THE PERSONAL AND SOCIAL DIMENSIONS OF PEER LEARNING: A 2 × 2 MODEL OF SOCIO-COGNITIVE CONFLICT REGULATION

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ABSTRACT

THE PERSONAL AND SOCIAL DIMENSIONS OF PEER LEARNING:
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The purpose of this dissertation study is to investigate the 2 × 2 socio-cognitive conflict regulation framework, with a particular focus on a new construct of *concurrence-seeking epistemic regulation*, characterized by students' compliance with others' views without experiencing any contradiction. I also examined how perceived competence and social interdependence (i.e., cooperative and competitive contexts) are associated with a range of student outcomes including socio-cognitive conflict regulation (a) in experimental studies using vignettes describing working with the other employee in a workplace (Pilot Study, Study 1) and (b) in a field study by asking undergraduates about group-work experiences in their real classroom (Study 2). Pilot Study (N = 201) and Study 1 (N = 504) provided empirical support for the existence of concurrence-seeking epistemic regulation as a new type of socio-cognitive conflict regulation, along with the validation of the 2 × 2 socio-cognitive conflict model, by evidence of factor structure, reliability of each measure, intercorrelations between the measures, and the effects of competence and social interdependence on each type of regulation. There were significant interactive effects of competence and social interdependence on constructive-epistemic and competitive-relational regulations in both Pilot Study and Study 1. Study 2 (N = 254) confirmed utility of the new measures of socio-cognitive conflict regulation in an actual undergraduate classroom by replicating their factor structure, reliabilities, and convergent and divergent validities from Pilot Study and Study 1. Furthermore, I examined structural relations among different types of students' socio-cognitive conflict regulations and their antecedents (i.e.,

competence, social interdependence, achievement goals) and consequences (i.e., behavioral engagement/disengagement, critical reasoning), and tested interactive effects of perceived competence and social interdependence using latent moderated structural equations approach. There were significant interactive effects of competence and cooperative perceptions on concurrence-seeking epistemic and protective-relational regulations, and a significant interactive effect of competence and competitive perceptions on protective-relational regulation. The interaction results indicate that as competence is higher, higher cooperative perceptions lead to even lower concurrence-seeking epistemic and protective-relational regulations. And, as perceived competence is higher, higher competitive perceptions lead to even lower protective-relational regulation. In addition, constructive-epistemic regulation showed the most adaptive learning outcomes in terms of behavioral engagement and critical reasoning. This dissertation study's findings refine conceptual model of socio-cognitive conflict regulation and shed light on both social interdependence theory and socio-cognitive conflict theory. They also provide more specific guidance for peer learning instructions to promote students' cognitive development.

To My Family Who Always Give Me Unconditional Love and Support

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CHAPTER 1:

Introduction

Learning occurs in social contexts such as in a classroom. Many educational psychologists and social psychologists stress dynamic learning systems based on interactions between learners as a key drive for cognitive development (Sommet, Darnon, & Butera, 2015; e.g., Johnson & Johnson, 2009; Patrick, Kaplan, & Ryan, 2011). Indeed, research on learning processes in small groups or dyads and the effects of peer argumentation on students' understanding of complex academic content has grown (Nussbaum, 2008; e.g., Asterhan & Babichenko, 2015). Such research maintains that participation in peer argumentation is effective for critical thinking, because it allows learners to compare different perspectives and move from one's initial views toward alternative perspectives that are proposed through critical thinking. According to contemporary approaches to Piaget's discussion of cognitive development, incongruence between ideas introduces doubt about the validity of one's own knowledge, and it leads one to reconsider and reconstruct the knowledge (Asterhan, 2013; Doise & Mugny, 1984). Therefore, intellectual conflicts facilitate learning by leading students to consider which view is more acceptable than another and trying to integrate their ideas (*epistemic regulation*).

But not all intellectual conflicts are equally valuable to students' learning. Some conflicts may be unfocused or shallow, and may be regulated in unproductive ways (Asterhan, 2013; Sommet et al., 2014, 2015) such as by sticking to one's own position and invalidating others' views (*competitive-relational regulation*) or by supporting others' views in order to protect one's own competence (*protective-relational regulation*). And rather than facilitate learning, these types of relational conflict regulation tend to suppress it (Buchs, Butera, Mugny, & Darnon, 2004).

Socio-cognitive conflict theory (Doise & Mugny, 1984; Mugny & Doise, 1978) posits that these different types of conflict regulations stem from two different concerns: (a) a concern about the validity of an idea or view (the cognitive concern) and (b) a concern about relative competence (the social concern). Recently, researchers have shown how these different types of concerns are associated with different perceptions of social interdependence (e.g., Roseth, Lee, & Saltarelli, under review; Saltarelli & Roseth, 2014). Guided by social interdependence theory (Johnson & Johnson, 1989, 2005), this research suggests that cooperative contexts (i.e., positive interdependence) tend to promote validity concerns because shared goals tend to diminish competence threat and allow students to focus on the task (Asterhan, 2013; Roseth et al., under review; Saltarelli & Roseth, 2014). In contrast, competitive contexts (i.e., negative interdependence) tend to increase concerns about relative competence because opposing goals (i.e., winning and losing) tends to increase competence threat and encourages students to focus on asserting their own point of view against others (i.e., competitive-relational regulation) or protecting themselves (i.e., protective-relational regulation).

What remains unclear from these studies on socio-cognitive conflict regulation is whether epistemic regulation may also depend on relative competence. Within cooperative situations where one's success depends on his or her partners' success and vice versa (Johnson & Johnson, 1989, 2005), incompetent individuals may want to help their partners by endorsing more valid answers of the partners quickly to avoid misleading others. This compliant type of epistemic regulation may suppress active cognitive engagement, but still address epistemic issues to some degree, because one tends to seek a more plausible perspective to contribute to everyone's goal achievement.

In this dissertation study, I aimed to examine how different levels of perceived competence and social interdependence affect socio-cognitive conflict regulation. More precisely, in this study I examined whether individuals regulate epistemic concerns in two different ways in cooperative contexts (i.e., positive interdependence)—namely, *constructive epistemic* regulation (the original form of epistemic regulation; Doise & Mugny, 1984; Mugny & Doise, 1978) and *concurrence-seeking epistemic* regulation (the newly proposed form)—depending on the level of perceived competence. Further, I proposed an integrative model that includes two different types of both epistemic and relational regulation based on *personal* (high or low level of perceived competence) and *social* (positive or negative interdependence) dimensions. To support this model, I examined the effects of perceived competence and social interdependence on socio-cognitive conflict regulation and other outcomes using an experimental vignette-based paradigm (Study 1). I then investigated relations among socio-cognitive conflict regulation and hypothesized correlates using a field observational design in a real classroom setting (Study 2).

The remainder of this dissertation is organized as follows. First, I review relevant literature on peer argumentation and provide an overview of the two social-psychological theories informing this research: socio-cognitive conflict theory and social interdependence theory (Chapter 2). I then describe an integrative model of socio-cognitive conflict regulation based on prior models (e.g., argumentative discourse, controversy, and conflict resolution). I then provide specific research questions and hypotheses (Chapter 3), and detail the method, results, and discussion for Pilot Study (Chapter 4), Study 1 (Chapter 5), and Study 2 (Chapter 6). And finally, I conclude with an in-depth discussion of the findings (Chapter 7).

CHAPTER 2:

Literature Review

This study builds on a range of literature including argumentation, Piaget's theorizing about conflict in peer learning, constructive controversy, and conflict management. In the next section, I first introduce the benefits of peer argumentation with Piaget's idea about conflict in peer learning and what concerns are prevalent during peer argumentation and, more broadly, peer learning. I then review two key theories—socio-cognitive conflict theory and socio-cognitive conflict theory—to account for the social-psychological processes underlying peer learning. Finally, I propose an integrative model of socio-cognitive conflict by incorporating these two theories, and present how this model aligns with prior literature on argumentative discourse, controversy, and conflict management.

Conflict in Peer Learning

Benefits of Conflict in Peer Learning

Supporting students to become a critical thinker is one of the long-lasting essential themes for educational psychologists (Frijters, ten Dam, & Rijlaarsdam, 2008; Nussbaum, 2005). There are various definitions and views on critical thinking, but one of the common central features of critical thinking may be that it involves high level of cognitive engagement with deep processing of content, use of elaborative strategy, or metacognitive reflection where students "think deeply about the arguments and counterarguments" (Dole & Sinatra, 1998, p. 121; Nussbaum & Sinatra, 2003). Such critical thinking can be promoted by peer collaboration, because it may increase individual conceptual understanding of subject matter by constructing explanations for contradictory information with peers, which requires high level of cognitive engagement (Asterhan & Schwarz, 2009; Keefer et al., 2000).

Researchers, therefore, have designed a variety of instructional interventions or models based on peer collaboration to promote students' cognitive engagement for conceptual change (Nussbaum & Sinatra, 2003; e.g., Chan, Burtis, & Bereiter, 1997; Guzzetti, Snyder, Glass, & Gamas, 1993). Many conceptual change interventions or models have been based on Piaget's idea about conceptual change or cognitive development, which suggests that conceptual change arises from the dissonance or disequilibrium that exists between current beliefs and new experiences (Kienhues, Bromme, & Stahl, 2008). Accordingly, in such instructional interventions, students with different initial views are paired, and they present their partners with information that contradicts their views, which stimulates cognitive conflict. This conflict is expected to lead students to seek equilibrium and to integrate different views into more sophisticated ones (Asterhan & Schwarz, 2009; Piaget, 1985), which is considered cognitive development.

Importantly, to induce such a state of mental imbalance and thinking about alternative perspectives (i.e., counterarguments), simply putting two people together is not sufficient (Asterhan & Schwarz, 2009); instead, *argumentation*—an activity in which individuals "attempt to strengthen or weaken the acceptability of one or more ideas, views, or solutions through engagement in reasoning" (Asterhan, 2013, p. 251)—is a necessary component. Indeed, argumentation has been identified as a promising instructional practice across different domains including science (e.g., Asterhan & Schwarz, 2009; Foster, 2012; Nussbaum, Sinatra, & Owens, 2012), social science (e.g., educational psychology: Johnson & Johnson, 2009b; Roseth, Saltarelli & Glass, 2011; Salteralli & Roseth, 2014), mathematics (Prusak, Hershkowitz, & Schwarz, 2012), and even physical activities (Lafont, 2012).

Asterhan and Schwarz (2016) maintain the importance of peer argumentation in educational disciplines and present the rationale for why argumentation should benefit learning. First, students may correct their incomplete or erroneous understanding of complex concepts on their own, while articulating their ideas before presenting them to others. The verbal articulation can promote students' self-reflection and self-awareness of their own understanding, thereby developing a better understanding of academic concept (Amigues, 1988; Keil, 2006). Second, students may try to actively explore different, alternative views in order to compromise potential gaps between their own views and other scientific ideas, which promote students' reasoning skills and also understanding of academic concept. Finally, among multiple views, ideas, or explanations, students have to consider which one is most plausible and acceptable based on any available evidence and rationale and why, strengthening their understanding of the concept through deeper processing.

It is important to note that these learning benefits are not guaranteed by all forms of peer argumentation. Instead, there are some important characteristics that differentiate unproductive and productive peer argumentation. For instance, just finding erroneous ideas in each other's reasoning is not sufficient for a good understanding of the concept, but identifying, accepting, and integrating more plausible ideas into one's own understanding is also necessary. Asterhan (2013) addresses this point as productive and effective argumentative discourse for learning and cognitive development should not only be critical and but also constructive. This type of ideal argumentative discourse, one that balances critical reasoning and collaborative construction, is introduced by different researchers with various names, including 'deliberation' (Kroll, 2005), 'collaborative argumentation' (Nussbaum, 2008), 'exploratory talk' (Mercer, 1996; Wegerif,

Mercer, & Dawes, 1999), 'critical discussion' (Keefer et al, 2000), 'co-constructive, critical argumentation' (Asterhan, 2013), and 'constructive controversy' (Johnson & Johnson, 2009b).

Asterhan (2013) highlights that interactive or peer argumentation types that different researchers consider ideal have common features. Students are willing to engage in the argumentative discussion actively by listening to and critically examining different kinds of views proposed during the discussion and also by conceding to persuasive arguments. In addition, there is an atmosphere underlying collaboration and mutual respect, and any competition in such type of peer argumentation is based on *issue-driven* critical dialogue (Keefer et al., 2000), meaning a competition between ideas, not based on *position-driven* eristic dialogue, meaning a competition between individuals.

Interestingly, the importance of rational thinking and collaboration is not limited to educational settings, but is also discussed in social settings more broadly such as business (Tjosvold, 2008) and conflict management (Blake & Mouton, 1964; Johnson & Johnson, 2005b; Kilmann & Thomas, 1977). This broader literature suggests that when interpersonal conflicts occur, active involvement, open-minded interaction, rational argument, and cooperative goals are all considered necessary to manage conflicts constructively (for more details, see Prior Literature section under Different Types of Socio-cognitive Conflict Regulation). Thus, across education and other settings, individuals in productive argumentative discussion tend to desire to solve conflicts by focusing on the problem, thinking critically, and integrating different views through collaborative work.

Unfortunately, in educational settings especially it is often challenging for students to focus only on collaborating others to solve the problem, or epistemic issue. In peer learning, students are not only concerned with understanding the cognitive issues, but they are also

concerned with different social issues (e.g., competence threat, interrupting others' goals) that can hinder students' productive peer argumentation and, in turn, diminish learning gains.

Concerns about Conflict in Peer Learning

Productive peer argumentation is challenging for a lot of students even with specific guidance for critical argumentation (Asterhan & Schwarz, 2007). Cognitive psychologists have pointed out that some challenges of peer argumentation may stem from individuals' characteristics, including age, schooling, knowledge, or skills (Kuhn, 1991; Means & Voss, 1996). These differences may be partly the reasons for challenges of peer argumentation, but this is not the entire story (Asterhan, 2013). When working with others, one's concern about looking stupid to others, or concern about providing incorrect answers so misinforming others, can inhibit productive argumentation and, in turn, suppress learning and cognitive development.

First, when students are working together, research suggests they can be worried about protecting self-competence, rather than focusing on resolving epistemic conflicts. This is more likely to happen in competitive contexts such as when peers show disagreement in a way that emphasizes winning or social comparison (Butera & Mugny, 1995; Darnon, Doll, & Butera, 2007). In such contexts, one tends to focus on being perceived as competent and knowledgeable, or avoiding being perceived as incompetent and less knowledgeable (Buchs et al., 2004; Butera, Darnon, & Mugny, 2010).

Second, when students are working together, it stands to reason that low competent students may be especially worried about answering incorrectly and misleading others because of their low ability. As a result, low-competence students may focus more on agreeing with other's approaches instead of providing their own approach. This may be especially likely in cooperative contexts in which students work together to achieve shared goals. In such contexts, incompetent

students may tend to avoid any possibilities to make others confused. These students may also acknowledge others' perspectives quickly without experiencing contradiction, because they assume, given their low competence, that others' answers are more correct and therefore simply following others' views is the most helpful approach to achieve the shared goal and avoid incorrect answers. This dissertation is the first to identify and test empirically this type of conflict regulation.

In summary, when students work together, social and epistemic concerns may play different roles in learning and cognitive development. Specifically, concerns about relative competence levels or misleading answers may prevent students from deeper level of cognitive engagement and productive peer argumentation.

Next, I provide a more detailed account of socio-cognitive cognitive theory (Doise & Mugny, 1984; Mugny & Doise, 1978), upon which this dissertation strives to build. I also introduce different types of conflict regulation depending on which concerns are more salient to students.

Socio-Cognitive Conflict Theory

Socio-cognitive conflict theory considers socio-cognitive conflict a main factor for learning during social interaction (Doise & Mugny, 1984; Mugny & Doise, 1978; see Buchs et al., 2004, for a more recent review), on the basis of Piaget's (1985) notion that the way peer interaction contributes to cognitive development. In fact, many educational psychologists have shown the benefits of socio-cognitive conflict for learning across not only educational domains (e.g., Foster, 2012; Lafont, 2012; Nussbaum et al., 2012; Prusak et al., 2012) but also contexts such as peer-managed classroom discussions (Wu, Anderson, Nguyen-Jahiel, & Miller, 2013) or computer-assisted dyadic interactions (Roseth et al., 2011; Saltarelli & Roseth, 2014).

Confronting someone holding an opposing point of view during social interaction (e.g., peer argumentation) induces both social (i.e., the disagreement between two persons) and cognitive (i.e., each individual doubts her or his own answer) conflicts (Buchs, Pulfrey, Gabarrot, & Butera, 2010), and therefore such disagreement is called "socio-cognitive conflict." Socio-cognitive theory posits that there are two different ways that this socio-cognitive conflict is regulated, and prior research has shown that students' different regulating styles are associated with different academic achievement (e.g., Buchs et al., 2010; Darnon, Buchs, & Butera, 2002).

On the one hand, when individuals are uncertain about the validity of different points of view (the "cognitive" issue: "Is my answer correct?"; Sommet et al., 2015; Piaget, 1985), they tend to regulate the socio-cognitive conflict in an *epistemic* way by focusing on the task and on understanding the problem. This is the case particularly when a disagreeing partner is perceived as an informational support (Sommet et al., 2015), rather than threat for self-evaluation. When individuals engage in epistemic regulation, they are more likely to consider the validity of each other's answers and try to integrate their diverging views to better understand the task or problem. Hence, epistemic regulation is associated with cognitive progress (Buchs et al., 2004) and perceptions of positive relationship with partners (or cooperative perceptions; Buchs et al., 2004; Darnon et al., 2002; Saltarelli & Roseth, 2014).

On the other hand, when individuals are uncertain about their own competence relative to a confronting partner (the "social" issue: "Is my partner more competent than me?"; Doise & Mugny, 1984; Sommet et al., 2015), they tend to regulate the socio-cognitive conflict in a *relational* way by focusing on social comparison and on defending their competence. This is the case particularly when a disagreeing partner is perceived as threat to self-evaluation (Sommet et al., 2015), rather than an informational support. When individuals engage in relational

regulation, they are more likely to confirm their viewpoint in order to win argument and demonstrate their competence, or they are more likely to conform to the other's viewpoint in order to avoid showing their incompetence (Sommet et al., 2014, 2015). Overall, relational regulation is associated with less cognitive progress (Buchs et al., 2004) and perceptions of less positive relationship with partners (or competitive perceptions) as compared to epistemic regulation (Buchs et al., 2004; Darnon et al., 2002; Saltarelli & Roseth, 2014).

More recently, researchers proposed and validated the relational regulation by differentiating it into competitive-relational and protective-relational regulations, based on individuals' perceived ability to cope with stressful situations such as confronting disagreeing partner in discussion or peer argumentation (Sommet et al., 2014). When individuals perceive themselves to have enough abilities to cope with those situations, they perceive those situations as a challenge, and focus on gaining a possible reward (e.g., winning, academic reputation, praise). Hence, they display more *approach* or dominant coping strategies (Cohen & Lazarus, 1979), such as confrontation or argumentation; they may try to stick to their own position and invalidate others' views. Such behavior is termed *competitive-relational* regulation. Conversely, when individuals perceive themselves to have limited abilities to cope with the stressful situations, they perceive those situations as a threat, and focus on not losing whatever they already have (e.g., academic reputation). Hence, they display more *avoidance* or submissive coping strategies (Cohen & Lazarus, 1979), such as acceptance or compliance; they may try to espouse or adopt others' views in order to avoid direct confrontation. Such behavior is termed *protective-relational* regulation.

Researchers have proposed that performance goals are antecedents of these different styles of relational regulations (Sommet et al., 2014; see Poortvliet & Darnon, 2010, for a

review). Performance goals consist of performance-approach goals, aims to demonstrate one's competence, and performance-avoidance goals, aims to avoid showing one's incompetence (Elliot, 1999; Elliot & McGregor, 2001). Prior literature has shown that, in social or interpersonal contexts, individuals with performance-approach goals tend to show an active social pattern of behaviors including dominant or self-serving behaviors, whereas those with performance-avoidance goals tend to show a passive social pattern of behaviors including submissive or obedient behaviors (Conroy, Elliot, & Thrash, 2009). Indeed, Sommet and his colleagues (2014, 2015) have reported empirical evidence for performance-approach goals as a significant antecedent of competitive-relational regulation, and performance-avoidance goals as a significant antecedent of protective-relational regulation. Mastery goals—or aims to develop one's competence—are also found as a significant antecedent of epistemic regulation (Darnon, Muller, Schrager, Pannuzzo, & Butera, 2006).

In summary, socio-cognitive theory identifies two major concerns when individuals are working together: (a) cognitive concern, or uncertainty about the answer, leading individuals to engage more in epistemic regulation; and (b) social concern, or uncertainty about one's competence relative to other's, leading individuals to engage more in relational regulation. When one does not perceive the partner threatening, one's cognitive concerns are likely to occur, leading to enhanced learning by focusing on the task and problem (i.e., epistemic regulation), whereas when one perceives the partner threatening, one's social concerns are likely to occur, inhibiting learning gains by focusing on social comparison (i.e., relational regulation). Lastly, relational regulation is further differentiated into competitive-relational and protective-relational regulations by whether individuals perceive that they have enough ability to cope with the situation where their partner is perceived threatening to self-evaluation.

What socio-cognitive conflict theory overlooks is that epistemic regulation may also vary depending on whether individuals perceive that they have enough ability to understand the problem on their own. If students perceive that they have limited abilities or resources to understand a problem, they may still want to understand the problem by aligning their thinking with others' thinking that looks more correct. In this way, their focus is still on the epistemic issue in that they do not want to let themselves and their partners down by misunderstanding the problem, but their regulating way is more likely to be submissive or passive, rather than actively facing with different views and integrating them, because they are not competent about the problem. They tend to give in to others' perspectives because they tend to think that their own ideas may not help better understanding for everyone. This is more likely to happen when individuals are sharing goals (i.e., positive interdependence) such as in cooperative contexts, so others' understanding can help one's understanding, and vice versa.

In short, one may expect the ways of socio-cognitive regulation to be differentiated depending on one's perceived competence on a task and the perceived context in which the socio-cognitive interaction takes place. Another theory—social interdependence theory (Deutsch, 1949, 1985; Johnson & Johnson, 1989, 2005)—is well positioned to identify different types of social contexts and to describe how these different social contexts, or social interdependence, can determine individuals' motivation, group processes, and outcomes, which could lead to better understanding of the relations between different social interdependence and different kinds of concerns and conflict regulating styles in interpersonal contexts.

