came from the high individual support condition. In contrast, the two groups who met the initial criteria for a negative climate (all reporting a negative event),

both came from the low individual support condition. This trend indicates the level of support provided for individual planning may influence learners' engagement and, consequently, the socio-emotional climate experienced by the group. Although we did not observe major differences in group-level task perceptions between the two groups, future research should examine whether types of planning support affect socio-emotional climate in consistent ways across a large number of groups (see also Järvelä et al. 2016). Beyond planning, groups' ability to collectively adapt in challenging situations may be an important factor distinguishing effective from ineffective regulators (see also Winne and Hadwin 2008). Groups' adaptations in response to challenging situations can become important points for identifying the needs for regulatory supports within teams. Hence, we call for further research to examine groups' regulatory pathways from the point of encountering a challenge through to its resolution (or lack thereof).

Findings in the last theme suggest a positive socio-emotional climate is built upon feelings of trust portrayed through respectfully encouraging and supporting one another's participation and motivation. Interacting positively may not come naturally to group members and is, therefore, a skill that should be pedagogically encouraged and supported by instructors. Previous evidence suggests that effective collaborative learning largely depends on the quality of student interactions (Dillenbourg and Tchounikine 2007; Kobbe et al. 2007) and teachers' guidance in fostering beneficial interactions amongst collaborators (Webb 2009). Thus, supporting learners' regulation of emotions and motivation in collaboration is as important as supporting knowledge building between members in a team. One support instructors could provide is to proactively discuss with students interactions that might impede or benefit group functioning, also accounting for cultural differences that might be at play (see Volet 2001). Encouraging students to think about such topics beforehand may prompt them to make plans for

engaging positive socio-emotional interactions from the start and navigating negative socio-emotional experiences when the need arises.

One contribution of our study was examining socio-emotional interactions and regulation in a purely text-based collaborative session—a setting that may elicit different socio-emotional and regulatory processes when compared to face-to-face settings. For example, coordinating statements where the main purpose is to situate oneself and others in the learning environment (i.e., orienting) and explicitly expressing emotions using text emphasis and emoticons may be used more frequently in virtual collaboration. Investigating regulatory processes in online environments may, therefore, require that additional or different processes be considered. In other research, it has been argued that computer-mediated collaboration is often more task oriented with socio-emotional interactions decreasing as groups move along (e.g., Orvis et al. 2002), whereas face-to-face collaboration provides more opportunities for personal and socio-emotional interactions (Walther 1992). Though the decrease in socio-emotional interactions may be true for the negative climate group in our study, positive socio-emotional interactions remained continuously present in the positive climate group—a finding that is consistent with Kwon et al.'s (2014) 'good collaborators' (see also Malmberg et al. 2015). In other words, purposeful engagement in socio-emotional interactions and regulation of socio-emotional challenges seemed to be more dependent on group members' regulatory skills than the medium of collaboration itself. Above all, researching socio-emotional interactions and regulation in online environments provides opportunities for researchers to unpack those processes at several granularity levels. Apart from describing the types of regulatory and socio-emotional activities in collaborative groups (e.g., Kwon et al. 2014) and examining the influence of such activities on performance (e.g., Janssen et al. 2010), the sequential nature and the temporality of socio-

emotional interactions and regulatory actions can also be inspected. However, challenges in using online mediums do exist and include (a) technical difficulties in judging the temporal scope of meaningful socio-emotion and regulation episodes for data analysis and (b) the lack of non-verbal displays that may provide additional information about how group members are feeling and responding to the situation. Additional measures of learners' emotional processes may be useful for providing insight into learners' emotional reactions during collaboration, such as the self-report tools implemented in our study.

Another consideration for future research is the cultural or language challenges that afford or constrain the development of a positive socio-emotional climate. In our research, the negative climate group included two English-as-second-language (ESL) students who clearly expressed concern with their language skills. It is possible the focus on their perceived incompetence became a potent condition, changing the negative climate group's productivity. Another possibility is the ESL learners in the negative climate group may have carried a different set of culturally-bound working styles (see Volet 2001), creating differences in learning trajectories. Future research could examine to what degree culture or language differences interact with emotion regulation in group contexts.

Given the exploratory nature of this study, we focused on the first of two graded collaborative assignments in the course. It would be interesting to see how the groups' regulatory behaviors and socio-emotional interactions varied from the first collaborative experience to next. Presumably, the products of working together for one assignment would become conditions influencing the next collaborative cycle. For example, perceptions of a negative working climate may have prompted the negative climate group to engage in more detailed planning in the next collaborative assignment. Research is still being conducted to test the validity of that assumption.

Moreover, we did not explicitly examine groups' regulation in terms of quality because we were primarily interested in examining the change over time and interplay of regulatory actions. Examining the quality of regulatory processes was beyond the scope of this paper, but is another avenue of further research.

Finally, our selection of two cases demonstrating extreme differences in group members' perceptions of salient socio-emotional climate allowed us to generate two contrasting profiles, providing insights into the factors that differentiate a positive climate from a negative climate. Analysis of other group profiles, such as a mixed climate, may lead future research to demonstrate different salient factors that contribute to such climates. Regardless, our findings generally corroborate and extend those of other studies, thus offering a meaningful contribution to the research in this area. This exploratory study could lead to research with other groups and different contexts in order to further understand the regulatory mechanisms that contribute to productive and equally satisfying collaboration.

Conclusion

In summary, this cross-case analysis opens the door to many possibilities for research in regulation of collaborative learning. These possibilities span from (a) supporting regulation through encouraging higher levels of self-regulation prior to group work, providing scaffolds in the early stage of collaboration, and prompting groups to interact in a positive and respectful manner to (b) researching groups' regulation through challenging episodes and enactment of socially-shared regulation of learning. Certainly, the findings of this cross-case analysis demonstrate a need for researchers to further examine the important associations between groups' regulatory behaviors and the nature of groups' socio-emotional processes at a large scale.

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Appendix

Table 7 Code frequencies (and proportions) across coding categories

Codes	Positive climate	Negative climate
Regulatory processes	**466**	**339**
Planning	97 (20.8%)	81 (24.0%)
Enacting	91 (19.5%)	84 (24.9%)
Monitoring	145 (31.1%)	90 (26.6%)
Orienting	109 (23.4%)	70 (20.7%)
Adapting	13 (2.8%)	3 (0.9%)
Off-task	11 (2.4%)	10 (3.0%)
Modes of regulation	**474**	**344**
Self-regulation	91 (19.2%)	83 (24.1%)
Co-regulation	164 (34.6%)	82 (23.8%)
Co-regulatory request	13 (2.7%)	11 (3.2%)
Socially-shared regulation	206 (43.5%)	168 (48.8%)
Socio-emotional interactions	**205**	**118**
Positive interactions	190 (92.7%)	69 (58.5%)
Apologizing	6 (2.9%)	2 (1.7%)
Humor/laughter	13 (6.3%)	5 (4.2%)
Encouraging participation / motivation	136 (66.3%)	46 (39.0%)
Promoting trust & cohesion	35 (17.1%)	16 (13.6%)
Negative interactions	3 (1.5%)	30 (25.4%)
Discouraging participation / motivation	0 (0.0%)	9 (7.6%)
Low cohesion or pushing one’s perspective	2 (1.0%)	8 (6.8%)
Pressuring others	1 (0.5%)	13 (11.0%)
Expressing emotions	12 (5.9%)	19 (16.1%)

Note: Proportions are of total category frequency.