Social Interdependence Theory

Social interdependence theory posits that *social interdependence* exists when the outcomes of individuals are influenced by each other's actions (Johnson & Johnson, 1989,

2005a). There are two types of social interdependence: *positive* and *negative*. Positive interdependence is established when goals are structured cooperatively, meaning individuals perceive that they can achieve their goals if, and only if, the others also achieve the goals. Since the actions of individuals promote the achievement of joint goals, social interdependence theory predicts, under cooperative conditions, individuals to engage in promotive interactions such as mutual help, trust, perspective taking, higher-level reasoning, effective communication, and constructive management of conflict. These promotive interactions facilitate goal achievement and induce a "benign spiral" (Deutsch, 1985) in which successful achievement leads to increased cooperative perceptions and engagement in the task, which in turn leads to higher achievement and so forth (Johnson & Johnson, 1989, 2005a). Therefore, positive interdependence or cooperative structures positively predict effort to achieve, interpersonal relationships, and psychological health (e.g., emotional maturity, well-adjusted social relations, personal identity, social competences; Johnson & Johnson, 1989, 2005a).

Negative interdependence is established when goals are structured competitively, meaning individuals perceive that they can achieve their goals if, and only if, the others do not achieve the goals. Since the actions of individuals obstruct the achievement of each other's goals, social interdependence theory predicts, under competitive conditions, individuals to engage in oppositional interactions such as less help, distrust, less accurate perspective taking, lower-level reasoning, ineffective and deceptive communication, and striving to win in conflicts. These oppositional interactions inhibit goal achievement and induce a "destructive spiral" (Deutsch, 1985) in which lower achievement leads to increased competitive perceptions and diminish engagement in the task, which in turn leads to lower achievement and so forth (Johnson & Johnson, 1989, 2005a). Therefore, negative interdependence or competitive structures negatively

predict effort to achieve, interpersonal relationships, and psychological health (Johnson & Johnson, 1989, 2005a).

No interdependence is established when goals are individualistic, meaning individuals perceive that they can achieve their goals regardless of others' goal achievement. Since the actions of individuals do not affect the achievement of each other's goals, social interdependence theory predicts, under individualistic conditions, individuals to focus only on increasing their own productivity and achievement and ignore the efforts of others. The feelings from goal achievement or failure tend not to transfer to other individuals, which leads to lower effort to achieve, interpersonal relationships, and psychological health than positive interdependence (Johnson & Johnson, 1989, 2005a).

Taken together, social interdependence theory posits that the way that individuals engage in goal achievement and social relationships may be determined by how goals are structured or more accurately, how goal structures are perceived by individuals—cooperatively or competitively. Under cooperative goal structures or positive interdependence, individuals engage in promotive interactions without concern about social comparison of competence. Cooperation tends to diminish competence threat and allows students to focus on the validity of answer in order to achieve the joint goal (Saltarelli & Roseth, 2014). Under competitive structures or negative interdependence, individuals engage in oppositional interactions with concerns about social comparison of competence. Competition tends to increase competence threat and lead students to focus on asserting their own point of view and protecting their self-esteem (Saltarelli & Roseth, 2014). In this way, positive interdependence promotes epistemic regulation by incorporating most valid solution through critical thinking, whereas negative interdependence

promotes relational regulation by asserting and defending their competence (Sommet et al., 2014).

It follows from social interdependence theory that socio-cognitive conflict regulation may vary as a function of social interdependence. Under positive interdependence, individuals focus on resolving epistemic conflicts, whereas under negative interdependence individuals focus on protecting self-competence. In other words, individuals' main concern during socio-cognitive interactions may differ depending on how individuals perceive social interdependence.

Hypothesizing A Second Type of Epistemic Regulation Under Positive Interdependence

Socio-cognitive conflict theory posits that individuals engage in epistemic regulation when individuals do not perceive their partner as threatening their sense of competence, such as within cooperative contexts (i.e., positive interdependence). But the assumption that individuals only have cognitive concerns (i.e., epistemic concerns) within cooperative contexts and do not also have social concerns (e.g., competence threats) remains untested. In this dissertation, I suggest that social concerns—particularly concerns about relative competence—also exist under positive interdependence. Specifically, when cooperating partners disagree it stimulates concerns about whether they are helping or inhibiting shared goal achievement by continuing to negotiate the conflict. In other words, when an individual perceives themselves to be relatively competent about the problem, they also perceive the argumentation process by which the conflict is resolved as helping to achieve the shared goal because being exposed to alternative perspectives and defending one's point of view leads to a better understanding of the issue (Doise & Mugny, 1984; Johnson & Johnson, 2009; Mercier, Boudry, Pagliere & Trouche, 2017; Nussbaum, 2008). However, when an individual perceives themselves to be less competent under positive interdependence, they perceive that advocating their point of view and continuing the

argumentation process inhibits shared goal achievement because they think their own understanding of the issue is likely to be less valid than a more competent partner. Thus, incompetent students are less likely to maintain or argue their opinions under cooperative conditions, and more likely to accept others' thinking to avoid making mistakes and misleading others. As such, the motivation of incompetent students is more avoidance-valenced because, by going along with another's point of view, they avoid inhibiting cooperative goal attainment.

In summary, in this dissertation I posit that students may also have social concerns under positive interdependence, which are avoiding compromising others' understanding. Due to these concerns, those with low competence aim to quickly agree with others' approaches rather than integrating diverging views under positive interdependence. Correspondingly, I also propose that epistemic regulation may be more accurately described in terms of two different types. Individuals with high competence engage in "*constructive epistemic conflict regulation*," by actively incorporating diverging views and collaborating with others, which is consistent with the original type of epistemic regulation described in socio-cognitive conflict theory. But individuals with low competence engage in "*concurrence-seeking epistemic conflict regulation*," which differs from the original form of epistemic regulation in terms of how to cope with conflicts (i.e., submissive vs. agentive) or valence (i.e., avoidance vs. approach).

A 2 × 2 Model of Socio-cognitive Conflict

To account for different types of epistemic conflict regulation in socio-cognitive conflict regulation model, I propose a more comprehensive model of socio-cognitive conflicts consisting of two dimensions: (a) personal dimension (perceived competence) and (b) social dimension (social interdependence). Before this, however, it is important to summarize the limitations of prior theories and, so doing, make clear why this integrative model is needed.

Socio-cognitive conflict theory (Doise & Mugny, 1984; Mugny & Doise, 1978) is well positioned to describe multiple concerns (i.e., concerns about the answer and self-evaluation) and types of conflict regulations (i.e., epistemic and relational regulations) in peer learning situations, but it assumes that epistemic regulation is unidimensional while relational regulation can be engaged in either a competitive or a protective way. This theory overlooks the possibility of multidimensional epistemic regulation depending on individuals' perceived competence.

Social interdependence theory (Deutsch, 1985; Johnson & Johnson, 1989) may provide one of the possible solutions to account for how different social contexts determine different types of individual concerns and conflict regulation. This theory suggests that how individuals perceive goal structures—cooperative or competitive—may influence how individuals interact with each other, and thus determine their conflict-regulating styles as well. However, this theory posits that social interdependence determines outcomes regardless of personal characteristics such as personal perception of ability to cope with the situation (e.g., agentic or submissive). Specifically, cooperative contexts based on positive interdependence facilitate goal achievement through promotive interactions including high-level reasoning, effective communication, and constructive management of conflict.

What social interdependence theory does not account for is how perceived differences in competence affect cooperative interactions. When an individual perceives in oneself limited abilities to cope with the situation, he or she may tend to display more avoidance or submissive coping strategies (Cohen & Lazarus, 1979) by accepting or following disagreeing people in their group. Hence, the idea that positive interdependence always promotes epistemic regulation (e.g., Saltarelli & Roseth, 2014; Sommet et al., 2014) should be reconsidered by accounting for how

individuals' behaviors would be different depending on their perception of ability to cope with the situation under positive interdependence.

In short, integrating socio-cognitive conflict theory and social interdependence theory may be promising for better understanding of the nature of socio-cognitive conflicts and, more generally, the way individuals regulate cooperative goals. Integration not only helps accommodate the limitations of each theory, but it also helps identify two different types of epistemic regulation (i.e., constructive-epistemic and concurrence-seeking epistemic regulations) with the two different types of relational regulation (i.e., competitive-relational and protective-relational regulations).

Two Dimensions of Different Interpersonal Goal Models

This integrative 2 × 2 model of socio-cognitive conflict regulation shares many parallels with other models of interpersonal goals, conflict resolution, and argumentation. Three models are especially noteworthy in that their underlying dimensions align with the two dimensions of the proposed integrative model of socio-cognitive conflict regulation: (a) a model of interpersonal goals suggested by Dryer & Horowitz (1997) and Ojanen and her colleagues (Ojanen, Grönroos, & Salmivalli, 2005); (b) a dual-concern model of conflict resolution suggested by different theorists including Blake and Mouton (1964), Johnson and Johnson (2005b), Kilmann and Thomas (1977), and Rahim (1983); and (c) a framework of discourse types suggested by Asterhan (2013).

Interpersonal goal model. First, interpersonal goals (Dryer & Horowitz, 1997; Ojanen et al., 2005) based on individuals' social motives or needs consist of (a) gaining *agency*, or power, and (b) gaining *communion*, or affiliation and intimacy with others (Buhrmester, 1996). On one side of the *agency* dimension is agency (gaining authority and showing confidence), and on the

other submission (avoiding conflicts by following others' expectations). And on one side of the *communion* dimension is communality (maintaining closeness and affiliation with others) and on the other side is separation (concealing one's feelings and thoughts). Thus, the interpersonal goal model suggests that when individuals interact with other people, their social goals (i.e., goals targeted for attaining, maintaining, or avoiding specific end states for self in relation to other people) depend on how much they attempt to gain power and show confidence and how much they strive for relationship with others. Combining these two dimensions yield different types of interpersonal goals (for more details, see RQ 2-3 in Chapter 3).

The dual-concern model of conflict management. Second, a dual-concern model of conflict management was first introduced by Blake and Mouton (1964), and has been articulated by several theorists (Johnson, 1978; Rahim, 1983; Thomas, 1976). The model has two dimensions of interpersonal conflict behavior: *concern-for-self* dimension (the extent to which people attempt to satisfy their own interests) and *concern-for-the-other* dimension (the extent to which people want to satisfy the interests of the others). These two dimensions are also called *assertiveness* and *cooperation* (Kilmann & Thomas, 1977; Thomas, 1976) or *goals* (reaching an agreement that satisfies our wants and meets our goals) and *relationship* (maintaining an appropriate relationship with the other person; Johnson & Johnson, 2005). Thus, such models suggest that when individuals become engaged in a conflict, their behavior depends on how important their own interests and goals to themselves and how important they perceive others' interests and the relationship to be. After all, a person's conflict management styles can be understood along these two dimensions (for more details, see Conflict management section under Different Types of Socio-Cognitive Conflict Regulation).

Argumentative discourse. Lastly, Asterhan (2013) assessed argumentative discourse based on key features from epistemic dimension and interpersonal dimension. The epistemic dimension consists of how much critical reasoning and consensual construction with validation of explanations are prevalent in discourse. The interpersonal dimension consists of how much collaborative or competitive markers are prevalent in discourse. These markers, such as language, facial expressions, and body posture, stem from individuals' collaborative or competitive motives. Thus, the discourse type is determined by individuals' engagement in epistemic conflicts (i.e., conflicts between ideas, not conflicts between persons) and interpersonal goals (i.e., collaborative or competitive goals). These two dimensions also yield different discourse types (for more details, see Argumentative discourse section under Different Types of Socio-Cognitive Conflict Regulation).

Summary. Taken together, these three models involve similar dimensions: one dimension focuses more on one's own interest or agentic goals toward the task itself (i.e., epistemic concern), while the other focuses more on the others' interest or concerns about interpersonal relationships rather than the task itself. These two dimensions are in line with *personal* and *social* dimensions of the proposed model in this dissertation. First, the personal dimension aligns with the dimension related to one's agency, assertiveness, concern about oneself or epistemic concern, because the personal dimension is the extent of one's perception of ability to cope with the situation or how much one's own goals in the task are valued, leading to more agentic or submissive pattern of behaviors. The social dimension also aligns with the dimension related to one's desire for communion and cooperation and concern about others, because the social dimension is the extent of goal structures in interpersonal contexts or how much relationships with others are important, leading to more cooperative (communal) or

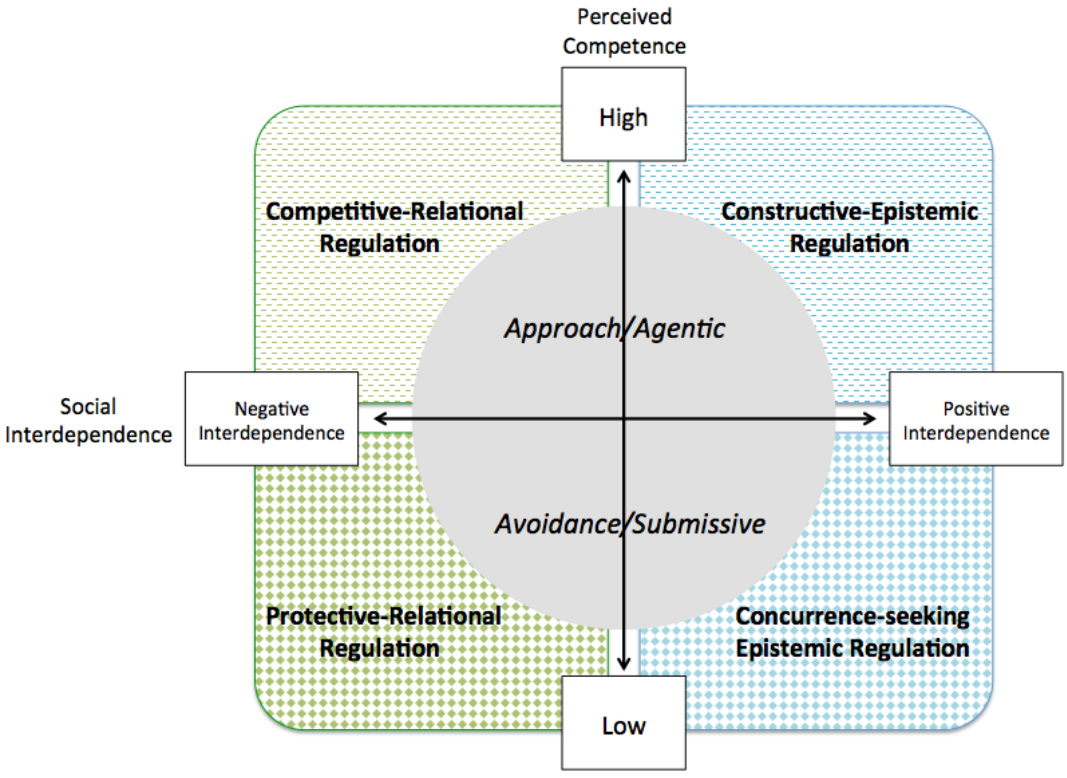
competitive (indifferent or separated) pattern of behaviors. Therefore, I propose these two dimensions for the new model of socio-cognitive conflict regulation in this dissertation.

Social Interdependence Defined: Positive vs. Negative

As a horizontal dimension (see Figure 1), I suggest different social interdependence or social contexts based on social interdependence theory. The social interdependence means a *goal structure* that specifies the type of interdependence (i.e., positive interdependence, negative interdependence) among individuals' goals, which determines interacting ways. In positive interdependence, individuals promote and facilitate others' goal attainment, which represents the right side of the model. In negative interdependence, individuals obstruct and block others' goal attainment, which represents the left side of the model.

Figure 1

The proposed model of 2 × 2 socio-cognitive conflict regulation



Under positive interdependence (on the right side of the model), individuals only achieve their goals when cooperating partners also achieve their goals. Thus, individuals are less likely to be worried about demonstrating their competence or outperforming others, but more likely to focus on cognitive concerns. At the same time, there may also be social concerns under positive interdependence such as in cooperative contexts. After all, when individuals perceive that they can achieve their goals only if their group members also achieve their goals, it encourages actions that promote goal achievement (e.g., providing mutual help, sharing information) and *discourages* actions that inhibit goal achievement (e.g., misleading others by providing bad information, blocking others more competent efforts).

Under negative interdependence (on the left side of the model), there is winning or losing between individuals, and obstructive interactions (e.g., less help, distrust) are prevalent. Thus, individuals are less likely to be worried about others' goal achievement and cognitive concerns, but more likely to focus on demonstrating their competence or avoiding showing incompetence to protect themselves.

Personal Competence Levels: High vs. Low

As a vertical dimension (see Figure 1), I suggest different levels of perceived competence towards the task or problem, which is in line with a criterion of differentiating between competitive- and protective-relational regulations in socio-cognitive conflict theory. In stressful situations like interpersonal conflict, one tends to develop coping strategies to reduce the tension induced by the situation (Lazarus, 1999). These coping strategies are determined by one's perceptions of control over the situation, known as *appraisals* (Cohen & Lazarus, 1979; Lazarus & Launier, 1978). If one has high degree of perceived control over the situation (i.e., high perceived competence), one anticipates gains and *challenge-appraisal* is likely to occur. The

challenge-appraisal based on high perceived competence may induce more active coping strategies and agentic behaviors such as dominance and leadership. In contrast, if one has low degree of perceived control over the stressor (i.e., low perceived competence), one anticipates loss or harm and *threat-appraisal* is likely to occur. The threat-appraisal based on low perceived competence may induce more passive coping strategies and submissive behaviors such as compliance and subordination.

Similarly, achievement motivation literature has also proposed that one's behaviors are differentiated as a function of valence—*approach* and *avoidance* (Elliot, 1999; Elliot & Church, 1997). In approach motivation, behavior is directed by a positive or desirable event or possibility, whereas in avoidance motivation, behavior is directed by a negative or undesirable event or possibility. Theorists have considered one's perceived competence a moderator of approach-avoidance distinction (Nicholls, 1984). Thus, when individuals have higher perceived competence or higher perception of abilities to cope with stressful situations, they tend to involve in agentic or approach (e.g., resistance) strategies for potential gains, which is represented as the upper side of the model. When individuals have lower perceived competence or lower perception of abilities to cope with stressful situations, they tend to involve in submissive or avoidance (e.g., withdrawal) strategies for not losing, which is represented as the lower side of the model.

Therefore, when individuals have a high level of perceived competence in the task (on the upper side of the model), they tend to show more agentic and approach behaviors, by actively searching for new information and alternative perspectives (under positive interdependence), or by sticking to their own views to win the argument (under negative interdependence). When individuals have a low level of perceived competence in the task (on the lower side of the model), they tend to show more submissive and avoidance behaviors, by complying with others'

perspectives to avoid incorrect answers and avoid inhibiting everyone's success (under positive interdependence), or by withdrawing their own opinion to avoid looking stupid and protect themselves (under negative interdependence).

Different Types of Socio-Cognitive Conflict Regulation

Prior literature. The four types of socio-cognitive conflict regulation proposed in this dissertation can be articulated based on prior literature on different types of argumentative discourse, controversy and decision making, and conflict management. In this section, I provide more details about characteristics of each type of socio-cognitive conflict regulation in relation to various types of interpersonal dialogues or behavior discussed in the prior literature. The argument is made that this literature supports the different types of socio-cognitive conflict regulation, including the new type of socio-cognitive conflict regulation—concurrence-seeking epistemic regulation. Table 1 (in Appendix A; all tables are placed in Appendix A) summarizes different models of socio-cognitive conflict regulation in relation to different types of argumentative discourse, controversy and decision making, and conflict management.

***Argumentative discourse*.** Peer argumentation researchers (e.g., Asterhan, 2013; Mercer, 1996; Keefer et al., 2000; Wegerif et al., 1999) have investigated peer-led student dialogues by videotaping classroom discourse and categorizing dialogue types based on salient common features, and also determined which dialogue type is most beneficial for learning (see Table 1).

Mercer (1996) and Wegerif et al. (1999) suggested three different social modes of thinking: (a) disputational talk; (b) cumulative talk; and (c) exploratory talk. In disputational talk, there is little constructive criticism of suggestions and short exchanges consisting of assertions and counter-assertions, resulting in individualized decision making. In cumulative talk, there are positive but uncritical discussion, and individuals construct a "common knowledge" through

repetitions, confirmation, and elaborations. In exploratory talk, there are critical but constructive discussions and some challenges from alternative views. Individuals make progresses on knowledge construction through consideration of divergent views and joint agreement.

Keefer et al. (2000) identified four dialogue types: (a) critical discussion; (b) explanatory inquiry; (c) eristic discussion; and (d) consensus dialogue. In critical discussion, eristic discussion, and consensus dialogue, participants have divergent opinions or beliefs or they have taken a position so that at least some concessions can be expected. Explanatory inquiry, however, is initiated by lack of knowledge rather than divergent opinions or a conflict of viewpoint, so all participants share a position and it may be hard to enter the argumentation phase. Thus, all but explanatory inquiry of Keefer et al.'s (2000) dialogue types can be considered as argumentative discourse. Specifically, the goal for a critical discussion is to understand and accommodate divergent viewpoints by sharing opinions and persuading others. The goal for an eristic discussion is to defend one's own position through personal attacks or tricky arguments devastating the opposition. Lastly, the goal for a consensus dialogue is to simply accept the first viewpoint presented, which sometimes seems a successful dialogue, but it is "facile agreements" that actually undermine the goal of a critical discussion.

Asterhan (2013) also identified three discourse types: (a) co-constructive critical argumentation; (b) adversarial argumentation; and (c) consensual discourse. As presented earlier, these different discourse types are yielded based on epistemic and interpersonal dimensions. Co-constructive critical argumentation is characterized by critical reasoning and consensual construction with validation of explanations as the epistemic dimension, while adversarial argumentation and consensual discourse are away from the epistemic dimension due to lack of consensual construction with validation of explanations and the lack of critical reasoning,

respectively. As the interpersonal dimension, co-constructive critical argumentation and consensual discourse are collaborative, while adversarial argumentation is competitive.

All argumentative discourse literature suggests that the most adaptive forms of discourse—e.g., exploratory talk (Mercer, 1996; Wegerif et al., 1999), critical discussion (Keefer et al., 2000), and co-constructive critical argumentation (Asterhan, 2013)—involve critical thinking and consensual construction (i.e., integrating diverging views). All of these forms result in conceptual learning gains (i.e., conceptual change) through a number of claims, requests for claims, challenges, rebuttals, agreements, or concessions, which do not tend to appear in other types of argumentative discourse (Asterhan & Schwarz, 2009).

Controversy and decision making. Constructive controversy exists when interpersonal conflict arises and individuals seek to reach an agreement (Johnson & Johnson, 2007, 2009b). Constructive controversies aim to synthesize creative solutions by considering both advantages and disadvantages of proposed ideas, and so doing engaging individuals in Aristotle's notion of *deliberate discourse*. The motivation underlying constructive controversy is the epistemic curiosity, which arises as a result of the uncertainty, conceptual conflict, or disequilibrium that, in turn, elicits a more active search for new information and perspectives.

Constructive controversy contrasts with three other forms of conflict decision-making processes: *debate*, *concurrence seeking*, and *individualistic efforts* (see Table 1). Debate exists when individuals argue their positions that opposite to each other and, after the discussion, there is the best position or the winner among different presentations. One tends to be closed-minded and reject opposing information and perspectives. Concurrence seeking exists when individuals of a group tend to make a consensus and avoid disagreement or argument, resulting in inhibiting discussion or comparison of alternative perspectives. Concurrence seeking aligns with the

concept of *groupthink* (Janis, 1982), which arises when members of group are trying to make a quick consensus without doubts. The motivation underlying concurrence seeking is to maintain the harmonious atmosphere of the group. Lastly, individualistic efforts exist when individuals work alone, and their goals are not related with others' goals. Since one makes a decision without discussing on the information with others, this type of decision-making process is not interpersonal.

Johnson and Johnson's meta-analysis with 39 studies (2009b) conducted since 1970 found that, among different types of decision-making processes, constructive controversy is more adaptive decision-making process than debate, concurrence seeking, and individualistic efforts, in terms of various outcomes such as academic achievement, cognitive reasoning, perspective taking, motivation, attitudes toward task, and interpersonal attraction. One interesting finding from this study is such ideal type of decision-making process, constructive controversy, tends to take place within conditions where active involvement of all participants (i.e., solving the problem by integrating different views with explanation) and cooperative goal structures exist. These conditions provide some insights into the proposed model in terms of what conditions lead to the ideal type of socio-cognitive conflict regulation—more active and competent individuals under cooperative goal structures.

Conflict management. As addressed earlier, the dual concerns model identifies styles of conflict management based on two dimensions, but different researchers call the styles and dimensions differently (see Table 1). Blake and Mouton (1964) introduced integrating, dominating, obliging, avoiding, and compromising based on the concern-for-self and concern-for-the-other dimensions, while Thomas (1976) reinterpreted and renamed them as collaborating, competing, accommodating, avoiding, and compromising based on assertiveness and

cooperativeness dimensions. Lastly, Johnson and Johnson (2005b) described strategies to manage conflicts as confronting, forcing, smoothing, withdrawing, and compromising based on the goals and relationships dimensions.

When integrating, collaborating, and confronting, individuals tend to work with the other people and initiate problem-solving negotiations to resolve the conflict. When dominating, competing, and forcing, individuals tend to pursue their own concerns at the other people's expense to win their position. When obliging, accommodating, and smoothing, individuals tend to give up their own goals in order to satisfy the other people's concerns and maintain the relationship. When avoiding and withdrawing, individuals tend to avoid conflicts and postpone an issue or simply withdraw from a threatening situation. When compromising, which is some combination of all four conflict-managing strategies, individuals tend to find a mutually acceptable solution that requires sacrificing part of their own goals and relationship in order to reach an agreement. Compromising, however, is not addressed in this dissertation because the proposed model focuses only on the *main* effects of personal and social factors on socio-cognitive conflict regulating types, not some combination of these main effects in the model.

Prior research has shown that individuals with integrating, collaborating, and confronting strategies engage in open discussion by listening to other points of view and integrating those diverging opinions into a new, constructive understanding. Thus, these types of conflicting-management strategies lead to higher quality solutions than the other types of strategies (Thomas & Kilmann, 2008).

Socio-cognitive conflict regulation. This review of literature provides better understanding of how the four types of socio-cognitive conflict regulation are differentiated. The prior literature, particularly the literature on conflict management, suggests that there is an

avoidance or submissive type of conflict management while pursuing cooperativeness and relationship goals (e.g., obliging, accommodating, smoothing). This kind of regulation, however, has been overlooked in the socio-cognitive conflict literature because most assume that epistemic conflict regulation—which focuses on integrating different views through cooperation—represents an approach and agentic form of regulation. However, theoretically, the dimension of approach-avoidance or agency-submission may be integral to the all competence-based forms of regulation (Atkinson, 1957; Murray, 1938), including socio-cognitive conflict regulation, as achievement goals (Elliot & McGregor, 2001), which introduces a submissive type of epistemic regulation. For instance, when disagreements occur, some incompetent individuals may follow others' perspectives to understand the problem because they think others' answers are more correct and their own answers can misinform others. Therefore, the submissive type of epistemic regulation, concurrence-seeking epistemic regulation, is operative in real learning settings and that it is important to develop a specific empirical profile for this new type of regulation.

Conceptually, concurrence-seeking epistemic regulation differs from constructive-epistemic regulation in terms of the coping strategies (agentic vs. submissive), from protective-relational regulation in terms of the perceptions of social interdependence (positive vs. negative), and from competitive-relational regulation in terms of both the coping strategies and perceptions of social interdependence. It is not easy to make empirical predictions regarding the antecedents and consequences of concurrence-seeking epistemic regulation; the submissive component of the regulation is likely to be associated with negative antecedents and consequences, while the perceptions of positive interdependence is likely to be associated with positive antecedents and consequences. Taken together, I hypothesize that concurrence-seeking epistemic regulation will be less associated with desirable antecedents and consequences than constructive-epistemic

regulation, and more associated with them than protective-relational regulation (for more details, see hypotheses in Chapter 3). Now in this section I will explain distinctive characteristics of the four different types of socio-cognitive conflict regulation type. Table 2 summarizes these characteristics.

***Constructive-epistemic regulation*.** Exploratory talk (Mercer, 1996; Wegerif et al., 1999), (issue-driven) critical discussions (Keefer et al., 2000), co-constructive critical argumentation (Asterhan, 2013), controversy (or deliberate discourse, Johnson & Johnson, 2009b), integrating (Blake & Mouton, 1964), collaborating (Kilmann & Thomas, 1977), and confronting (Johnson & Johnson, 2005b) are the types of dialogue, discourse, or conflict-managing strategies that align with constructive-epistemic regulation in the socio-cognitive conflict model (Doise & Mugny, 1984). This type of discourse is considered ideal, because individuals actively engage in not only critical reasoning based on their high perceived competence but also collaborative construction with others to better understand the problem (Asterhan, 2013). The following rules are the specific features of this ideal type of discourse that have been commonly proposed in the literature:

(a) Challenges are expected, but they are conflicts between ideas (issue-driven discussion), not between individuals (position-driven discussion).
(b) Individuals critically examine alternatives that are discussed before making a decision.
(c) Individuals seek to make consensus.
(d) There is a collaborative atmosphere where all individuals are encouraged to speak and take responsibility for decisions.

This ideal type of argumentative discourse is characterized as having a more open discussion with a more heterogeneous mix of different opinions, leading to issue-driven conflicts

with aims for understanding. Individuals explore differences in perspectives and try to settle the conflicts through rational reasoning, leading to the development of critical thinking. They are also willing to make concessions if other perspectives are persuasive and plausible, and incorporate these concessions into arguments to strengthen their argument conclusions. The concessions are essential for a constructive discourse, but they must be done with supporting reasons, explanation, and elaborations, which is differentiated from quick consensus seeking that is agreement without rational reasoning. Lastly, this type of discourse occurs within a cooperative context (i.e., positive interdependence) where everyone feels responsible for reaching sound conclusions by producing and conceding to validated arguments that do not align with their initial positions. Under this atmosphere, individuals are less likely to be threatened by others' competence, but more likely to focus on the validity of the answer or argument without concerns about self-evaluation, which may promote cognitive development.

***Competitive-relational regulation*.** Disputational talk (Mercer, 1996; Wegerif et al., 1999), eristic discussions (Keefer et al., 2000), adversarial argumentation (Asterhan, 2013), debate (Johnson & Johnson, 2009b), dominating (Blake & Mouton, 1964), competing (Kilmann & Thomas, 1977), and forcing (Johnson & Johnson, 2005b) are the types of dialogue, discourse, or conflict-managing strategy consistent with competitive-relational regulation in socio-cognitive conflict model. This type of discourse heavily focuses on concerns about self-competence and self-evaluation, which diverts students' attention away from the conflicts between ideas. Because individuals aim to win the arguments based on their perception of high competence, this type of discourse is void of collaborative construction of knowledge (Asterhan, 2013). The following rules are the specific features of this type of discourse that have been commonly proposed in the literature:

(a) Challenges are expected, and they are conflicts between individuals (position-driven discussion), not between ideas (issue-driven discussion).

(b) Individuals have a high frequency of critical argumentation moves such as reasoned challenges, reasoned rebuts, and oppositions, but they engage in critical discussion without serious consideration of others' perspectives.

(c) Individuals aim to persuade others to yield.

(d) There is a competitive atmosphere where individuals do not cope with others but simply opposes with a counterclaim, resulting in failure to integrating and elaborating arguments.

This type of argumentative discourse is characterized as having a more closed discussion with minimal engagement to consider different opinions, leading to position-driven conflicts with aims for defending their own positions or winning the argument. Individuals think about why other perspectives are wrong, and challenge or attack their partners to make them yield. Therefore, there are neither collaborative thinking effort nor consensual construction. Mercer (1996) described this type of discourse as "disagreement and individualized decision making." Lastly, this type of discourse occurs under competitive contexts (i.e., negative interdependence) while individuals aim to win the argument by showing that others' perspectives are wrong. Under this atmosphere, individuals are more likely to be threatened by others' competence, but less likely to focus on the validity of the answer or argument, which may hinder cognitive development.

Protective-relational regulation. The argumentation literature has not clearly differentiated between protective-relational regulation and concurrence-seeking epistemic regulation. Argumentation researchers' "cumulative talk" (Mercer, 1996; Wegerif et al., 1999),

"(position-driven) consensus dialogues" (Keefer et al., 2000), and "consensual discourse" (Asterhan, 2013) may be consistent with the concepts of some combination of protective-relational regulation and concurrence-seeking epistemic regulation. These types of argumentative discourse are void of critical reasoning as well as collaborative construction of knowledge[1]. In contrast, researchers of controversy and conflict resolution show a possibility that the conflict-regulating style with submissive tendency may be divided into protective-relational regulation and concurrence-seeking epistemic regulation based on how important social relationships are to individuals.

One engages in protective-relational regulation when one is threatened by others' evaluation about competence and perceives one's own competence as low (Sommet et al., 2014, 2015), which diverts one's attention away from the conflicts between ideas. In this situation, one participates in the discourse by espousing or adopting others' views quickly in order to avoid direct confrontation, which is similar to avoiding (Blake & Mouton, 1964; Kilmann & Thomas, 1977) and withdrawing (Johnson & Johnson, 2005b) as one of the conflict resolution types. Because individuals aim to avoid showing their low self-competence by withdrawing their suggestions, this type of discourse is void of critical reasoning as well as collaborative construction of knowledge (Asterhan, 2013). The following rules may be the specific features of this type of discourse:

[1] Asterhan (2013) describes consensual discourse as low critical reasoning but high consensual construction with validation of explanations, which is contrast to my view on consensual discourse in that I describe it as being low in both critical reasoning and consensual construction with validation of explanations. Consensual discourse takes place when individuals want to make a quick consensus without much cognitive engagement, so "validation of explanations" may not be a necessary component of consensual discourse. I propose that protective-relational regulation and consensus-seeking epistemic regulation are consistent with Asterhan's (2013) consensual discourse only if it means low levels of *both* critical reasoning and consensual construction with validation of explanations.

(a) Challenges are expected from conflicts between individuals (position-driven discussion), but individuals tend to avoid them rather than confronting them.

(b) Individuals have no critical argumentation moves, and show quick consensus seeking. They tend to less engage in the discussion by withdrawing their own opinion.

(c) Individuals aim to protect self-esteem and self-competence.

(d) There is a competitive atmosphere where individuals do not cope with others but also do not oppose with others' views. Passive or indifferent engagement in the discussion results in failure to integrating and elaborating arguments.

This type of argumentative discourse is characterized as having a more closed discussion with minimal engagement to consider different opinions, leading to position-driven conflicts with aims for protecting self-esteem. Individuals seem to work together, but they actually tend to avoid conflict by withholding their opinion in order to prevent themselves looking less competent. Therefore, there are neither collaborative thinking effort nor critical reasoning. Mercer (1996) described this type of discourse as constructing a "common knowledge by accumulation," and Keefer et al. (2000) described it as "facile agreements" because individuals simply accept and build on the first claim presented. Individuals who are less competent tend to engage in this type of discourse, with the motivation for avoiding showing poorer performance than others under competitive contexts (i.e., negative interdependence), because individuals are more likely to be threatened by others' competence under this atmosphere. This may eventually hinder cognitive development.

Concurrence-seeking epistemic regulation. A new type of regulation in this dissertation is concurrence-seeking epistemic regulation, which is similar to concurrence seeking (Johnson & Johnson, 2009b), obliging (Blake & Mouton, 1964), accommodating (Kilmann & Thomas,

1977), and smoothing (Johnson & Johnson, 2005b), one of the controversy and conflict resolution types. Similar to protective-relational regulation, this regulation is also characterized by consensual discourse, but it is not position-driven dialogues. Thus, demonstrating high competence or avoiding demonstrating low competence is not the main goal of the discourse, but the goal of this discourse is to avoid not fully understanding the problem and avoid misleading others. To this end, one participates in the discourse by espousing or adopting others' views quickly, because one believes others' views are more correct than one's, and one does not want others to be confused by one's own perspective. There are a lot of concessions, but they are done quickly without a lot of validated explanations or rational reasoning. The following rules may be the specific features of this type of discourse:

(a) Challenges are expected from cognitive concerns about not fully understanding the problem and social concerns about misleading others so everyone will misunderstand the problem.

(b) Individuals have no critical argumentation moves, and show quick consensus seeking. They tend to comply with other's views to avoid making mistakes rather than merely less engaging in the discussion by withdrawing their own opinion.

(c) Individuals aim to protect everyone's goals (i.e., understanding the task) in their group.

(d) There is a collaborative atmosphere where individuals agree with others and do not oppose with others' views. However, this collaboration is likely to be from quick consensus seeking rather than consensual construction with validation of explanations, resulting in failure to integrating and elaborating arguments.

This type of argumentative discourse is characterized as consensus seeking without deep cognitive engagement to avoid interrupting others' learning. Individuals seem to work together,

but they actually tend to follow what others want in order to reach more valid answers quickly and avoid misleading others in the same group. Therefore, collaborative thinking effort or critical reasoning is not much prevalent, at least less prevalent than constructive-epistemic regulation. As protective-relational regulation, this type of discourse can also be characterized as constructing "common knowledge by accumulation (Mercer, 1996)" and "facile agreements (Keefer et al., 2000)," but the motivation behind such discourse or regulation patterns is to avoid not fully understanding and prevent others from misunderstanding because of one's own incompetent answer. Compared to protective-relational regulation, individuals with concurrence-seeking regulation may be less likely to be threatened by others' competence, because they are sharing the goals with others (i.e., positive interdependence). However, those with less competence can still be concerned about not learning due to their low abilities and also be concerned about misinforming others because their success depends on others' success. Therefore, individuals who perceive themselves to be (not necessarily relatively, but absolutely) low competent tend to protect everyone's goals and focus more on complying with others' more plausible answers. Concurrence-seeking epistemic regulation still addresses epistemic concerns to some degree, in that it aligns with others' thinking because others' seem to be more correct, but it may not necessarily enhance cognitive development because one is incompetent and passively engage in thinking processes and discourse.

CHAPTER 3:

The Present Study

The purpose of this dissertation study is to examine how perceived competence and social interdependence are associated with a range of student outcomes including socio-cognitive conflict regulation, using self-reported measures (a) in an experimental study using vignettes describing working with the other employee in a workplace (Pilot, Study 1) and (b) in a field study by asking undergraduates about group-work experiences in their real classroom (Study 2).

Pilot Study

The most important need for this pilot study stems from the fact that the subscale on concurrence-seeking epistemic regulation is brand new. Thus, I first aim to ensure whether the measure of concurrence-seeking epistemic regulation can be empirically separable from the other three measures of regulation and represent internally consistent construct. I created a measure of concurrence-seeking epistemic regulation with content validity and revised existing measures of epistemic (i.e., constructive-epistemic), competitive-relational, and protective-relational regulations (see Appendix C for items).

One general rule for creating and revising the items in this study was to disentangle *motivation* from *regulation*. That is, the socio-cognitive conflict regulation items must measure regulating *behavior* that should not be conflated with the underlying *reason* for that regulating behavior. For example, one of the original items for epistemic regulation in Darnon et al. (2006) is "(to what extent did you) try to think about the text again in order to understand better?" In this item, there is a reason, "in order to understand better," for the behavior, "to think about the text again." This can be a problem for a couple of reasons. First, the item does not exactly measure what is supposed to measure, which should be one's *behavior* type of regulation alone,

rather than one's *motivation* for the regulating style. Second, the item can be more problematic when it comes to the associations with achievement goals. Achievement goals are considered one of the key antecedents of socio-cognitive conflict regulation, which have been found by the authors who developed the original measures of socio-cognitive conflict regulation (e.g., Darnon et al., 2006; Sommet et al., 2014, 2015). Specifically, mastery-approach goals were found to be an antecedent of epistemic regulation (Darnon et al., 2006), but this finding may have to be re-considered because the items of epistemic regulation already measures mastery-oriented motivation in part. One of the mastery-goal items (Elliot & McGregor, 2001) is "It is important for me to understand the content of this course as thoroughly as possible," which overlaps with the original item of epistemic regulation, "(to what extent did you) try to think about the text again in order to understand better?" In other words, since this regulation item already includes the motivation or goal—better understanding the text—for a certain regulating behavior, its positive association with mastery goals may not be necessarily from the fact that one is a predictor for the other, but simply from their shared measure variance. In this pilot study, I first revised the original items and developed all items of socio-cognitive conflict regulation to measure one's regulating *behavior* that is disentangled from motivation, and in the following studies (Study 1, 2), using the developed items, I examined whether achievement goals are still antecedents of socio-cognitive conflict regulation as one of the research questions.

The second aim in this pilot was to investigate the effects of perceived competence and social interdependence on socio-cognitive conflict regulation, but it is also important to ensure the manipulations through experimental vignette methodology really work so that these manipulating ways can be used in Study 1. I created hypothetical scenarios to manipulate participants' perceptions of competence (high vs. low) and social interdependence (positive vs.

negative), which leads to four different conditions: (a) high perceived competence—positive interdependence (Condition 1); (b) low perceived competence—positive interdependence (Condition 2); (c) high perceived competence—negative interdependence (Condition 3); and (d) low perceived competence—negative interdependence (Condition 4). Before examining the effects of perceived competence and social interdependence, I checked whether these four different scenarios differentially manipulate participants' perceptions of competence and social interdependence as intended. In summary, I first examined the internal structure of construct, socio-cognitive conflict regulation (Pilot RQ 1), and investigated how socio-cognitive conflict regulation differs by the four different experimental conditions (Pilot RQ 2).

Pilot RQ 1: Does the 2 × 2 model consisting of constructive-epistemic, concurrence-seeking epistemic, competitive-relational, and protective-relational regulation subscales fit the data well?

In order to support the 2 × 2 conflict regulation model in general and the concurrence-seeking epistemic and protective-relational regulations in particular, I pursued three objectives in this research question.

First, I sought to investigate whether the four factors including constructive-epistemic, concurrence-seeking epistemic, competitive-relational, and protective-relational regulations, represent empirically distinct constructs, in a content-valid, reliable manner. I also compared a series of alternative models to ensure that the data fit the hypothesized four-factor model better than other possible models.

Second, I examined the means and intercorrelations among the socio-cognitive conflict regulations particularly to determine how concurrence-seeking epistemic and protective-relational regulations are associated with the other regulation types, and if their correlation

patterns are differentiated from each other. I compared observed means by condition at a descriptive level, to investigate whether different perceptions of competence and social interdependence lead to different types of socio-cognitive conflict regulation.

Prior studies have shown that there is a positive correlation between epistemic and competitive-relational regulations (e.g., $r = .32$, $p < .05$, Darnon et al., 2006; $r = .21$, $p < .01$, Saltarelli & Roseth, 2014), whereas there is usually a negative correlation between competitive-relational and protective-relational regulations (e.g., rs = -.19 to -.39, $p < .05$; Study 3 in Sommet et al., 2014, and Study 1 and 3 in Sommet et al., 2015). There was one exception of non-significant relation between competitive-relational and protective-relational regulations ($r = -.07$, $p = .56$; Study 4 in Sommet et al., 2015), but they were not measured by self-reported measures, but occurrences of actual regulation behaviors. I aimed to determine whether the intercorrelations among regulation types are consistent with previous findings to support the revised measures of socio-cognitive conflict regulation in this study. I also expected constructive-epistemic regulation to be negatively correlated with protective-relational regulation, as their anticipated antecedents are uncommon—different levels of competence and different perceptions of social interdependence.

I hypothesized that the new type of regulation, concurrence-seeking epistemic regulation, would be negatively correlated with competitive-relational regulation, because both the coping strategies (or competence level) and perceptions of social interdependence are opposite to each other. However, its correlations with constructive-epistemic regulation and protective-relational regulation are not easy to be expected. Considering the prior findings by Sommet and his colleagues (2014, 2015), the negative associations are expected between the regulating types with the opposite coping strategies, meaning concurrence-seeking epistemic regulation would be

negatively associated with constructive-epistemic regulation but positively associated with protective-relational regulation. By contrast, considering the social interdependence component, the negative associations are expected between the regulating types with the opposite perceptions of social interdependence, meaning concurrence-seeking epistemic regulation would be negatively associated with protective-relational regulation but positively associated with constructive-epistemic regulation. Thus, I tested these hypotheses with the aim of developing a specific profile for concurrence-seeking epistemic regulation based on the empirical data.

Third, I also examined correlations between socio-cognitive conflict regulation types and their expected antecedents including competence, competence threat, and perceptions of social interdependence. Based on the proposed model (Figure 1) and prior research (Sommet et al., 2014, 2015), I hypothesized that constructive-epistemic regulation and competitive-relational regulation would be positively correlated with competence, whereas concurrence-seeking epistemic and protective-relational regulations would be negatively correlated with competence. I also hypothesized that constructive-epistemic regulation would be negatively correlated with competence threat, whereas concurrence-seeking epistemic and protective-relational regulations would be positively correlated with competence threat. One unclear hypothesis is the correlation between competitive-relational regulation and competence threat. On the one hand, competitive-relational regulation would be negatively correlated with competence threat, because this type of regulation may emerge from high competence. On the other hand, competitive-relational regulation would be positively correlated with competence threat, because this type of regulation may be more prevalent under competitive conditions where a lot of competitions exist, which leads to competence threat. Thus, I examined which hypothesis was supported.

Lastly, I hypothesized that cooperative, competitive, and individualistic perceptions would also be differentially correlated with different types of conflict regulation. Based on the proposed model (Figure 1), I hypothesized that constructive-epistemic and concurrence-seeking epistemic regulations would be positively correlated with cooperative perceptions but negatively correlated with competitive and individualistic perceptions. In contrast, competitive-relational and protective-relational regulations would be positively correlated with competitive and individualistic perceptions but negatively correlated with cooperative perceptions.

Pilot RQ 2: How do a variety of outcomes differ between four different conditions depending on social interdependence?

I compared different outcomes by four experimental conditions. I first ensured that each condition showed expected perceptions of competence (high, low) and social interdependence (cooperative, competitive) corresponding to the manipulation. Specifically, I expected perceived competence to be higher in high perceived competence—positive interdependence (Condition 1) and high perceived competence—negative interdependence (Condition 3) than in low perceived competence—positive interdependence (Condition 2) and low perceived competence—negative interdependence (Condition 4). I also expected cooperative perceptions to be higher in Condition 1 and 2 than in Condition 3 and 4, whereas competitive perceptions to be higher in Condition 3 and 4 than in Condition 1 and 2.

Competence. Both perceived competence and competence threat were examined as outcomes as a function of competence and social interdependence. I note that the result about the difference in the levels of perceived competence between Conditions 1 and 3 (i.e., high-competence conditions) and Conditions 2 and 4 (i.e., low-competence conditions) can also function as manipulation check. First, I hypothesized that there would be the effects of

competence level on the two competence-related outcomes (i.e., perceived competence and competence threat). Specifically, I hypothesized that perceived competence would be higher in Conditions 1 and 3 than Conditions 2 and 4, whereas I hypothesized that competence threat would be higher in Conditions 2 and 4 than Conditions 1 and 3.

Second, although I expected that the effects of competence would be relatively salient in the competence-relevant outcomes, there might also be the effects of social interdependence. Social interdependence theory (Deutsch, 1985; Johnson & Johnson, 1989) suggests that under cooperative contexts others' higher competence may not necessarily threaten one's competence, but it could rather be perceived as one's strength (or the source of increased competence) because cooperators share the goals. There have also been empirical findings about the effects of social interdependence on competence (or expectancy of success, self-efficacy) or motivation: they found that cooperative perceptions were positively associated with self-efficacy (Peterson & Roseth, 2014) and, more generally, motivation (Johnson, Johnson, Roseth, & Shin, 2014), whereas individualistic or competitive perceptions were negatively associated with them. Thus, if there are the effects of social interdependence, I hypothesized that perceived competence would be higher in Conditions 1 and 2 (i.e., positive-interdependence conditions) than Conditions 3 and 4 (i.e., negative-interdependence conditions), whereas competence threat would be higher in Conditions 3 and 4 than Conditions 1 and 2. However, the hypotheses regarding the effects of social interdependence were tentative given that the different conditions by competence level would be a more powerful predictor for the competence-related outcomes.

Social interdependence. Cooperative, competitive, and individualistic perceptions were examined. Again, I note that the differences in the levels of cooperative and competitive perceptions between Conditions 1 and 2 (i.e., positive-interdependence conditions) and

Conditions 3 and 4 (i.e., negative-interdependence conditions) can also function as manipulation check. First, I hypothesized that there would be the effects of social interdependence on all three types of social-interdependence perceptions. Specifically, I hypothesized that cooperative perceptions would be higher in Conditions 1 and 2 than Conditions 3 and 4, whereas I hypothesized that competitive and individualistic perceptions would be higher in Conditions 3 and 4 than Conditions 1 and 2.

Second, I hypothesized the effects of social interdependence would be different depending on participants' competence level, meaning there would be interactive effects of competence and social interdependence on all three types of social-interdependence perceptions. When participants are competent, they would have more cooperative perceptions under positive-interdependence conditions, because they would tend to help each other to achieve their shared goals with high competence. However, it would not be the case under negative-interdependence conditions: when participants are competent and they are under negative-interdependence conditions, they would have more competitive and individualistic perceptions, because they would aim to win others with high competence. By contrast, when participants are incompetent, there would not be large differences in cooperative, competitive, and individualistic perceptions between positive- and negative-interdependence conditions, because participants would not be competent enough to help (or cooperate with) others, win (or compete with) others, and complete the task independently under any conditions. Thus, incompetent participants' cooperative, competitive, and individualistic perceptions would be less different depending on the conditions of social interdependence than competent participants' different perceptions of social interdependence depending on the conditions of social interdependence.

Socio-cognitive conflict regulation. Constructive-epistemic, concurrence-seeking epistemic, competitive-relational, and protective-relational regulations were examined. Based on the proposed model (Figure 1), I first hypothesized that there would be the effects of competence on all four types of conflict regulation. Specifically, I hypothesized that constructive-epistemic and competitive-relational regulations would be higher in Conditions 1 and 3 (i.e., high-competence conditions) than Conditions 2 and 4 (i.e., low-competence conditions), whereas concurrence-seeking epistemic and protective-relational regulations would be higher in Conditions 2 and 4 than Conditions 1 and 3.

Second, I also hypothesized that there would be the effects of social interdependence on all four types of conflict regulation. Specifically, I hypothesized that constructive-epistemic and concurrence-seeking epistemic regulations would be higher in Conditions 1 and 2 (i.e., positive-interdependence conditions) than Conditions 3 and 4 (i.e., negative-interdependence conditions), whereas competitive-relational and protective-relational regulations would be higher in Conditions 3 and 4 than Conditions 1 and 2.

Finally, I hypothesized that there would be interactive effects of competence and social interdependence on all or at least some of socio-cognitive conflict regulations. When participants are competent, they would engage more in constructive-epistemic regulation under positive-interdependence condition than negative-interdependence condition. When competent participants are under negative-interdependence condition, they may tend to focus more on winning others with their high competence, rather than focusing on integrating different points of views. Hence, there would be larger differences in constructive-epistemic and competitive-relational regulations between positive-interdependence and negative-interdependence conditions when participants are competent than when participants are not competent. Similarly, I expected

that there would also be interactive effects on concurrence-seeking epistemic and protective-relational regulations. Specifically, when participants are incompetent, they would engage more in concurrence-seeking epistemic regulation under positive-interdependence condition, but more in protective-relational regulation under negative-interdependence condition. When participants are competent, there would be less differences in these two regulation types between positive-interdependence and negative-interdependence conditions than those when participants are incompetent.

Study 1

The main purpose of Study 1 is to replicate the effects of perceived competence and social interdependence on a variety of outcomes including socio-cognitive conflict regulation, using the four different conditions of vignettes and the measures of socio-cognitive conflict regulation developed in the pilot study. First, I aimed to replicate the internal structure of construct, socio-cognitive conflict regulation, using the developed measures in the pilot (RQ 1-1; replication of Pilot RQ 1), but I used several revised items based on the results from Pilot Study. Second, I aimed to ensure measurement invariance of the four-factor model of socio-cognitive conflict regulation across gender and ethnicity (RQ 1-2). Finally, I investigated how various outcomes differed by four different experimental conditions manipulating participants' perceptions of competence and social interdependence and determined whether the findings were replicated (RQ 1-3). For the last research question, I examined additional outcomes, including achievement goals and critical reasoning.

RQ 1-1 (replication of Pilot RQ 1): Does the 2 × 2 model consisting of constructive-epistemic, concurrence-seeking epistemic, competitive-relational, and protective-relational regulation subscales fit the data well?

I pursued the same three objectives as those in Pilot Study for this research question. First, I sought to investigate the factor structure of socio-cognitive conflict regulation, and set the same hypothesis (i.e., Pilot RQ 1) that the four factors, including constructive-epistemic, concurrence-seeking epistemic, competitive-relational, and protective-relational regulations, would represent empirically distinct constructs, in a content-valid, reliable manner, even with the four revised items (see Table 3 for more details). I also hypothesized that the data fit the hypothesized four-factor model better than a series of alternative models.

Second, I examined the means and intercorrelations among socio-cognitive conflict regulation types. As in Pilot Study, I also compared observed means by condition at a descriptive level. For the intercorrelations, I particularly focused on whether (a) competitive-relational regulation was still negatively correlated with protective-relational regulations, (b) constructive-epistemic regulation was still negatively correlated with competitive-relational regulations, and (c) concurrence-seeking epistemic regulation was still positively correlated with both constructive-epistemic and protective-relational regulations.

Third, I examined correlations between socio-cognitive conflict regulation types and their expected antecedents including competence, competence threat, and perceptions of social interdependence. I set the same hypotheses as those in Pilot Study, except for the correlations between protective-relational regulation and competitive and individualistic perceptions. As found in Pilot Study, I hypothesized that protective-relational regulation would be negatively

correlated with competitive perceptions, but positively correlated with individualistic perceptions.

I additionally examined correlations between socio-cognitive conflict regulation types and achievement goals and critical reasoning. Based on prior research on achievement goals as antecedents of socio-cognitive conflict regulation, I hypothesized that constructive-epistemic regulation would be more positively correlated with mastery-approach goals (Darnon et al., 2006) than other regulation types, whereas competitive-relational regulation would be more positively correlated with performance-approach goals and protective-relational regulation would be more positively correlated with performance-avoidance goals (Sommet et al., 2014, 2015) than other types of regulation. Mastery-approach goals favor a task focus, which is related to constructive-epistemic regulation that leads one to focus on how one's point of view can complement one's own understanding. In contrast, performance-approach goals favor a focus on social comparison, which is related to competitive-relational regulation that leads one to focus on demonstrating that they are right and that others are wrong. Performance-avoidance goals also favor a focus on social comparison, but they focus more on avoiding showing incompetence, which is related to protective-relational regulation that leads one to focus on protecting oneself by avoiding showing one's thinking and disengaging from the discussion/debate.

It has not been examined how mastery-avoidance goals and work-avoidance goals are correlated with socio-cognitive conflict regulation. Mastery-avoidance goals focus on avoiding not learning as much as possible (Elliot & McGregor, 2001), and they include epistemic concerns but being worried about losing what one already has. Considering that mastery-avoidance goals concern about learning, these goals would be positively correlated with constructive-epistemic regulation and concurrence-seeking epistemic regulation. Considering

that these goals are related to worries and passive attitudes, it may also be possible to relate to submissive regulation types, including concurrence-seeking epistemic and protective-relational regulations. However, the hypotheses regarding correlations between mastery-avoidance goals and regulation types are tentative, as mastery-avoidance goals involve somewhat mixed nature of motivation for learning or multifaceted definition of the construct (Madjar, Kaplan, & Weinstock, 2011).

I hypothesized that protective-relational regulation, compared to other types of regulation, would be more positively correlated with work-avoidance goals that focus on reducing the amount of effort into the task (Harackiewicz, Durik, Barron, Linnenbrink-Garcia, & Tauer, 2008; Nicholls, Cheung, Lauer, & Patashnick, 1989; Skaalvik, 1997). The nature of protective-relational regulation is withdrawing one's opinion and disengaging from the confrontation, which is in line with what work-avoidance goals aim—engaging in the task at the minimum level.

Lastly, I hypothesized that critical reasoning as a consequence of conflict regulation would also be differentially correlated with different types of conflict regulation. I expected constructive-epistemic regulation to be most strongly positively correlated with critical reasoning, because constructive-epistemic regulation focuses on the validity of the answer by considering different points of view. I also expected concurrence-seeking epistemic regulation to be positively correlated with critical reasoning because this type of regulation also concerns about epistemic issue, but this positive correlation would be weaker than that between constructive-epistemic regulation and critical reasoning. I expected protective-relational regulation to be negatively correlated with critical reasoning, because this type of regulation does not care about confrontation and tends to ignore the discussion/debate to protect one's self-

esteem; thus, the focus of this type of regulation is one's competence relative to others, not the task itself. The most unclear hypothesis is the correlation between competitive-relational regulation and critical reasoning, in that one might tend to think critically to argue that one is right and others are wrong, but at the same time, one might tend to just resist others' views without critical thinking and focus only on winning the argument. Thus, both positive and negative correlations with critical reasoning are expected, and I examined which hypothesis would be supported.

RQ 1-2: Is the four-factor model of socio-cognitive conflict regulation items invariant across students' gender and ethnicity?

Motivational or behavioral patterns in social contexts, such as socio-cognitive conflict regulation, can be different as a function of individuals' gender or ethnicity due to their past experiences related to their gender or ethnicity. For the same reason, conflict regulation researchers have controlled for gender effects in various ways, by including a control variable of gender in statistical models (e.g., Sommet et al., 2014), recruiting only female participants (e.g., Buchs & Butera, 2009), or pairing each participant with a same-sex partner only (Buchs et al., 2010). This suggests that it is also important to confirm that individuals conceptually understand the items of socio-cognitive conflict regulation in the same way across their gender or ethnicity. From a measurement perspective, different understandings of the same items by different groups of people are, of course, a problem. If a scale measures different contents depending on individuals, it is hard to ensure the validity of the measure. Tests of measurement invariance help confirm that the items measure the same contents based on individuals' identical understanding of the items across different groups of people, such as different gender or ethnic groups. In addition, tests of structural invariance through tests concerning the latent variables themselves,

such as differences in factor variances and covariances, provide more rigorous support for measurement invariance (Vandenberg & Lance, 2000).

I hypothesized that the measure of four types of socio-cognitive conflict regulation would be invariant across gender (i.e., male vs. female) and ethnicity (i.e., minority vs. non-minority [Whites]). In other words, measurement and structural invariance of the four-factor model would be ensured through equivalent patterns of fixed and free factor loadings, equivalent factor loadings, equivalent item intercepts, equivalent error variances, and equivalent variances and covariances across different gender or ethnicity groups.

RQ 1-3: How do a variety of outcomes differ among four different conditions depending on the perceptions of competence and social interdependence?

I compared different outcomes by four experimental conditions. I first ensured that each condition shows expected perceptions of competence (high vs. low) and social interdependence (positive vs. negative) corresponding to the manipulation. For competence-related variables (perceived competence, competence threat), social interdependence, and socio-cognitive conflict regulation, I set the same hypotheses as those in the pilot study (i.e., Pilot RQ 2) with particular focuses on whether (a) the effect of social interdependence on competence-related variables was still non-significant, (b) the interactive effects of competence and social interdependence on individualistic perceptions were still non-significant, and (c) the interactive effects of competence and social interdependence on concurrence-seeking epistemic and protective-relational regulations were still non-significant. In Study 1, I set additional hypotheses regarding achievement goals and critical reasoning.

Achievement goals. Five types of achievement goals were examined as a function of competence and social interdependence: mastery-approach goals, mastery-avoidance goals,

performance-approach goals, performance-avoidance goals, and work-avoidance goals. First, I hypothesized that there would be the effects of competence level on the different types of achievement goals. Specifically, I hypothesized that mastery-approach and performance-approach goals would be higher in Conditions 1 and 3 (i.e., high-competence conditions) than Conditions 2 and 4 (i.e., low-competence conditions), whereas I hypothesized that mastery-avoidance, performance-avoidance, and work-avoidance goals would be higher in Conditions 2 and 4 than Conditions 1 and 3. When participants are competent, they may tend to perceive tasks as a challenge and display more approach strategies (Cohen & Lazarus, 1979), so they would tend to aim to master the tasks (mastery-approach goals) or show their competence to others (performance-approach goals). In contrast, when participants are incompetent, they may tend to perceive tasks as a threat and display more avoidance strategies (Cohen & Lazarus, 1979), so they would tend to aim to avoid losing their skills or not learning as much as possible (mastery-avoidance goals), avoid showing their incompetence to others (performance-avoidance goals), or avoid putting in effort to do well (work-avoidance goals).

Second, I hypothesized that there would also be the effect of social interdependence on achievement goals based on prior research on the relations between goal structures in the classrooms and personal achievement goal orientations (e.g., Ames, 1992; Hänze & Berger, 2007; Nichols & Miller, 1994; Rogat, Linnenbrink-Garcia, & DiDonato, 2013; Summers & Svinicki, 2007). Specifically, I hypothesized that mastery-approach goals would be higher in Conditions 1 and 2 (i.e., positive-interdependence conditions) than Conditions 3 and 4 (i.e., negative-interdependence conditions), because cooperative goal structures promote cognitive activities such as question-taking, knowledge-checking, and explaining (Johnson & Johnson, 1989, 2005a; Webb, 1982), which are also expected learning behaviors for individuals with high

mastery-approach goals. In contrast, I hypothesized that performance-approach and performance-avoidance goals would be higher in Conditions 3 and 4 than Conditions 1 and 2, because competitive goal structures may lead participants to focus on social comparison—outperforming others or avoiding looking incompetent to others—which is in line with performance goals. Indeed, one recent study examining the relations between individuals' perceptions of social interdependence and achievement goals showed that college students' cooperative perceptions positively predicted mastery-approach goals, whereas competitive perceptions positively predicted performance-approach and performance-avoidance goals (Elliot et al., 2016). Conceptually, it is hard to set clear hypotheses regarding the relations of cooperative and competitive perceptions to mastery-avoidance and work-avoidance goals. Mastery-avoidance goals might rather be positively associated with individualistic perceptions. An individualistic attitude represents a valuing of and a liking of working alone, which may lead to preference of working and thinking independently and tendency toward self-criticism. As such, high individualistic perceptions may positively predict mastery goals, both mastery-approach and mastery-avoidance goals (Elliot et al., 2016). Thus, I did not set specific hypotheses regarding mastery-avoidance goals and work-avoidance goals, as it is not necessarily directly associated with cooperative or competitive perceptions.

Lastly, I hypothesized that there would be interactive effects of competence and social interdependence on at least some of achievement goal types. When participants are competent, they may be more likely to endorse mastery-approach goals under positive-interdependence condition than under negative-interdependence condition. When competent participants are under negative-interdependence condition, they may tend to focus more on demonstrating their competence to others. Hence, there would be a larger difference in mastery-approach goals

between positive-interdependence and negative-interdependence conditions when participants are competent than when participants are not competent. For the same reason, I also expected that there would be the interactive effect on performance-approach goals. Specifically, when participants are competent, they may be more likely to endorse performance-approach goals under negative-interdependence condition than positive-interdependence condition, and this difference would be larger than that when participants are incompetent.

In addition, I hypothesized that there would be the interactive effect on performance-avoidance goals. Specifically, when participants are incompetent, they may be more likely to endorse performance-avoidance goals under negative-interdependence condition than positive-interdependence condition. However, under negative-interdependence condition, competent participants may also endorse performance-avoidance goals because it may be important not to show one's incompetence to others when competing with others regardless of one's competence level. Under positive-interdependence conditions, however, competent participants would be less likely to endorse performance-avoidance goals, whereas if they are not competent, their concern about relative competence could still exist, which might lead to performance-avoidance goals. Therefore, I expected that under negative-interdependence conditions, incompetent participants' performance-avoidance goals would be higher than competent participants,' but their difference would not be large, or their performance-avoidance goals are similarly high. Under positive-interdependence conditions, incompetent participants' performance-avoidance goals would also be higher than competent participants,' but their difference would be larger than that under negative-interdependence conditions.

I did not set specific interaction hypotheses regarding mastery-avoidance goals and work-avoidance goals, because competence level would be a stronger factor influencing these goal types than social interdependence.

Critical reasoning. I first hypothesized that there would be the effect of competence on critical reasoning. Specifically, I expected competent participants to think more critically than incompetent participants, and thus critical reasoning would be higher in Conditions 1 and 3 (i.e., high-competence conditions) than Conditions 2 and 4 (i.e., low-competence conditions). Second, I hypothesized that there would be the effect of social interdependence on critical reasoning. Specifically, I expected participants under cooperative conditions to think more critically than those under competitive conditions, because one may tend to engage in promotive interactions such as effective communication, constructive management of conflict, and higher-level reasoning when goals are structured cooperatively (Johnson & Johnson, 1989, 2005a). Past meta-analysis studies have also found that positive interdependence promotes higher academic achievement than did negative and no interdependence (Johnson et al., 2004; Qin et al., 1995; Roseth, Johnson & Johnson, 2008; Stanne et al., 1999), suggesting cooperative contexts may increase critical reasoning.

Finally, I hypothesized that there would also be an interactive effect of competence and social interdependence on critical reasoning. Specifically, I expected that the difference in the level of critical reasoning between positive-interdependence and negative-interdependence conditions would be larger when participants are competent than that when they are incompetent. When participants are competent, they would show higher critical reasoning under positive-interdependence condition, whereas they would focus more on winning others rather than reasoning processes under negative-interdependence condition, and such tendencies may be

more salient when participants are competent than when they are incompetent. Thus, I hypothesized that there would be a larger difference in critical reasoning between positive-interdependence and negative-interdependence conditions when participants are competent than that when participants are incompetent.

Study 2

The main purpose of Study 2 is to examine the relations among students' socio-cognitive conflict regulations and their antecedent and consequence variables that are assessed in a real classroom setting. To this end, college students self-reported their experiences in an anatomy course where students participated in small-group discussion throughout an entire semester. As an extension of Study 1, I aimed to provide additional empirical evidence of the internal structure of socio-cognitive conflict regulation in anatomy laboratories as part of an undergraduate course (RQ 2-1; replication of RQ 1-1) and measurement invariance of the four-factor model of conflict regulation across different student groups in terms of gender (male vs. female), ethnicity (minority vs. non-minority), and prior course experience (first-taking vs. re-taking; RQ 2-2; replication of RQ 1-2). Lastly, I examined structural relations of socio-cognitive conflict regulation to its antecedents and consequences (RQ 2-3).

RQ 2-1 (replication of RQ 1-1): Does the 2 × 2 model consisting of constructive-epistemic, concurrence-seeking epistemic, competitive-relational, and protective-relational regulation subscales fit the data well?

I pursued the same three objectives as those in Study 1 for this research question. First, I sought to replicate the factor structure of socio-cognitive conflict regulation, so I set the same hypothesis (i.e., RQ 1-1) that the four factors would represent empirically distinct constructs, in a

content-valid, reliable manner, even with the two revised items (see Table 3 for more details). I also hypothesized that the data fit the hypothesized four-factor model better than a series of alternative models.

Second, I examined the means and intercorrelations among socio-cognitive conflict regulation types, and focused on whether the patterns of descriptive statistics in a real classroom were similar to those in the experimental study (i.e., Study 1). I also focused on whether the correlation between competitive-relational and protective-relational regulations was negative or non-significant.

Third, I examined intercorrelations among the four types of socio-cognitive conflict regulation types and correlations between these regulation types and their expected antecedents and consequences. I set the same hypotheses as those in Study 1 for the same variables, with particular focuses on the correlations (a) between competitive-relational and protective-relational regulations (negative or non-significant?), (b) between competitive/individualistic perceptions and protective-relational regulation, and (c) between perceptions of social interdependence and different types of achievement goals (consistent with Study 1's findings and/or Elliot et al.'s [2016] findings?).

I additionally aimed to examine correlations between socio-cognitive conflict regulation types and interpersonal goals and behavioral engagement and disengagement. First, different types of interpersonal goals (Dryer, Horowitz, 1997; Ojanen et al., 2005) are generated on the basis of different social motives or needs based on the dimensions of agency (agency vs. submission) and communality (communality vs. separation)[2]. I hypothesized that friendly goals (agency and communality; feeling closeness to the others and supporting others' goals) would be

[2] However, the hypotheses regarding the correlations between socio-cognitive conflict regulation types and interpersonal goals could not be tested in this study, due to the low reliabilities for each type of interpersonal goals.

positively correlated with the regulation types that are expected to emerge from cooperative perceptions (constructive-epistemic, concurrence-seeking epistemic), with a stronger correlation with constructive-epistemic regulation. Instead, I hypothesized that concurrence-seeking epistemic regulation would be more strongly positively correlated with friendly submissive goals (submission and communality; seeking others' approval by complying with their opinions). In contrast, friendly goals would be negatively correlated with the regulation types that are expected to emerge from competitive perceptions (competitive- and protective-relational).

I hypothesized that dominant goals (agency, separation; being in control, having no interest in others' opinions) would be positively correlated with the regulation types that are expected to emerge from competitive perceptions (competitive-relational, protective-relational), with a stronger correlation with competitive-relational regulation. Instead, I hypothesized that protective-relational regulation would be more strongly positively correlated with hostile submissive goals (submission and separation; avoiding social embarrassment). In contrast, dominant goals would be negatively correlated with the regulation types that are expected to emerge from cooperative perceptions (constructive-epistemic, concurrence-seeking epistemic).

Second, I hypothesized that behavioral engagement and disengagement as consequences of socio-cognitive conflict regulation would also be differentially correlated with different regulating types. Prior literature has consistently suggested that constructive-epistemic regulation is the most ideal type of socio-cognitive conflict regulation for learning, because individuals with constructive-epistemic regulation tend to consider the validity of each other's answers and integrate their different views to better understand the task, which in turn leads to cognitive progress (Buchs et al., 2004). Thus, I hypothesized that constructive-epistemic regulation would be most strongly positively correlated with behavioral engagement and negatively correlated

with behavioral disengagement. Next, I hypothesized that protective-relational regulation would be negatively correlated with behavioral engagement and positively correlated with behavioral disengagement, because protective-relational regulation would be more related to avoidance of the discussion (or debate) due to low motivation for social relationship as well as to low perceived competence. The hypotheses regarding competitive-relational and concurrence-seeking epistemic regulations are relatively unclear. For competitive-relational regulation, it may be weakly but still positively correlated with behavioral engagement, because it would lead to more involvement in discussion (or debate) to win others. For concurrence-seeking epistemic regulation, its avoidance-based motivation would lead to a negative correlation with behavioral engagement. However, it is also possible that participating in the discussion to show agreement with others would lead to a positive correlation with behavioral engagement. Thus, I set the hypotheses regarding competitive-relational and concurrence-seeking epistemic regulations temporarily, and aimed to document their correlations from the current findings.

RQ 2-2 (replication of RQ 1-2): Is the four-factor model of socio-cognitive conflict regulation items invariant across students' gender, ethnicity, and prior course experience?

I set the same hypotheses regarding the measurement and structural invariance of socio-cognitive conflict regulation items across gender and ethnicity as RQ 1-2. While replicating the measurement and structural invariance across gender and ethnicity, I also aimed to provide additional evidence of measurement and structural invariance across students with prior experience with the same course (re-taking) and those without prior experience (first-taking). Whether or not students have prior anatomy course experiences may influence the level of students' perceived competence. In fact, when conflict regulation researchers examine students' socio-cognitive conflict regulation, they have used the tasks that were not familiar to all

participants (e.g., reading materials that were not covered in any courses in their department) to control for participants' entering competence (e.g., Buchs & Butera, 2009; Buchs et al., 2010). The expected differences in socio-cognitive conflict regulation depending on students' prior experience with the course suggests that, from a measurement perspective, it is important to ensure that such differences are not originated from students' understanding inconsistencies depending on their prior course experience. Especially, the anatomy course where I collected data has been considered hard for students to pass with attainment of high grade, and there have consistently been a certain portion of students (21% of students on average for the last three semesters) who re-take the course. In the semester when I collected the data, there were 17% of students who re-took the course.

I hypothesized that the measure of four types of socio-cognitive conflict regulation would be invariant regardless of whether students took the same course before or not as well as their gender (i.e., male vs. female) and ethnicity (i.e., minority vs. non-minority [Whites]). In other words, measurement invariance of the four-factor model would be ensured through equivalent patterns of fixed and free factor loadings, equivalent factor loadings, equivalent item intercepts, equivalent error variances, and equivalent variances and covariances across different groups of students in terms of gender, ethnicity, and prior course experience (Vandenberg & Lance, 2000).

RQ 2-3: What are the structural relations among socio-cognitive conflict regulation and its antecedents and consequences?

As the last research question, I examined structural relations including different socio-cognitive conflict regulation types and their antecedents or consequences. I examined how different antecedents (perceived competence, cooperative and competitive perceptions, achievement goals) predicted different types of socio-cognitive conflict regulation, and how

different regulation types predicted different consequences (behavioral engagement and disengagement, critical reasoning).

Perceived competence and cooperative perceptions model. I examined how the latent main effects of perceived competence and cooperative perceptions and their latent interaction effect predicted the four types of socio-cognitive conflict regulation. I set the same hypotheses as RQ 1-3, but focused more on the interactive effects on constructive-epistemic and concurrence-seeking epistemic regulations because cooperative perceptions are expected to be antecedents of these two types of regulations, as function of perceived competence level.

Perceived competence and competitive perceptions model. I examined how the latent main effects of perceived competence and competitive perceptions and their latent interaction effect predicted the four types of socio-cognitive conflict regulation. I set the same hypotheses as RQ 1-3, but focused more on the interactive effects on competitive-relational and protective-relational regulations because competitive perceptions are expected to be antecedents of these two types of regulations, as function of perceived competence level.

Achievement goals model. I examined how the latent factors of four achievement goal types predicted the latent factors of four conflict regulation types. I set the same hypotheses as those regarding the correlations between conflict regulations and achievement goals (RQ 1-1), but focused more on the unexpected correlation results in Study 1 (i.e., all positive correlations between performance-avoidance goals and four regulation types), in order to determine whether they also showed the similarly unexpected correlation patterns in the actual classroom setting.

Behavioral engagement and disengagement model[3]. I examined how the latent factors of four conflict regulation types predicted the latent factors of behavioral engagement and

[3] An alternative approach to testing the model of consequences of socio-cognitive conflict regulation is that all three consequence variables (i.e., behavioral engagement and disengagement, and critical

disengagement. I set the same hypotheses as those regarding the correlations between conflict regulations and behavioral engagement and disengagement (RQ 2-1).

Critical reasoning model. I examined how the latent factors of four conflict regulation types predicted the latent factor of critical reasoning. I set the same hypotheses as those regarding the correlations between conflict regulations and critical reasoning (RQ 1-3).

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reasoning) are included in in the same model. However, that model did not fit the data very well, $\chi^2(432) = 743.92$, $p < .001$, CFI = .82, TLI = .79, RMSEA = .06, SRMR = .08, which might be due to the small sample size compared to the large number of latent variables in the model.

CHAPTER 4:

Pilot Study

The first aim of Pilot Study is to ensure that the internal structure of the construct, socio-cognitive conflict regulation, consists of four different regulation types (Pilot RQ 1). The second aim is to investigate how socio-cognitive conflict regulation differs by the four different experimental conditions (Pilot RQ 2) as well as to ensure the manipulations through experimental vignette methodology work before Study 1.

Method

The Pilot study was a two-by-two factorial design using experimental vignette methodology. The sponsoring university's Institutional Review Board (IRB No. x16-1282e) approved all study procedures.

Participants

Recruitment and eligibility. I recruited participants through Amazon's Mechanical Turk (MTurk), an Internet marketplace where employers post "Human Intelligence Tasks" (HITs) for paid workers to complete (Casler, Bickel, & Hackett, 2013). MTurk is a relatively new data collection method with characteristics of (a) an integrated participant compensation system; (b) a large participant pool; and (c) a streamlined process of study design, participant recruitment, and data collection (Buhrmester, Kwang, & Gosling, 2011). Recently, there has been some discussion on the utility of MTurk in psychology and other social sciences because it has potential to obtain high-quality data inexpensively and rapidly with the data obtained as reliable as those obtained via traditional methods (Buhrmester et al., 2011).

For Pilot Study, participants were recruited with a HIT posted on MTurk with an aim of collecting 200 eligible participants.

Using G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009), I estimated a priori the sample size assuming medium effect size ($\eta_p^2 = .06$ for a multivariate analysis of variance; Cohen, 1988) as minimum detectable effect size (MDES; Bloom, 1995). Assuming 80% power and $\alpha = .05$ for MANOVA, a sample size of 130 is needed to detect the main effects. This suggests that the sample sizes of $N = 200$ for Pilot Study would be sufficient to achieve power of 0.80 with $\alpha = .05$ and effect size of 0.06.

Eligibility criteria included the signed consent of Americans who (a) completed high-school-level education (including a GED) as the highest level, (b) are currently pursuing a post-secondary degree (e.g., B.A., B.S., etc.), (c) enrolled in school this semester, and (d) is between 18 and 25 years old. Exclusion criteria included people who failed to answer manipulation-check questions correctly or whose answers were considered insincere (e.g., all answers are the same).

Demographics. Table 4 presents participants' demographic information by condition. For the entire sample, the vast majority was European American or White (*n* = 139, 69) and used English as their native language (*n* = 199, 99%). There were more males (*n* = 116, 58%) than females (*n* = 85, 42%).

Procedure

Pilot Study was conducted in December of 2016. I posted my study advertisement on Amazon's MTurk to invite people to participate in an on-line research study where participants would be asked to read a short story and take a survey regarding their thoughts and feelings about it. Participants were paid for their participation ($2) within five days. It took about 8.5 hours for the data collection.

Participants were invited to click the survey link that was generated in Qualtrics, a research software for online data collection. They were first asked to answer five eligibility questions including their nationality, the highest education level completed, the current school level, the current college enrollment status, and age (see Appendix C for the specific questions). If all their answers met the eligibility criteria, they were asked to review a consent form and decide whether they agree to participate in this study by clicking an "I agree" button and typing their initials. If their answers did not meet the eligibility criteria, the task ended immediately, and they were not paid. They were informed why they are not eligible for this study.

After participants provided electronic assent, they were randomly assigned to one of the four experimental conditions according to the level of perceived competence (high vs. low) and social interdependence (positive vs. negative): (a) high competence—positive interdependence (Condition 1); (b) low competence—positive interdependence (Condition 2); (c) high competence—negative interdependence (Condition 3); and (d) low competence—negative interdependence (Condition 4). Accordingly, participants read one of four vignettes corresponding to their condition for manipulation (see Manipulation section), and they then answered three short questions for manipulation check. If their answers were not correct, the task ended immediately, and they were not paid. If they answered correctly, participants were asked to answer survey questions regarding variables of interest (see Measures section), while imagining how they would feel about the situation described in the vignette. At last, there were several demographic questions (see Appendix C for the specific questions). When they were finished, a random code was assigned to each of participant, and they were compensated if they entered it into the given box at the end of the survey. The average time for the survey completion was 9 minutes and 27 seconds.

Randomization. Participants were randomly assigned to one of the four experimental conditions. Supporting the efficacy of the randomization process, I found no evidence of differences in participants' demographic information but gender. Among the four conditions, there were no significant differences in ethnicity, $\chi^2(15, N = 200) = 12.95$, $p = .61$, age, $F(3, 197) = 0.13$, $p = .94$, first language (i.e., English vs. non-English), $\chi^2(3, N = 201) = 6.10$, $p = .11$, and current GPA, $F(3, 191) = 0.34$, $p = .80$. However, there was a significant difference in gender $\chi^2(3, N = 201) = 7.89$, $p = .05$. Save the gender result, the results strengthen confidence that any differences in dependent variables cannot be attributed to the participants' pre-existing demographic characteristics or their GPA. I also conducted MANCOVAs on social interdependence and socio-cognitive conflict regulation twice, with and without gender as a covariate (I conducted the MANCOVA on competence with gender as a covariate only due to its significance). I found that the significance patterns were the same, so I report the results without gender only for these analyses.

Manipulation. Participants were asked to read one of the four vignettes describing Alex, an employee in a large electronics company, as if they were Alex. All four vignettes described a situation where Alex is working with the other employee who disagrees with Alex. In the vignette below, the phrases in boldface reflect the manipulation for high level of perceived competence (1a), positive interdependence (2a), and perceived conflict (3). Accordingly, the following vignette is the manipulation example for the high competence—positive interdependence condition (Condition 1):

> As you might have heard, a large electronics company recently stopped selling its top-of-the-line smartphone because it was catching fire. In response, the company assigned employees to small groups to figure out why this happened.

To begin their work, one group leader asked each member to share their ideas. (1a, 3) Alex **Star** went first and blamed **the battery** for the fire, and the other employee went second and blamed the phones' **graphic interface**.

(2a) Given their different point of view, the group leader asked Alex and the other employee to **integrate** their positions in order to identify **a mutually agreeable** explanation of why the phones caught fire. Importantly, **Alex and the other employee would both need to be able to justify their final position** because **the group leader would randomly ask one of them to explain it** to the company's president.

(1a) **Fortunately**, Alex was **certain** about how to (2a) **cooperate** with the other employee because he/she (1a) **knew** a lot about smartphones. In fact, Alex felt **competent** because he/she **had very good reasons for why he/she thought the battery caused the phones to catch fire**.

Next, in the vignette below, the phrases in boldface reflect the manipulation for low level of perceived competence (1b), negative interdependence (2b), and perceived conflict (3). Accordingly, the following vignette is the manipulation example for the low competence—negative interdependence condition (Condition 4):

As you might have heard, a large electronics company recently stopped selling its top-of-the-line smartphone because it was catching fire. In response, the company assigned employees to small groups to figure out why this happened.

To begin their work, one group leader asked each member to share their ideas. (1b, 3) Alex **New** went first and blamed the phones' **graphic interface** for the fire, and the other employee went second and blamed **the battery**.

(2b) Given their different point of view, the group leader asked Alex and the other employee to **debate** their positions in order to identify the **best** explanation of why the phones caught fire. Importantly, **whoever won the debate would then present their explanation** to the company's president.

(1b) **Unfortunately,** Alex was **uncertain** about how to (2b) **compete** with the other employee because he/she (1b) **didn't know** a lot about smartphones. In fact, Alex felt **incompetent** because he/she **had just made up his/her idea about the graphic interface causing the phones**.

For the low competence—positive interdependence condition (Condition 2), I used (1b), (2a), and (3) phrases for manipulation, and for the high competence—negative interdependence condition (Condition 3), I used (1a), (2b), and (3) phrases for manipulation.

Measures

Participants responded to the survey after reading one of the four vignettes. The survey included manipulation-checking questions and questions about two competence-related variables (perceived competence, competence threat), social interdependence, and socio-cognitive conflict regulation. Save manipulation-checking questions, all variables were based on scale items ranging from *not at all* (1) to *very much so* (5). Items were modified according to the purpose of this study, and all of the items are presented in Appendix C.

Manipulation check. The purpose of manipulation-checking questions is to check whether participants read the given scenario carefully, so their perceptions of conflict (i.e., the existence of disagreements; "In the story, did the other employee agree with Alex about why the phones were catching fire?"), competence (i.e., competent vs. incompetent; "Did Alex feel competent?"), and social interdependence (i.e., cooperative goal vs. competitive goal; "What was the goal of Alex's work with the other employee?") were accordingly manipulated. A single item was used for each perception, and all of the items were easy enough so long as participants read the scenario and follow the instruction. If they did not get all the three questions correct, they were not be able to continue to take the survey.

Perceived competence. Perceived competence was assessed following Darnon et al.'s (2006) procedure. There were three items (α = .89), and they asked how much individuals would understand the problem and be competent about it.

Competence threat. Competence threat was assessed following Buchs et al.'s (2004) procedure. There were three items (α = .76), and they asked how much individuals would be worried or anxious about the other employee's competence or performance.

Social interdependence. Perceptions of social interdependence were assessed with the Social Interdependence Scale (Johnson & Norem-Hebeisen, 1977): cooperation (α = .75), competition (α = .84), and individualism (α = .79). There were five items for each subscale, including two-reversed cooperation items for individualism, and all items asked about individuals' attitudes toward interdependence with the other employee.

Socio-cognitive conflict regulation. Socio-cognitive conflict regulation was assessed with the new measure developed for this study. The new measure included all original items with some changes for constructive-epistemic and competitive-relational regulations developed by Darnon et al. (2006). Table 5 presents how each original item has been revised. For constructive-epistemic regulation, I revised one of three original items based on the idea that all the items should measure one's regulating *behavior* that is disentangled from motivation (see The Present Study for more details): I revised the original item (Epistemic 1 in Table 5), "(to what extent did you) try to think about the text again in order to understand better" to "I thought about what I would learn from other students' ideas." I also revised the other two original items to make them more succinct (Epistemic 2 in Table 5) or reflect on the context of study more accurately (Epistemic 3 in Table 5; from "*both* points of view" to "*multiple* points of view" due to the context of small group activities in the present study), but what the original items ask is remained the same in the revised items. For competitive-relational regulation, I made slight changes in the original three items to more clarify the question (Competitive 2 in Table 5) or reflect on the context of study more accurately (all three items in Table 5; from "he (she)" to "other students").

And, I created additional three items for each constructive-epistemic and competitive-relational regulation, resulting in six items for each subscale.

However, the items for protective-relational regulation originally developed by Sommet et al. (2014, 2015) was considerably revised, because what the original items measure (i.e., thinking others' answers are more correct, complying/agreeing with others' opinion) is conflated with the concept of concurrence-seeking epistemic regulation. When one is incompetent about the task, he or she may think other's answer is more correct (the original item; Protective 1 in Table 5), which may in turn lead to different submissive ways of conflict regulation (depending on the perception of social contexts). In the present study, I suggest these submissive regulating styles may be differentiated into protective-relational and concurrence-seeking epistemic regulations, but there is only one type of submissive regulation as a conflated form of two different submissive regulating styles in the original measure. Therefore, I created all six items each for protective-relational regulation as well as concurrence-seeking epistemic regulation. In sum, there were four different subscales with six items for each, resulting in 24 items in total. All items asked about individuals' regulating behaviors when they are working with the other employee and disagreements occur.

Data Analyses

Exploratory factor analysis (EFA). I conducted EFAs on the 24 conflict regulation items via principal-components extraction with oblimin rotation.

Confirmatory factor analysis (CFA). I conducted a CFA on the conflict regulation items, and the solution was generated on the basis of maximum-likelihood estimation using the lavaan package (Rosseel, 2012) in R. All conflict regulation items were loaded onto each latent factor of conflict regulation. To identify the model, the variance of each latent factor was fixed to

1 (Bollen, 1989). As recommended by Hoyle and Panter (1995), I used several different indices to evaluate the fit of the model to the data (Browne & Cudeck, 1993), including the comparative fit index (CFI; value ≥ .90), Tucker-Lewis Index (TLI; value ≥ .90), root-mean-square error of approximation (RMSEA; value ≤ .08), and standardized root mean square residual (SRMR; value ≤ .08). I also checked whether all standardized factor loadings were within an acceptable range (values > .50). Furthermore, I conducted additional CFAs to compare the fit of the hypothesized model with a series of alternative models, in order to ensure that the hypothesized model provides a better fit than other alternative models, following the procedures of Elliot and his colleagues' work on the validation of new measures (Elliot & McGregor, 2001; Elliot et al., 2011).

Multivariate analysis of covariance (MANCOVA). I conducted 2 (perceived competence: high, low) × 2 (social interdependence: positive, negative) MANCOVAs to analyze main and interactive effects on different outcomes twice for each analysis: (a) with all covariates including gender, ethnicity, first language, and GPA; and (b) with only significant covariates. I report only the results with significant covariates for each analysis.

Results

Participant Flow and Missing Data

A total of 2,261 people attempted to participate in this study through MTurk, and answered questions asking their eligibility (i.e., nationality, the highest education level completed, the current school level, the current college enrollment status, and age). Of the 2,261 people, 201 (8.9%) were eligible and all of them agreed to participate in the study. Missing data proportions were minimal, ranging between 0 and 1.5% across all items. Little's MCAR test

(Little & Rubin, 2002), $\chi^2(513) = 672.70$, $p < .001$, was statistically significant. However, a missing data proportion of less than about 5% is likely to be inconsequential for biases and loss of power, allowing for the use of listwise deletion (Allison, 2001; Graham, 2009). Grubbs' test (Grubbs, 1969) showed that there was no univariate outlier in each condition using a $p < .01$.

Pilot RQ 1: Does the 2 × 2 model consisting of constructive-epistemic, concurrence-seeking epistemic, competitive-relational, and protective-relational regulation subscales fit the data well?

Exploratory factor analyses (EFAs). As presented in Table 6, EFAs revealed the expected four-factor structure, and I found four problematic items. First, one of the concurrence-seeking epistemic regulation items (i.e., "I would support the other employee's opinion.") was loaded more onto the factor of constructive-epistemic regulation ($\lambda = .30$ for concurrence-seeking epistemic; $\lambda = .47$ for constructive epistemic). Second, one of the protective-relational items (i.e., "I would disengage from any discussion of our ideas.") was cross-loaded onto both protective-relational and concurrence-seeking epistemic regulations ($\lambda = .36$ for concurrence-seeking epistemic; $\lambda = -.41$ for protective relational). The other two items were less problematic, but their factor loadings for the corresponding factor were relatively small. Specifically, one of the concurrence-seeking epistemic regulation items (i.e., "I would easily align my thinking with the other employee's point of view without experiencing any contradiction.") showed only .34 of loading for the corresponding factor, and one of the protective-relational regulation items (i.e., "I would withhold my idea despite thinking it still has merit.") showed only -.43 of loading for the corresponding factor, although these items showed the largest factor loadings onto each corresponding factor.

Accordingly, these four items were excluded from the following analyses (and these four items were re-written in Study 1), and Table 7 shows the final EFA results without the item. Again, the analysis revealed the expected four-factor structure, and each factor comprised the expected regulation items. Factor 1 accounted for 27.7% of the variance and comprised the six competitive-relational regulation items (eigenvalue = 5.54). Factor 2 accounted for 18.9% of the variance and comprised the six constructive-epistemic regulation items (eigenvalue = 3.78). Factor 3 accounted for 12.3% of the variance and comprised the four protective-relational regulation items (eigenvalue = 2.47). Factor 4 accounted for 6.3% of the variance and comprised the four concurrence-seeking epistemic regulation items (eigenvalue = 1.26). All items loaded above .53 on their primary factor; none of the secondary loadings exceeded .21.

Confirmatory factor analyses (CFAs). I conducted a CFA on the hypothesized model where the 20 conflict regulation items were loaded on each latent factor of conflict regulation (see Figure 2 in Appendix B; all following figures are placed in Appendix B). The results supported the hypothesized model. Each fit statistic met the criteria for a good fitting model: χ^2 (164) = 320.25 $p < .001$, CFI = .92, TLI = .91, RMSEA = .07, SRMR = .07. Standardized factor loadings and residual variances of items are presented in Table 8, and all factor loadings were moderate to strong (ranging from .57 to .90).

I conducted additional analyses to compare the fit of the hypothesized model with a series of four alternative models: (a) a three-factor model A, in which the competitive-relational and protective-relational items load on their respective latent variables, and the constructive-epistemic and concurrence-seeking epistemic items load together on a third latent variable; (b) a three-factor model B, in which the constructive-epistemic and competitive-relational items load on their respective latent variables, and the concurrence-seeking epistemic and protective-

relational items on a third latent variable; (c) an epistemic-relational model in which the constructive-epistemic and concurrence-seeking epistemic items load together on one latent variable, and the competitive-relational and protective-relational items load together on another; and (d) an agentic[approach]-submissive[avoidance] model in which the constructive-epistemic and competitive-relational items load together on one latent variable, and the concurrence-seeking epistemic and protective-relational items load together on another. I used the chi-square difference test, the Akaike information criterion (AIC) and the adjusted Bayesian information criterion (BIC) to evaluate the relative fit of the 2 × 2 model with the alternative models (Kline, 2005). A chi-square difference value for an alternative model that is significantly larger than zero indicates that the alternative model provides a worse fit to the data than the hypothesized model; lower AIC and adjusted BIC values indicate better fit. As presented in Table 9, the results from these analyses indicated that none of the alternative models provided a good fit to the data, and the hypothesized model provided a better fit than any of the alternative models.

Descriptive statistics, internal consistencies, and intercorrelations. Table 10 presents the descriptive statistics by condition and across conditions for all variables including the conflict regulations. Across four conditions, the mean for constructive-epistemic regulation was highest, followed by competitive-relational regulation and concurrence-seeking epistemic regulation, and protective-relational regulation was lowest. Constructive-epistemic and competitive-relational regulations were higher than the scale midpoint (i.e., 3.0), but concurrence-seeking epistemic and protective-relational regulations were lower than the scale midpoint. For all types of regulation, the full range of scores was used (i.e., 1 to 5). Constructive-epistemic regulation was highest (M = 3.98, SD = 0.69) in the high competence—positive interdependence condition (Condition 1), concurrence-seeking epistemic regulation was highest

(*M* = 3.30, *SD* = 0.90) in the low competence—positive interdependence condition (Condition 2), and competitive-relational regulation was highest (*M* = 3.87, *SD* = 0.65) in the high competence—negative interdependence condition (Condition 3). Protective-relational regulation was highest (*M* = 3.00, *SD* = 0.80) in the low competence—positive interdependence condition (Condition 2), which was slightly higher than that in the low competence—negative interdependence condition (Condition 4; *M* = 2.93, *SD* = 0.97).

Each of the conflict regulations demonstrated a high level of reliability (ranging from .82 to .89). Table 11 presents internal consistencies and intercorrelations among all variables. Regarding the intercorrelations among the conflict regulation variables, all variables were significantly (*p*s < .05) or marginally significantly (*p*s < .10) correlated with each other. Specifically, constructive-epistemic regulation was positively correlated with concurrence-seeking epistemic regulation (*r* = .14), and negatively correlated with competitive-relational (*r* = -.14) and protective-relational (*r* = -.13) regulations. Concurrence-seeking epistemic regulation was negatively correlated with competitive-relational regulation (*r* = -.36), but positively correlated with protective-relational regulation (*r* = .47). Finally, competitive-relational regulation was negatively correlated with protective-relational regulation (*r* = -.24).

Regarding the correlations between competence-related variables and socio-cognitive conflict regulation types, perceived competence was positively correlated with constructive-epistemic regulation (*r* = .14) and competitive-relational regulation (*r* = .47), whereas perceived competence was negatively correlated with concurrence-seeking epistemic (*r* = -.38) and protective-relational regulations (*r* = -.57). Competence threat was positively correlated with concurrence-seeking epistemic (*r* = .17) and protective-relational (*r* = .45) regulations, whereas

competence threat was not significantly correlated with constructive-epistemic and competitive-relational regulations.

Regarding the correlations between social-interdependence variables and socio-cognitive conflict regulation types, cooperative perceptions were positively correlated with constructive-epistemic (r = .60) and concurrence-seeking epistemic (r = .17) regulations, whereas cooperative perceptions were negatively correlated with competitive-relational (r = -.19) and protective-relational (r = -.21) regulations. Competitive perceptions were negatively correlated with constructive-epistemic (r = -.16), concurrence-seeking epistemic (r = -.15) and, unexpectedly, protective-relational (r = -.18) regulations, whereas competitive perceptions were positively correlated with competitive-relational regulation (r = .78). Lastly, individualistic perceptions were negatively correlated with constructive-epistemic regulation (r = -.33), whereas individualistic perceptions were positively correlated with competitive-relational (r = .42) and protective-relational (r = .22) regulations.

Pilot RQ 2: How do a variety of outcomes differ between four different conditions depending on the perceptions of competence and social interdependence?

Before conducting multivariate analyses of covariance (MANCOVAs), I checked for multivariate outliers for each condition. There was no multivariate outlier for the two competence variables (i.e., perceived competence and competence threat) and the three types of social interdependence, but one multivariate outlier for the four types of socio-cognitive conflict regulation was identified with the use of Mahalanobis distance using a $p < .001$. This identified multivariate outlier was excluded for the following corresponding analysis. One of the Box's M tests showed significant results at $p < .001$ (i.e., socio-cognitive conflict regulation), but the cell sizes for the current study are considerably even, which may lead to robustness to the violation

of the homogeneity of variance-covariance matrix assumption (R. A. Johnson & Wichern, 1998; Tabachnick & Fidell, 2013). All MANOVAs or MANCOVAs results are summarized in Table 12.

Manipulation check. I conducted a *t*-test for the manipulation of perceived competence, and the result revealed that the high-competence conditions (Condition 1, 3; $M = 4.24$, $SD = 0.65$) showed significantly higher perceived competence than the low-competence conditions (Condition 2, 4; $M = 2.82$, $SD = 1.08$), $t(164.50) = 11.34$, $p < .001$, $|d| = 1.59$. For the manipulation of social interdependence, a MANOVA result showed a significant multivariate omnibus, Wilks' $\lambda = 0.85$, $F(2, 198) = 17.63$, $p < .001$, $\eta_p^2 = 0.15$. The between-subject tests were significant for cooperative perceptions, $F(1, 199) = 4.41$, $p = .04$, $\eta_p^2 = 0.02$, and competitive perceptions, $F(1, 199) = 33.11$, $p < .001$, $\eta_p^2 = 0.14$. Specifically, the positive-interdependence conditions (Condition 1, 2; $M = 3.64$, $SD = 0.71$) showed higher cooperative perceptions than the negative-interdependence conditions (Conditions 3, 4; $M = 3.42$, $SD = 0.78$), and the negative-interdependence conditions (Condition 3, 4; $M = 3.62$, $SD = 0.88$) showed higher competitive perceptions than the positive-interdependence conditions (Conditions 1, 2; $M = 2.91$, $SD = 0.87$). Results confirm the effectiveness of the manipulations for both perceived competence and social interdependence.

Competence. Model 1 revealed that only gender was a significant predictor among the covariates. In Model 2, controlling for the effect of gender, MANCOVA results showed a significant multivariate omnibus for competence only, Wilks' $\lambda = 0.61$, $F(2, 195) = 67.07$, $p < .001$, $\eta_p^2 = 0.39$. It did not show a significant multivariate omnibus for social interdependence, Wilks' $\lambda = 0.98$, $F(2, 195) = 2.11$, $p = .13$, $\eta_p^2 = 0.02$, and the competence × social interdependence interaction, Wilks' $\lambda = 0.98$, $F(2, 195) = 1.60$, $p = .20$, $\eta_p^2 = 0.02$.

The between-subject tests for competence were significant for perceived competence, $F(1, 196) = 124.58$, $p < .001$, $\eta_p^2 = 0.39$, and competence threat, $F(1, 196) = 14.29$, $p < .001$, $\eta_p^2 = 0.07$. Specifically, the high-competence conditions (Conditions 1, 3; $M = 4.24$, $SD = 0.65$) showed higher perceived competence than the low-competence conditions (Conditions 2, 4; $M = 2.82$, $SD = 1.08$), and the low-competence conditions (Conditions 2, 4; $M = 3.42$, $SD = 0.96$) showed higher competence threat than the high-competence conditions (Conditions 1, 3; $M = 2.93$, $SD = 1.04$).

Social interdependence. Model 1 revealed that only first language was a significant predictor among the covariates. In Model 2, controlling for the effect of first language, MANCOVA results showed a significant multivariate omnibus for competence, Wilks' $\lambda = 0.96$, $F(3, 194) = 3.08$, $p = .03$, $\eta_p^2 = 0.05$, social interdependence, Wilks' $\lambda = 0.84$, $F(3, 194) = 12.23$, $p < .001$, $\eta_p^2 = 0.16$, and the competence × social interdependence interaction, Wilks' $\lambda = 0.90$, $F(3, 194) = 7.19$, $p < .001$, $\eta_p^2 = 0.10$.

The between-subject tests for competence were not significant for cooperative perceptions, $F(1, 196) = 0.93$, $p = .34$, $\eta_p^2 = 0.01$, and individualistic perceptions, $F(1, 196) = 0.22$, $p = .64$, $\eta_p^2 = 0.001$, whereas they were significant for competitive perceptions, $F(1, 196) = 7.81$, $p = .006$, $\eta_p^2 = 0.04$. Specifically, the high-competence conditions (Conditions 1, 3; $M = 3.45$, $SD = 0.95$) showed higher competitive perceptions than the low-competence conditions (Conditions 2, 4; $M = 3.10$, $SD = 0.89$).

The between-subject tests for social interdependence were significant for cooperative perceptions, $F(1, 196) = 4.44$, $p = .04$, $\eta_p^2 = 0.02$, competitive perceptions, $F(1, 196) = 34.02$, $p < .001$, $\eta_p^2 = 0.15$, and individualistic perceptions, $F(1, 196) = 13.47$, $p < .001$, $\eta_p^2 = 0.06$. Specifically, the positive-interdependence conditions (Conditions 1, 2; $M = 3.64$, $SD = 0.71$)

showed higher cooperative perceptions than the negative-interdependence conditions (Conditions 3, 4; M = 3.42, SD = 0.78). In contrast, the negative-interdependence conditions (Condition 3, 4) showed higher competitive (M = 3.62, SD = 0.88) and individualistic (M = 3.05, SD = 0.74) perceptions than the positive-interdependence conditions (Conditions 1, 2; competitive: M = 2.91, SD = 0.87; individualistic: M = 2.64, SD = 0.87).

The between-subject tests for the competence × social interdependence interaction were marginally significant for cooperative perceptions, $F(1, 196) = 3.42$, $p = .07$, $\eta_p^2 = 0.02$, and they were significant for competitive perceptions, $F(1, 196) = 17.36$, $p < .001$, $\eta_p^2 = 0.08$. However, individualistic perceptions were not significant, $F(1, 196) = 2.55$, $p = .11$, $\eta_p^2 = 0.01$.

Specifically, within high-competence conditions, there were larger differences in cooperative and competitive perceptions between positive- and negative-interdependence conditions than those within low-competence conditions. Within high-competence conditions, cooperative perceptions were higher in the positive-interdependence condition (Condition 1; M = 3.80, SD = 0.69) than those in the negative-interdependence condition (Condition 3; M = 3.38, SD = 0.82), $t(98) = 2.74$, $p = .01$, $|d| = .55$, whereas within low-competence conditions, there was a very small difference in cooperative perceptions between positive-interdependence (Condition 2; M = 3.50, SD = 0.70) and negative-interdependence (Condition 4; M = 3.46, SD = 0.74) conditions, $t(99) = 0.24$, $p = .81$ (Figure 3). However, this result should be interpreted with caution as the between-subject test for the interaction was only marginally significant for cooperative perceptions.

Similarly, within high-competence conditions, competitive perceptions were higher in the negative-interdependence condition (Condition 3; M = 4.00, SD = 0.70) than those in the positive-interdependence condition (Condition 1; M = 2.83, SD = 0.81), $t(98) = 7.72$, $p < .001$, $|d|$

= 1.55, whereas within low-competence conditions, there was a smaller difference in competitive perceptions between positive-interdependence (Condition 2; *M* = 2.99, *SD* = 0.91) and negative-interdependence (Condition 4; *M* = 3.22, *SD* = 0.87) conditions, *t*(99) = 1.29, *p* = .20 (Figure 4).

Socio-cognitive conflict regulation. Excluding the one outlier, Model 1 revealed no significant covariate. In Model 2, MANOVA results showed a significant multivariate omnibus for competence, Wilks' $\lambda = 0.76$, $F(4, 193) = 15.62$, $p < .001$, $\eta_p^2 = 0.25$, social interdependence, Wilks' $\lambda = 0.84$, $F(4, 193) = 9.00$, $p < .001$, $\eta_p^2 = 0.16$, and the competence × social interdependence interaction, Wilks' $\lambda = 0.91$, $F(4, 494) = 4.76$, $p = .001$, $\eta_p^2 = 0.09$.

The between-subject test for competence was not significant for constructive-epistemic regulation, $F(1, 196) = 1.96$, $p = .16$, $\eta_p^2 = 0.01$, whereas they were significant for concurrence-seeking epistemic regulation, $F(1, 196) = 32.24$, $p < .001$, $\eta_p^2 = 0.14$, competitive-relational regulation, $F(1, 196) = 20.90$, $p < .001$, $\eta_p^2 = 0.10$, and protective-relational regulation, $F(1, 196) = 38.28$, $p < .001$, $\eta_p^2 = 0.16$. The low-competence conditions (Conditions 2, 4) showed higher concurrence-seeking epistemic (*M* = 3.05, *SD* = 0.88) and protective-relational (*M* = 2.95, *SD* = 0.86) regulations than the high-competence conditions (Conditions 1, 3; concurrence-seeking epistemic: *M* = 2.37; *SD* = 0.81; protective-relational: *M* = 2.18; *SD* = 0.88). In contrast, the high-competence conditions (Conditions 1, 3) showed higher competitive-relational regulation (*M* = 3.43; *SD* = 0.87) than the low-competence conditions (Conditions 2, 4; *M* = 2.84, *SD* = 0.97).

The between-subject tests for social interdependence were significant for concurrence-seeking epistemic regulation, $F(1, 196) = 11.75$, $p = .001$, $\eta_p^2 = 0.06$, and competitive-relational regulation, $F(1, 196) = 30.41$, $p < .001$, $\eta_p^2 = 0.13$. However, they were not significant for constructive-epistemic regulation, $F(1, 196) = 2.23$, $p = .14$, $\eta_p^2 = 0.01$, and protective-relational

regulation, $F(1, 196) = 1.13$, $p = .29$, $\eta_p^2 = 0.01$. The positive-interdependence conditions (Condition 1, 2; $M = 2.93$, $SD = 0.90$) showed higher concurrence-seeking epistemic regulation than the negative-interdependence conditions (Conditions 3, 4; $M = 2.50$, $SD = 0.87$). In contrast, the negative-interdependence conditions (Condition 3, 4; $M = 3.47$, $SD = 0.89$) showed higher competitive-relational regulation than the positive-interdependence conditions (Conditions 1, 2; $M = 2.78$, $SD = 0.92$).

The between-subject tests for the competence × social interdependence interaction were significant for constructive-epistemic regulation, $F(1, 196) = 10.55$, $p = .001$, $\eta_p^2 = 0.05$, and competitive-relational regulation, $F(1, 196) = 5.01$, $p = .03$, $\eta_p^2 = 0.03$. However, they were not significant for concurrence-seeking epistemic regulation, $F(1, 196) = 1.05$, $p = .31$, $\eta_p^2 = 0.01$, and protective-relational regulation, $F(1, 196) = 0.01$, $p = .94$, $\eta_p^2 < 0.001$.

Specifically, within high-competence conditions, constructive-epistemic regulation was higher in the positive-interdependence condition (Condition 1; $M = 3.98$, $SD = 0.69$) than in the negative-interdependence condition (Condition 3; $M = 3.51$, $SD = 0.84$), $t(98) = 3.03$, $p = .003$, $|d| = 0.61$. However, within low-competence conditions, constructive-epistemic regulation was slightly higher in the negative-interdependence condition (Condition 4; $M = 3.97$, $SD = 0.62$) than in the positive-interdependence condition (Condition 2: $M = 3.80$, $SD = 0.61$), $t(98) = 1.41$, $p = .16$ (Figure 5). Also, within high-competence conditions, competitive-relational regulation was much higher in the negative-interdependence condition (Condition 3; $M = 3.87$, $SD = 0.65$) than in the positive-interdependence condition (Condition 1; $M = 2.93$, $SD = 0.83$), $t(98) = 6.32$, $p < .001$, $|d| = 1.26$. Within low-competence conditions, competitive-relational regulation was also higher in the negative-interdependence condition (Condition 4; $M = 3.04$, $SD = 0.92$) than in the positive-interdependence condition (Condition 2; $M = 2.65$, $SD = 0.98$), but the difference

was smaller than that within high-competence conditions, $t(98) = 2.07$, $p = .04$, $|d| = 0.41$ (Figure 6).

Discussion

In this pilot study, I aimed to provide support for the 2 × 2 socio-cognitive conflict regulation model so that this model can be used for the main studies (Study 1, 2). In this section, I overview the findings from this pilot study briefly, then proceed to discuss what needs to be revised, replicated, and further investigated in Study 1. Broader implications of this research for theory, research, and practice are addressed in General Discussion (Chapter 7).

Pilot RQ 1: Does the 2 × 2 model consisting of constructive-epistemic, concurrence-seeking epistemic, competitive-relational, and protective-relational regulation subscales fit the data well?

The three stated objectives were successfully addressed in this research question. First, the measure of four-factor model of socio-cognitive conflict regulation fit the data well with good internal consistency of each factor. Second, the mean scores of concurrence-seeking epistemic and protective-relational regulations were operative, although to a somewhat lesser extent than the other two regulations. Intercorrelations among different regulation types were generally consistent with the hypotheses. Third, each of the regulation types was differentially correlated with antecedent variables.

Factor structure and internal consistencies. In line with the hypotheses, each of the four types of socio-cognitive conflict regulation showed high reliability (αs $\geq .82$), and both EFA and CFA supported that each of the regulations in the hypothesized 2 × 2 model represent distinct constructs, excluding four items that are discussed in the next paragraph. The 2 × 2

model also appeared to fit the data better than other alternative models including the previous three-factor model consisting of epistemic (constructive-epistemic), competitive-relational, and protective-relational regulations. These findings therefore support the need to expand the three-factor regulation model to a 2 × 2 regulation model that separates constructive-epistemic and concurrence-seeking epistemic regulations.

The exploratory factor analysis (EFA), however, showed that four out of 24 socio-cognitive conflict regulation items could be problematic in that their factor loadings for their hypothesized factor were relatively small. Table 3 summarizes the problems of the items and how they were revised for the next study. First, one of the concurrence-seeking epistemic regulation items (i.e., "I would support the other employee's opinion.") was loaded more onto the factor of constructive-epistemic regulation. Conceptually, "supporting other's opinion" can overlap with constructive-epistemic regulation which emphasizes considering and integrating others' different opinions. Thus, I revised the item by focusing more on quick acceptance of opinion of the partner who is more competent for Study 1, which is "I would accept the other employee's opinion without worrying about my original idea."

Second, one of the protective-relational items (i.e., "I would disengage from any discussion of our ideas.") was cross-loaded onto both protective-relational and concurrence-seeking epistemic regulations. The main reason might be from the phrase "*our* ideas," which could trigger cooperative perceptions which overlap with concurrence-seeking epistemic regulation that is cooperative and, like protective-relational regulation, passive. Thus, I revised the item by focusing more on avoidance of engagement in the conflict for Study 1, which is "I would disengage from any confrontation and avoid the conflict."

Third, another concurrence-seeking epistemic regulation item (i.e., "I would easily align my thinking with the other employee's point of view without experiencing any contradiction.") showed a relatively small factor loading. This item might need more content about epistemic concerns, so I used the revised item, "I would align my thinking with the other employee's as if I reached the same conclusions myself," for Study 1.

Last, another protective-relational regulation item (i.e., "I would withhold my idea despite thinking it still has merit.") also showed a relatively small factor loading. In this item, the phrase, "despite thinking it still has merit," is unnecessary for protective-relational regulation and rather addresses epistemic concerns. Thus, I revised it by focusing more on avoidance or ignorance of the conflict for Study 1, which is "I would withdraw my ideas and wait for the conflict to end."

Descriptive statistics and intercorrelations among conflict regulations. Overall, the new type of regulation, concurrence-seeking epistemic regulation, was operative in this study, and its mean was slightly lower than the scale midpoint but higher than protective-relational regulation. Specifically, the overall means indicate that concurrence-seeking epistemic and protective-relational regulations were less prevalent than the other two forms of conflict regulation characterized by higher competence in the context of this study. Comparing the raw means by condition showed the possibility that inducing different levels of competence and social interdependence may lead to different types of socio-cognitive conflict regulation. Specifically, and in line with the proposed model (Figure 1), constructive-epistemic regulation was highest when participants were competent and their goals were cooperative. Concurrence-seeking epistemic regulation was highest when participants were incompetent and their goals were cooperative. Competitive-relational regulation was highest when participants were

competent and their goals were competitive. One slight exception was protective-relational regulation, in that it was highest when participants were incompetent and their goals were cooperative, but it was also closely high when participants were incompetent and their goals were competitive. However, these results are only from the observed means using descriptive statistics, so more rigorous statistical tests using inferential statistics should be conducted, which is addressed in Pilot RQ 2.

Regarding intercorrelations among different types of conflict regulation, the correlation between constructive-epistemic and competitive-relational regulations was inconsistent with previous finding. The present study showed a marginally significantly negative correlation whereas the previous studies showed a significantly positive correlation (e.g., Darnon et al., 2006; Saltarelli & Roseth, 2014). Constructive-epistemic and competitive-relational regulations are different in terms of perceptions of social context—cooperative versus competitive—according to the conceptual model in this study, but they share the antecedent of competence since both relate to high level of competence. Due to both the shared (competence level) and unshared (social interdependence) characteristics, conceptually, it is possible to have both positive and negative correlations. There might also be other possible reasons for the correlation inconsistent with the prior findings: different characteristics of task or setting, different nationalities of participants, or slightly different items (to separate motivation from regulation in the current study) in different studies. In the following studies (Study 1 and 2), I focused on the correlation between constructive-epistemic and competitive-relational regulations, and clarified whether this negative correlation was replicated or changed depending on context (e.g., a hypothetical workplace in Study 1, a real classroom in Study 2).

Interestingly, there have not been prior studies reporting the correlation between constructive-epistemic and protective-relational regulations, as the prior studies focused on either epistemic and competitive-relational regulations only (e.g., Darnon et al., 2006) or competitive-relational and protective-relational regulations only (e.g., Sommet et al., 2014, 2015). The present study showed a (marginally) significantly negative relation between these two regulations, which is expected by the conceptual model in that these two regulations are different in terms of perceptions of both competence level and social interdependence.

The correlation between competitive-relational and protective-relational regulations in this pilot study was consistent with that from some of the previous findings in that these two regulation types were negatively related to each other (Sommet et al., 2014, 2015). Their negative correlation may be from their opposite coping strategies—approach versus avoidance. Importantly, I revised the items of protective-relational regulation to measure it more precisely by reflecting on passive or indifferent engagement and withdrawal of one's own opinion, which is somewhat different from what the original items focused on (see Table 5). Nevertheless, its negative correlation with competitive-relational regulation was maintained in the present study, which is supportive evidence of the validity for the revised items of protective-relational regulation. According to the proposed model in this dissertation, however, these two regulations have a common antecedent, competitive perceptions, as well: therefore, it needs to confirm whether their correlation remains as negative in Study 1.

The main interest is the correlations between concurrence-seeking epistemic regulation and the other types of regulation. As expected, concurrence-seeking epistemic regulation was negatively correlated with competitive-relational regulation, because they are different in terms of both competence level and social interdependence. Interestingly, concurrence-seeking

epistemic regulation was positively correlated with both constructive-epistemic and protective-relational regulations. This suggests that the shared antecedent (i.e., cooperative perception for constructive epistemic and incompetence for protective relational) may play a more essential role than unshared antecedent (i.e., different competence levels for constructive epistemic and different perceptions of social interdependence for protective relational) in the relations of concurrence-seeking epistemic regulation to constructive-epistemic and protective-relational regulations. I focused on whether these correlation results were replicated in Study 1.

It is noteworthy that the positive correlation between concurrence-seeking epistemic and protective-relational regulations was strong, but the extent of the correlation value (r = .47) was sufficient to separate these two regulations. Further, their correlation with constructive-epistemic regulation showed the opposite directions: the positive correlation for concurrence-seeking epistemic regulation (r = .14), but the negative correlation for protective-relational regulation (r = -.13). Therefore, although concurrence-seeking epistemic and protective-relational regulations showed a positive correlation between each other, there is also correlational evidence that these two regulations are empirically differentiated from each other.

Correlations between conflict regulations and antecedent variables. Overall, the intercorrelations among each type of regulation and possible antecedents provided convergent and discriminant validity for the measure of socio-cognitive conflict regulation. First, the correlations between each type of regulation and competence-related variables largely supported the proposed model of socio-cognitive conflict regulation, meaning perceived competence and competence threat were linked to the 2 × 2 conflict regulations in the predicted manner. As predicted, the regulation types that were expected to be from high competence (i.e., constructive-epistemic and competitive-relational regulations) were actually related with higher perceived

competence, and the regulation types that were expected to be from low competence (i.e., concurrence-seeking epistemic and protective-relational regulations) were actually related with lower perceived competence and higher competence threat. Importantly, perceived competence was more strongly negatively correlated with protective-relational regulation (r = -.57) than concurrence-seeking epistemic regulation (r = -.38), and competence threat was more strongly positively correlated with protective-relational regulation (r = .45) than concurrence-seeking epistemic regulation (r = .17). This suggests that concerns about relative competence may be more strongly associated with protective-relational regulation than concurrence-seeking epistemic regulation. This supports the idea that protective-relational regulation may emerge from more competitive contexts, whereas concurrence-seeking epistemic regulation may emerge from more cooperative contexts.

Second, the correlations between each type of regulation and social-interdependence variables also largely support the proposed model of socio-cognitive conflict regulation, meaning cooperation-based regulation types (i.e., constructive-epistemic and concurrence-seeking epistemic regulations) were positively correlated with higher cooperative perceptions, and competitive-relational regulation, one of the competition-based regulation types, was strongly positively correlated with higher competitive and individualistic perceptions. Importantly, the positive relation between cooperative perceptions and constructive-epistemic regulation was much stronger (r = .60) than that between cooperative perceptions and concurrence-seeking epistemic regulation (r = .14). This suggests that a cooperative attitude may be even more related to a behavior originated from high competence and low competence threat, such as constructive-epistemic regulation, than a behavior from low competence and high competence threat, such as concurrence-seeking epistemic regulation.

Unexpectedly, protective-relational regulation was not positively correlated with competitive perceptions, but it was negatively correlated with competitive perceptions; however, it positively correlated with individualistic perceptions. Protective-relational regulation addresses the withdrawal of one's opinion and avoidance of the conflict due to low competence and high competence threat, and therefore this type of regulation may be negatively related to wanting to compete with others and aiming to do better than others (i.e., competitive perceptions). Instead, protective-relational regulation may rather be positively related to wanting to work alone because it includes avoidance of the conflict with others and disengagement from confrontation due to high competence threat. I focused on whether the correlations between protective-relational regulation and competitive/individualistic perceptions were replicated in the following studies.

Pilot RQ 2: How do a variety of outcomes differ between four different conditions depending on social interdependence?

Manipulation check, competence, and social interdependence. I first ensured that vignette-based manipulations functioned appropriately as I intended. As expected, the results revealed that the mean score of perceived competence was significantly higher in the high-competence conditions (Conditions 1, 3) than in the low-competence conditions (Conditions 2, 4). And, the results revealed that the mean score of cooperative perceptions was significantly higher in the positive-interdependence conditions (Conditions 1, 2) than in the negative-interdependence conditions (Conditions 3, 4), whereas the mean score of competitive perceptions was significantly higher in the negative-interdependence conditions than in the positive-interdependence conditions, as expected. This suggests that the created vignettes worked successfully in manipulating participants' perceptions of competence and social interdependence as they intended, and therefore they can be used for the following main studies.

Next, the MANCOVA results about the competence-related variables (i.e., perceived competence and competence threat) provided additional evidence of effective manipulations for competence level in that the high-competence conditions showed higher perceived competence than the low-competence conditions. Furthermore, the high-competence conditions showed lower competence threat than the low-competence conditions, which was consistent with the hypotheses. Unlike the expectations guided by social interdependence theory (Deutsch, 1985; Johnson & Johnson, 1989), there were no significant effects of social interdependence on the competence-related variables. Empirical findings showed a positive association between cooperation and competence (Johnson et al., 2014; Peterson & Roseth, 2014), but this association was found only when participants actually cooperatively worked with others and achieved their goals, or at least perceived that they would achieve their goals. In Study 1, I examined whether this non-significant main effect of social interdependence was replicated.

The MANCOVA results about social interdependence also provided additional evidence of effective manipulations for social interdependence. Specifically, the positive-interdependence conditions showed higher cooperative perceptions and lower competitive perceptions than the negative-interdependence conditions, whereas the negative-interdependence conditions showed higher competitive perceptions and lower cooperative perceptions than the positive-interdependence conditions. The negative-interdependence conditions also showed higher individualistic perceptions than the positive-interdependence conditions. In addition, the main effect of competence indicated that participants in the high-competence conditions showed higher competitive perceptions than those in the low-competence conditions, indicating higher competence may lead to higher desire to work better than others in general. High competence

may trigger motivation to compete with others through more approach or dominant tendencies in conflicting situations (Cohen & Lazarus, 1979).

Finally, as expected, the MANCOVA results revealed significant interactive effects of competence and social interdependence on social interdependence, specifically on cooperative and competitive perceptions. The positive-interdependence conditions led to a higher level of cooperative perceptions than the negative-interdependence conditions, but it was not always the case when participants' perceived competence was low. When participants' competence was low, their cooperative perceptions in the positive-interdependence conditions were not much different from those in the negative-interdependence conditions. For the competitive perceptions, the negative-interdependence conditions led to a higher level of competitive perceptions than the positive-interdependence conditions, but it was not always the case when participants' perceived competence was low. When participants' competence was low, their competitive perceptions in the negative-interdependence conditions were not much different from those in the positive-interdependence conditions. For the individualistic perceptions, however, there was no significant interactive effect.

Taken together, the effects of social interdependence on cooperative and competitive perceptions were more salient when participants' competence was high. One possible explanation is that incompetent participants' focus would be more on their competence level than the goals of the task (i.e., social context), so incompetent participants may be less influenced by social context than competent ones. However, I should note that the interactive effect on cooperative perceptions was only marginally significant, and therefore I focused on whether the interactive effect on cooperative perceptions was significant in Study 1. I additionally focused on

whether the non-significant interactive effect on individualistic perceptions was replicated in Study 1.

Socio-cognitive conflict regulation. As expected, the MANOVA results about the main effect of competence showed that the high-competence conditions showed higher competitive-relational regulation but lower concurrence-seeking epistemic and protective-relational regulations than the low-competence conditions. The associations between competence level and competitive-relational and protective-relational regulations were consistent with prior findings (Sommet et al., 2014, 2015). Although there was no difference in constructive-epistemic regulation depending on the competence level, there was a significant interactive effect of competence and social interdependence on constructive-epistemic regulation.

Next, the MANOVA results about the main effect of social interdependence showed that the positive-interdependence conditions showed higher concurrence-seeking epistemic and lower competitive-relational regulations than the negative-interdependence conditions, as expected. The association between social interdependence and competitive-relational regulation was consistent with prior findings (Saltarelli & Roseth, 2014). Although there were no differences in constructive-epistemic and protective-relational regulations depending on the perceptions of social interdependence, there was a significant interactive effect of competence and social interdependence on constructive-epistemic regulation. However, for protective-relational regulation, there was also no significant interactive effect. Thus, I examined whether there was still no effect of social interdependence on protective-relational regulation in Study 1.

Finally, the MANOVA results showed that there were significant interactive effects of competence and social interdependence on constructive-epistemic and competitive-relational regulations. Specifically, the positive-interdependence condition led to a higher level of

constructive-epistemic regulation than the negative-interdependence condition, but it was the case only when participants were in the high-competence condition. When participants were in the low-competence conditions, those under negative-interdependence condition rather showed slightly higher constructive-epistemic regulation than those under positive-interdependence condition. This suggests that it is not true that more competent individuals always engage in more adaptive conflict regulation (e.g., constructive-epistemic regulation) than incompetent individuals, but it depends on the perceptions of social context—cooperative versus competitive. Regarding competitive-relational regulation, as expected, this type of regulation was higher under negative-interdependence condition than under positive-interdependence condition, but this difference was much larger within the high-competence conditions than within the low-competence conditions. In line with the findings about the interactive effects on social interdependence variables, the effect of social interdependence tended to be stronger when participants were competent. Taken together, both competence and social interdependence play key roles in constructive-epistemic and competitive-relational regulations, which supports the fundamental idea of the proposed model.

However, there were no significant interactive effects on concurrence-seeking epistemic and protective-relational regulations. There were only significant main effects of competence on both regulations and a significant main effect of social interdependence only on concurrence-seeking epistemic regulation. Thus, I focused on whether or not these non-significant interactive effects on these two regulations were remained in Study 1.

Summary

In sum, the results of this pilot study provide empirical support for the existence of concurrence-seeking epistemic regulation as a new type of socio-cognitive conflict regulation,

which is differentiated from protective-relational regulation. They also support the 2 × 2 socio-cognitive conflict model more generally, by evidence of factor structure, reliability of each measure, intercorrelations between the measures and correlations with antecedent variables (i.e., competence, social interdependence), and the effects of competence and social interdependence on each type of regulation.

There were several fruitful achievements in the pilot study: (a) validation of the independence of the four socio-cognitive conflict regulations; (b) documentation of a specific empirical profile for concurrence-seeking epistemic regulation as well as the other three types of regulation; and (c) confirmation of the vignette-based manipulations. There were also several results that I need to focus more on in Study 1 while replicating the findings from the pilot study: (a) the four-factor structure with the four revised items (still good fit?); (b) the correlations between competitive-relational and protective-relational regulations (still negative?), between constructive-epistemic and competitive-relational regulations (still negative?), and between concurrence-seeking epistemic and constructive-epistemic/protective-relational regulations (still positive?); (c) the correlation between protective-relational regulation and competitive (still negative?) and individualistic (still positive?) perceptions; (d) the effect of social interdependence on competence-related variables (still non-significant effect?); (e) the interactive effect of competence and social interdependence on individualistic perceptions (still non-significant effect?); and (f) the interactive effects of competence and social interdependence on concurrence-seeking epistemic and protective-relational regulations (still non-significant effects?).

CHAPTER 5:

Study 1

The first aim of Study 1 is to replicate the pilot study's findings about the internal structure of construct, socio-cognitive conflict regulation, using the developed measures in the pilot with several revised items (RQ 1-1). The second aim is to ensure measurement invariance of the four-factor model of socio-cognitive conflict regulation across gender and ethnicity (RQ 1-2). The last aim is to replicate the pilot study's findings about the effects of perceived competence and social interdependence on a variety of outcomes including socio-cognitive conflict regulation (RQ 1-3). For the last research question, I examined additional outcomes, including achievement goals and critical reasoning.

Method

Study 1 used the same research design as that for Pilot Study, but with a larger sample size. Thus, this study was also the two-by-two factorial design using experimental vignette methodology, and the sponsoring university's Institutional Review Board (IRB No. x16-1282e) approved all study procedures.

Participants

Recruitment and eligibility. As recruited in Pilot Study, I recruited participants through MTurk with an aim of collecting 500 eligible participants. As estimated in Pilot Study, $N = 130$ would be sufficient to achieve power of 0.80 with $\alpha = .05$ and effect size of 0.06. Eligibility and exclusion criteria were the same as those in Pilot Study.

Demographics. Table 13 presents participants' demographic information by condition. For the entire sample of Study 1, the vast majority was European American or White ($n = 320$,

64%) and used English as their native language (n = 495, 98%). There were more males (n = 301, 60%) than females (n = 195, 39%).

Procedure

Study 1 was conducted in December of 2016. All procedures including eligibility check (see Appendix C), manipulation (see Manipulation section), measures (see Measures section and Appendix C for the specific questions) in Study 1 were the same as those in Pilot Study. I completed data collection through Amazon's MTurk within about 25 hours upon positing the research advertisement. As a part of the research participation, participants took the survey in Qualtrics, and the average time for the survey completion was 9 minutes and 40 seconds.

Eligible participants were randomly assigned to one of the four experimental conditions. Supporting the efficacy of the randomization process, I found no evidence of differences in participants' demographic information. Specifically, there were no significant differences in gender, $\chi^2(3, N = 496) = 1.88$, $p = .60$, ethnicity, $\chi^2(18, N = 503) = 15.84$, $p = .60$, age, $F(3, 500) = 1.16$, $p = .32$, first language (i.e., English vs. non-English), $\chi^2(3, N = 503) = 0.04$, $p = .99$, and current GPA, $F(3, 483) = 0.08$, $p = .97$. This suggests that any differences in dependent variables cannot be attributed to the participants' pre-existing demographic characteristics or their GPA.

Measures

Participants responded to the survey after reading one of the four vignettes. As in Pilot Study, the survey included the same manipulation-checking questions and the same questions about two competence-related variables (perceived competence [$\alpha = .79$], competence threat [$\alpha = .79$]), social interdependence (cooperation [$\alpha = .77$], competition [$\alpha = .81$], individualism [$\alpha = .83$]), and socio-cognitive conflict regulation. In addition to these variables, in Study 1,

achievement goals and critical reasoning were also asked. Save manipulation-checking questions, all variables were based on scale items ranging from *not at all* (1) to *very much so* (5). All items are presented in Appendix C.

Socio-cognitive conflict regulation. Socio-cognitive conflict regulation was assessed with the new measures developed in Pilot Study, except for four items. For Study 1, I revised four items (i.e., two items for concurrence-seeking epistemic regulation and two items for protective-relational regulation) based on the results from Pilot Study (see Table 3), which is more specifically addressed in Discussion on the pilot study's results.

Achievement goals. Five different types of achievement goals were assessed with the Achievement Goal Questionnaire (AGQ; Elliot & McGregor, 2001) and work-avoidance goal scale from Harackiewicz et al.'s (2008) study: mastery-approach goals (α = .80), mastery-avoidance goals (α = .84), performance-approach goals (α = .82), performance-avoidance goals (α = .68), and work-avoidance goals (α = .78). There were three items for each subscale, and they asked about individuals' goals in the situation where they were working with the other employee.

Critical reasoning. Critical reasoning was assessed following Strom and Strom's (2011) procedure. There were five items, and they asked how much individuals would think critically and creatively when they were working with the other employee. One of the items was excluded due to its less relevant content to the context of this study (i.e., "I would use logic to challenge the other employee's thinking") and deleterious contribution to the reliability (α = .68 for five items; α = .75 for four items).

Data Analyses

I conducted the EFAs and CFA on the 24 conflict regulation items to examine the factor structure of four types of conflict regulation and 2 (perceived competence: high, low) × 2 (social interdependence: positive, negative) MANCOVAs to analyze main and interactive effects on different outcomes. As did in Pilot Study, for MANCOVAs, I report only the results with significant covariates for each analysis.

Multi-group CFA. In Study 1, I conducted multi-group CFAs on four-factor model of socio-cognitive conflict regulation items to test for the invariance of the hypothesized model over gender (male vs. female) and ethnicity (minority vs. non-minority [Whites]) using the lavaan package (Rosseel, 2012) in R. If measurement invariance is supported, the proposed measure of socio-cognitive conflict regulation can be valid across gender or ethnicity, which indicates conceptual understanding of the items are equivalent across different groups of gender or ethnicity. I tested a series of nested models to assess different levels of measurement invariance following Vandenberg and Lance's (2000) guidelines: equivalent patterns of fixed and free factor loadings in Model 1 (i.e., configural variance), equivalent factor loadings in Model 2 (i.e., weak invariance), equivalent item intercepts in Model 3 (i.e., strong invariance), equivalent error variances (i.e., strict invariance), and equivalent variances and covariances. For tests of measurement and structural invariance, I compared the change in fit indices in consecutive models. Invariance is inferred if the change in CFI is less than .01 and the change in RMSEA is less than .015 (Chen, 2007; Cheung & Rensvold, 2002).

Analysis of covariance (ANCOVA). For critical reasoning, I conducted 2 (perceived competence: high, low) × 2 (social interdependence: positive, negative) ANCOVAs to analyze main and interactive effects: (a) with all covariates including gender, ethnicity, first language,

and GPA; and (b) with only significant covariates. I report only the results with significant covariates for the analysis.

Results

Participant Flow and Missing Data

A total of 5,419 people attempted to participate in this study through MTurk, and answered questions asking their eligibility. Of the 5,419 people, 504 (9.3%) were eligible and all of them agreed to participate in the study. Little's MCAR test, $\chi^2(3310) = 3942.61$, $p < .001$, was statistically significant, but missing data proportions were less than 5% (< 0.8% across all items), allowing for the use of listwise deletion (Allison, 2001; Graham, 2009). Grubbs' test (Grubbs, 1969) showed that there was no univariate outlier in each condition using a $p < .01$.

RQ 1-1 (replication of Pilot RQ 1): Does the 2 × 2 model consisting of constructive-epistemic, concurrence-seeking epistemic, competitive-relational, and protective-relational regulation subscales fit the data well?

Exploratory factor analyses (EFAs). As presented in Table 14, EFAs revealed the expected four-factor structure, but one of the concurrence-seeking epistemic regulation items (i.e., "I would accept the other employee's opinion without worrying about my original idea.") was loaded more onto the factor of protective-relational regulation ($\lambda = .31$ for concurrence-seeking epistemic; $\lambda = .41$ for protective relational). Accordingly, the item was excluded, and Table 15 shows the final EFA results without the item. Again, the analysis revealed the expected four-factor structure, and each factor comprised the expected regulation items. Factor 1 accounted for 26.4% of the variance and comprised the six constructive-epistemic regulation items (eigenvalue = 6.07). Factor 2 accounted for 22.1% of the variance and comprised the six

protective-relational regulation items (eigenvalue = 5.09). Factor 3 accounted for 9.1% of the variance and comprised the six competitive-relational regulation items (eigenvalue = 2.10). Factor 4 accounted for 5.7% of the variance and comprised the five concurrence-seeking epistemic regulation items (eigenvalue = 1.31). All items loaded above .51 on their primary factor; none of the secondary loadings exceeded |.15|, except for one of the concurrence-seeking epistemic regulation items (i.e., "I would go along with the other employee's idea without hesitation."). This item was loaded onto the corresponding factor (λ = -.51), but it was also loaded onto the protective-relational regulation factor (λ = .31). Thus, I revised this item and used the revised one for Study 2.

Confirmatory factor analyses (CFAs). I conducted a CFA on the hypothesized model where the 23 conflict regulation items were loaded on each latent factor of conflict regulation (see Figure 7). The results supported the hypothesized model. Each fit statistic met the criteria for a good fitting model: χ^2 (224) = 748.23, p < .001, CFI = .91, TLI = .90, RMSEA = .07, SRMR = .07. Standardized factor loadings and residual variances of items are presented in Table 8, and all factor loadings were moderate to strong (ranging from .64 to .80).

I conducted additional analyses to compare the fit of the hypothesized model with a series of four alternative models that were investigated in Pilot Study, including (a) a three-factor model A, (b) a three-factor model B, (c) an epistemic-relational model, and (d) an agentic[approach]-submissive[avoidance] model. As presented in Table 9, the results from these analyses indicated that none of the alternative models provided a good fit to the data, and the hypothesized model provided a better fit than any of the alternative models.

Descriptive statistics, internal consistencies, and intercorrelations. Table 16 presents the descriptive statistics by condition and across conditions for all variables including the

conflict regulations. Across four conditions, the mean for constructive-epistemic regulation was highest, followed by competitive-relational regulation and concurrence-seeking epistemic regulation, and protective-relational regulation was lowest, which was the same pattern as Pilot Study. Constructive-epistemic and competitive-relational regulations were higher than the scale midpoint (i.e., 3.0) while concurrence-seeking epistemic and protective-relational regulations were lower than the midpoint. The full range of scores was used (i.e., 1 to 5) for all types of regulation. Constructive-epistemic regulation was highest (M = 4.09, SD = 0.60) in the high competence—positive interdependence condition (Condition 1), concurrence-seeking epistemic regulation was highest (M = 3.00, SD = 0.82) in the low competence—positive interdependence condition (Condition 2), competitive-relational regulation was highest (M = 3.68, SD = 0.77) in the high competence—negative interdependence condition (Condition 3), and protective-relational regulation was highest (M = 2.65, SD = 0.93) in the low competence—negative interdependence condition (Condition 4).

Each of the conflict regulations demonstrated a high level of reliability (ranging from .83 to .89). Table 17 presents internal consistencies and intercorrelations among all variables. Regarding the intercorrelations among the conflict regulation variables, all variables were significantly correlated with each other (ps < .001) except for the only marginally significant correlation between competitive-relational and protective-relational regulations (p = .08). Specifically, constructive-epistemic regulation was positively correlated with concurrence-seeking epistemic regulation (r = .19), and negatively correlated with competitive-relational (r = -.49) and protective-relational (r = -.16) regulations. Concurrence-seeking epistemic regulation was negatively correlated with competitive-relational regulation (r = -.26), but positively correlated with protective-relational regulation (r = .53). Finally, competitive-relational

regulation was negatively correlated with protective-relational regulation (r = -.08). The patterns of intercorrelations among the socio-cognitive conflict regulation variables in Pilot Study were replicated.

The correlations between competence-related variables and socio-cognitive conflict regulation types in Pilot Study were replicated in general. Specifically, perceived competence was positively correlated with constructive-epistemic regulation (r = .08) and competitive-relational regulation (r = .38), whereas perceived competence was negatively correlated with concurrence-seeking epistemic (r = -.24) and protective-relational regulations (r = -.47). Competence threat was positively correlated with concurrence-seeking epistemic (r = .13) and protective-relational (r = .42) regulations, whereas competence threat was negatively correlated with constructive-epistemic regulation. Unlike the pilot study, competence threat was additionally positively correlated with competitive-relational regulation (r = .25).

The correlations between social-interdependence variables and socio-cognitive conflict regulation types in Pilot Study were also replicated in general. Specifically, cooperative perceptions were positively correlated with constructive-epistemic (r = .69) and concurrence-seeking epistemic (r = .24) regulations, whereas cooperative perceptions were negatively correlated with competitive-relational (r = -.33) and protective-relational (r = -.17) regulations. Competitive perceptions were negatively correlated with constructive-epistemic (r = -.25), concurrence-seeking epistemic (r = -.11) and, protective-relational (r = -.11) regulations, whereas competitive perceptions were positively correlated with competitive-relational regulation (r = .69). Lastly, individualistic perceptions were negatively correlated with constructive-epistemic regulation (r = -.50), but positively correlated with competitive-relational (r = .52) and protective-relational (r = .10) regulations. Unlike the pilot study, individualistic

perceptions were additionally negatively correlated with concurrence-seeking epistemic regulation (r = -.24).

Next, regarding the correlations between achievement-goal variables and socio-cognitive conflict regulation types, mastery-approach goals were positively correlated with constructive-epistemic regulation (r = .50), but negatively correlated with concurrence-seeking epistemic (r = -.14) and protective-relational (r = -.41) regulations. Mastery-avoidance goals were positively correlated with constructive-epistemic (r = .25), concurrence-seeking epistemic (r = .20) and, protective-relational (r = .27) regulations, but negatively correlated with competitive-relational regulation (r = -.21). Performance-approach goals were positively correlated with competitive-relational regulation (r = .66), but negatively correlated with constructive-epistemic (r = -.21), concurrence-seeking epistemic (r = -.17), and protective-relational (r = -.10) regulations. Interestingly, performance-avoidance goals were weakly positively correlated with all types of conflict regulation: constructive-epistemic regulation (r = .12), concurrence-seeking epistemic regulation (r = .14), competitive-relational regulation (r = .13), and protective-relational regulation (r = .16). Lastly, work-avoidance goals were positively correlated with concurrence-seeking epistemic (r = .41), competitive-relational (r = .19), and protective-relational (r = .63) regulations, whereas work-avoidance goals were negatively correlated with constructive-epistemic regulation (r = -.26).

Finally, critical reasoning was positively correlated with constructive-epistemic (r = .80) and concurrence-seeking epistemic (r = .14) regulations, but negatively correlated with competitive-relational (r = -.35) and protective-relational (r = -.20) regulations.

RQ 1-2: Is the four-factor model of socio-cognitive conflict regulation invariant across students' gender and ethnicity?

I conducted two-group analyses in which I constrained various sets of parameter estimates to be invariant over gender (male and female) and ethnicity (minority and non-minority [Whites]) to test for measurement invariance of the four-factor model. I compared fit indices for models with different sets of invariance constraints, ranging from Model 2 and 8 (configural invariance) to the most restrictive, Model 6 and 12 (factor variances/covariances invariance). Fit indices (Table 18) showed that the initial model of the multi-group CFA for gender (Model 2) fitted well, $\chi^2 = 1029.63$, $df = 448$, $p < .001$, CFI = .90, RMSEA = .07. The changes in model fit statistics were also acceptable across all consecutive models (e.g., < .01 for CFI; < .015 for RMSEA; Chen, 2007; Cheung & Rensvold, 2002). Fit indices (Table 18) showed that the initial model of the multi-group CFA for ethnicity (Model 8) also fitted well, $\chi^2 = 1027.86$, $df = 448$, $p < .001$, CFI = .90, RMSEA = .07. The changes in model fit statistics were also acceptable across all consecutive models.

This provides evidence of configural invariance (Model 2, 8), weak invariance (Model 3, 9), strong invariance (Model 4, 10), strict invariance (Model 5, 11), and factor variances/covariances invariance (Model 6, 12) across gender and ethnicity. This suggests that the measurement properties of the instrument were reasonably equal for males and females, and for minority and White students.

RQ 1-3: How do a variety of outcomes differ among four different conditions depending on the perceptions of competence and social interdependence?

Before conducting multivariate analyses of covariance (MANCOVAs) and an analysis of covariance (ANCOVA), I checked for multivariate outliers or univariate outliers for each

condition. There was no multivariate outlier for the two competence variables (i.e., perceived competence and competence threat), but four multivariate outliers for the three types of social interdependence, three multivariate outliers for the four types of socio-cognitive conflict regulation, and three multivariate outliers for the five types of achievement goals were identified with the use of Mahalanobis distance using a $p < .001$. These identified multivariate outliers were excluded for the following corresponding analyses. Three of the Box's M tests showed significant results at $p < .001$ (i.e., competence, socio-cognitive conflict regulation, achievement goals), but the cell sizes for the current study are relatively even, which may lead to robustness to the violation of the homogeneity of variance-covariance matrix assumption (R. A. Johnson & Wichern, 1998; Tabachnick & Fidell, 2001). For the ANCOVA on critical reasoning, there were two univariate outliers, so I conducted the ANCOVAs excluding them. All MANOVAs or MANCOVAs results are summarized in Table 12.

Manipulation check. I conducted a *t*-test for the manipulation of perceived competence, and the result revealed that the high-competence conditions (Condition 1, 3; $M = 4.31$, $SD = 0.64$) showed significantly higher perceived competence than the low-competence conditions (Condition 2, 4; $M = 3.01$, $SD = 0.92$), $t(450.01) = 18.34$, $p < .001$, $|d| = 1.64$. For the manipulation of social interdependence, a MANOVA result showed a significant multivariate omnibus, Wilks' $\lambda = 0.89$, $F(2, 497) = 30.17$, $p < .001$, $\eta_p^2 = 0.11$. The between-subject tests were significant for cooperative perceptions, $F(1, 498) = 8.94$, $p = .003$, $\eta_p^2 = 0.02$, and competitive perceptions, $F(1, 498) = 56.24$, $p < .001$, $\eta_p^2 = 0.10$. Specifically, the positive-interdependence conditions (Condition 1, 2; $M = 3.76$, $SD = 0.66$) showed higher cooperative perceptions than the negative-interdependence conditions (Conditions 3, 4; $M = 3.58$, $SD = 0.74$), whereas the negative-interdependence conditions (Condition 3, 4; $M = 3.56$, $SD = 0.75$)

showed higher competitive perceptions than the positive-interdependence conditions (Conditions 1, 2; M = 3.03, SD = 0.81). Results confirm the effectiveness of the manipulations for both perceived competence and social interdependence.

Competence. Model 1 revealed that only ethnicity was a significant predictor among the covariates. In Model 2, controlling for the effect of ethnicity, MANCOVA results showed a significant multivariate omnibus for competence, Wilks' $\lambda = 0.60$, $F(2, 497) = 163.40$, $p < .001$, $\eta_p^2 = 0.40$, and social interdependence, Wilks' $\lambda = 0.97$, $F(2, 497) = 6.55$, $p = .002$, $\eta_p^2 = 0.03$. However, the competence × social interdependence interaction was only marginally significant, Wilks' $\lambda = 0.99$, $F(2, 497) = 2.32$, $p = .10$, $\eta_p^2 = 0.01$.

The between-subject tests for competence were significant for perceived competence, $F(1, 498) = 327.44$, $p < .001$, $\eta_p^2 = 0.40$, and competence threat, $F(1, 498) = 30.99$, $p < .001$, $\eta_p^2 = 0.06$. Specifically, the high-competence conditions (Conditions 1, 3; M = 4.31, SD = 0.64) showed higher perceived competence than the low-competence conditions (Conditions 2, 4; M = 3.01, SD = 0.92), and the low-competence conditions (Conditions 2, 4; M = 3.32, SD = 1.04) showed higher competence threat than the high-competence conditions (Conditions 1, 3; M = 2.85, SD = 0.96).

The between-subject tests for social interdependence were not significant for perceived competence, $F(1, 498) = 0.94$, $p = .33$, $\eta_p^2 = 0.002$, but significant for competence threat, $F(1, 498) = 9.06$, $p = .003$, $\eta_p^2 = 0.02$. Specifically, the negative-interdependence conditions (Conditions 3, 4; M = 3.20, SD = 1.03) showed higher competence threat than the positive-interdependence conditions (Conditions 1, 2; M = 2.96, SD = 1.01).

The between-subject tests for the competence × social interdependence interaction was not significant for perceived competence, $F(1, 498) = 0.06$, $p = .80$, $\eta_p^2 < 0.001$, but significant

for competence threat, $F(1, 498) = 3.81$, $p = .05$, $\eta_p^2 = 0.01$. Specifically, for competence threat (see Figure 8), the difference between high- and low-competence conditions within positive-interdependence conditions (Condition 1: $M = 2.61$, $SD = 0.87$; Condition 2: $M = 3.27$, $SD = 1.03$), $t(236) = 5.31$, $p < .001$, $|d| = 0.69$, was larger than that within negative-interdependence conditions (Condition 3: $M = 3.05$, $SD = 0.99$; Condition 4: $M = 3.37$, $SD = 1.05$), $t(264) = 2.48$, $p = .014$, $|d| = 0.30$. However, this result should be interpreted with caution as the multivariate omnibus for the interaction was only marginally significant.

Social interdependence. Excluding the four outliers, Model 1 revealed that there was no significant predictor among the covariates. In Model 2, MANOVA results showed a significant multivariate omnibus for competence, Wilks' $\lambda = 0.91$, $F(3, 494) = 15.52$, $p < .001$, $\eta_p^2 = 0.09$, social interdependence, Wilks' $\lambda = 0.89$, $F(3, 494) = 21.03$, $p < .001$, $\eta_p^2 = 0.11$, and the competence × social interdependence interaction, Wilks' $\lambda = 0.97$, $F(3, 494) = 5.95$, $p = .001$, $\eta_p^2 = 0.04$.

The between-subject test for competence was not significant for cooperative perceptions, $F(1, 496) = 0.18$, $p = .67$, $\eta_p^2 < 0.001$. However, the between-subject tests for competence were significant for competitive perceptions, $F(1, 496) = 23.86$, $p < .001$, $\eta_p^2 = 0.05$, and individualistic perceptions, $F(1, 496) = 20.25$, $p < .001$, $\eta_p^2 = 0.04$. Specifically, the high-competence conditions (Conditions 1, 3) showed higher competitive ($M = 3.49$, $SD = 0.83$) and individualistic ($M = 2.91$, $SD = 0.81$) perceptions than the low-competence conditions (Conditions 2, 4; competitive: $M = 3.13$, $SD = 0.78$; individualistic: $M = 2.57$, $SD = 0.82$).

The between-subject tests for social interdependence were significant for cooperative perceptions, $F(1, 496) = 9.14$, $p = .003$, $\eta_p^2 = 0.02$, competitive perceptions, $F(1, 496) = 58.16$, $p < .001$, $\eta_p^2 = 0.11$, and individualistic perceptions, $F(1, 496) = 16.82$, $p < .001$, $\eta_p^2 = 0.03$.

Specifically, the positive-interdependence conditions (Conditions 1, 2; M = 3.76, SD = 0.68) showed higher cooperative perceptions than the negative-interdependence conditions (Conditions 3, 4; M = 3.58, SD = 0.74). In contrast, the negative-interdependence conditions (Conditions 1, 2) showed higher competitive (M = 3.56, SD = 0.75) and individualistic (M = 2.88, SD = 0.83) perceptions than the negative-interdependence conditions (Conditions 3, 4; competitive: M = 3.03, SD = 0.81; individualistic: M = 2.58, SD = 0.81).

The between-subject tests for the competence × social interdependence interaction were significant for cooperative perceptions, $F(1, 496) = 8.57$, $p = .004$, $\eta_p^2 = 0.02$, competitive perceptions, $F(1, 496) = 11.04$, $p = .001$, $\eta_p^2 = 0.02$, and individualistic perceptions, $F(1, 496) = 6.18$, $p = .01$, $\eta_p^2 = 0.01$. Specifically, within positive-interdependence conditions, cooperative perceptions were higher in the high-competence condition (M = 3.85, SD = 0.62) than in the low-competence condition (M = 3.69, SD = 0.69), $t(234) = 1.84$, $p = .07$, $|d| = 0.24$. However, within negative-interdependence conditions, cooperative perceptions were higher in the low-competence condition (M = 3.68, SD = 0.69) than in the high-competence condition (M = 3.47, SD = 0.78), $t(262) = 2.31$, $p = .02$, $|d| = 0.29$ (Figure 9). For competitive perceptions (see Figure 10), the difference between high- and low-competence conditions within positive-interdependence conditions (Condition 1: M = 3.09; SD = 0.82; Condition 2: M = 2.98; SD = 0.80), $t(234) = 1.00$, $p = .32$, was smaller than that within negative-interdependence conditions (Condition 3: M = 3.83; SD = 0.67; Condition 4: M = 3.27; SD = 0.74), $t(262) = 6.42$, $p < .001$, $|d| = 0.79$. This pattern was the same for individualistic perceptions (see Figure 11): the difference between high- and low-competence conditions within positive-interdependence conditions (Condition 1: M = 2.65; SD = 0.79; Condition 2: M = 2.51; SD = 0.82), $t(234) = 1.38$,

p = .17, was smaller than that within negative-interdependence conditions (Condition 3: M = 3.13; SD = 0.77; Condition 4: M = 2.63; SD = 0.82), $t(262) = 5.12$, $p < .001$, $|d| = 0.63$.

Socio-cognitive conflict regulation. Excluding the three outliers, Model 1 revealed that no significant covariate. In Model 2, MANOVA results showed a significant multivariate omnibus for competence, Wilks' $\lambda = 0.77$, $F(4, 494) = 37.66$, $p < .001$, $\eta_p^2 = 0.23$, social interdependence, Wilks' $\lambda = 0.87$, $F(4, 494) = 18.18$, $p < .001$, $\eta_p^2 = 0.13$, and the competence × social interdependence interaction, Wilks' $\lambda = 0.94$, $F(4, 494) = 7.36$, $p < .001$, $\eta_p^2 = 0.06$.

The between-subject test for competence was marginally significant for constructive-epistemic regulation, $F(1, 497) = 3.67$, $p = .06$, $\eta_p^2 = 0.01$. And, the between-subject tests for competence were significant for concurrence-seeking epistemic regulation, $F(1, 497) = 20.69$, $p < .001$, $\eta_p^2 = 0.04$, competitive-relational regulation, $F(1, 497) = 80.36$, $p < .001$, $\eta_p^2 = 0.14$, and protective-relational regulation, $F(1, 497) = 60.51$, $p < .001$, $\eta_p^2 = 0.11$. Specifically, the high-competence conditions (Conditions 1, 3; M = 3.74, SD = 0.84) showed lower constructive-epistemic regulation than the low-competence conditions (Conditions 2, 4; M = 3.90, SD = 0.72). However, the result about constructive-epistemic regulation should be interpreted with caution, as the between-subject test was only marginally significant. Next, the high-competence conditions (Conditions 1, 3) showed lower concurrence-seeking epistemic (M = 2.53, SD = 0.87) and protective-relational (M = 2.04, SD = 0.77) regulations than the low-competence conditions (Conditions 2, 4; concurrence-seeking epistemic: M = 2.88, SD = 0.79; protective relational: M = 2.60, SD = 0.85). However, the high-competence conditions (Conditions 1, 3) showed higher competitive-relational regulation (M = 3.35, SD = 0.82) than the low-competence conditions (Conditions 2, 4; M = 2.71, SD = 0.80).

The between-subject tests for social interdependence were significant for constructive-epistemic regulation, $F(1, 497) = 27.01$, $p < .001$, $\eta_p^2 = 0.05$, concurrence-seeking epistemic regulation, $F(1, 497) = 11.86$, $p = .001$, $\eta_p^2 = 0.02$, competitive-relational regulation, $F(1, 497) = 66.03$, $p < .001$, $\eta_p^2 = 0.12$, but this test was not significant for protective-relational regulation, $F(1, 497) = 0.01$, $p = .94$, $\eta_p^2 < 0.001$. Specifically, the positive-interdependence conditions (Conditions 1, 2) showed higher constructive-epistemic ($M = 4.00$, $SD = 0.68$) and concurrence-seeking epistemic ($M = 2.85$, $SD = 0.84$) regulations than the negative-interdependence conditions (Conditions 3, 4; constructive-epistemic: $M = 3.65$, $SD = 0.83$; concurrence-seeking epistemic: $M = 2.58$, $SD = 0.85$). However, the positive-interdependence conditions (Conditions 3, 4; $M = 2.73$, $SD = 0.79$) showed lower competitive-relational regulation than positive-interdependence conditions (Conditions 1, 2; $M = 3.30$, $SD = 0.85$).

The between-subject tests for the competence × social interdependence interaction were significant for constructive-epistemic regulation, $F(1, 497) = 20.60$, $p < .001$, $\eta_p^2 = 0.04$, and competitive-relational regulation, $F(1, 497) = 5.27$, $p = .02$, $\eta_p^2 = 0.01$. However, the between-subject tests for the competence × social interdependence interaction were not significant for concurrence-seeking epistemic regulation, $F(1, 497) = 0.06$, $p = .81$, $\eta_p^2 < 0.001$, and protective-relational regulation, $F(1, 497) = 1.27$, $p = .26$, $\eta_p^2 = 0.003$. Specifically, within positive-interdependence conditions, constructive-epistemic regulation was higher in the high-competence condition ($M = 4.09$, $SD = 0.60$) than in the low-competence condition ($M = 3.92$, $SD = 0.74$), $t(234) = 1.94$, $p = .05$, $|d| = 0.25$. However, within negative-interdependence conditions, constructive-epistemic regulation was higher in the low-competence condition ($M = 3.87$, $SD = 0.70$) than in the high-competence condition ($M = 3.44$, $SD = 0.90$), $t(253.49) = 4.39$, $p < .001$, $|d| = 0.53$ (Figure 12). For competitive-relational regulation (see Figure 13), the

difference between high- and low-competence conditions within positive-interdependence conditions (Condition 1: $M = 2.97$; $SD = 0.71$; Condition 2: $M = 2.51$; $SD = 0.80$) was smaller, $t(234) = 4.59$, $p < .001$, $|d| = 0.61$, than that within negative-interdependence conditions (Condition 3: $M = 3.68$; $SD = 0.77$; Condition 4: $M = 2.91$; $SD = 0.75$), $t(263) = 8.19$, $p < .001$, $|d| = 1.01$.

Achievement goals. Excluding the three outliers, Model 1 revealed that gender and ethnicity were significant predictors among the covariates. In Model 2, controlling for the effects of gender and ethnicity, MANCOVA results showed a significant multivariate omnibus for competence, Wilks' $\lambda = 0.81$, $F(5, 490) = 23.01$, $p < .001$, $\eta_p^2 = 0.19$, social interdependence, Wilks' $\lambda = 0.91$, $F(5, 490) = 9.56$, $p < .001$, $\eta_p^2 = 0.09$, and the competence × social interdependence interaction, Wilks' $\lambda = 0.98$, $F(5, 490) = 2.31$, $p = .04$, $\eta_p^2 = 0.02$.

The between-subject tests for competence were significant for mastery-approach goals, $F(1, 494) = 4.06$, $p = .045$, $\eta_p^2 = 0.01$, mastery-avoidance goals, $F(1, 494) = 84.43$, $p < .001$, $\eta_p^2 = 0.15$, performance-approach goals, $F(1, 494) = 8.99$, $p = .003$, $\eta_p^2 = 0.02$, performance-avoidance goals, $F(1, 494) = 12.30$, $p < .001$, $\eta_p^2 = 0.02$, and work-avoidance goals, $F(1, 494) = 4.61$, $p = .03$, $\eta_p^2 = 0.01$. Specifically, the high-competence conditions (Conditions 1, 3) showed higher mastery-approach ($M = 4.35$, $SD = 0.70$) and performance-approach ($M = 3.64$, $SD = 0.94$) goals than the low-competence conditions (Conditions 2, 4; mastery approach: $M = 4.21$, $SD = 0.75$; performance approach: $M = 3.37$, $SD = 0.87$). In contrast, the low-competence conditions (Conditions 2, 4) showed higher mastery-avoidance ($M = 3.73$, $SD = 0.93$), performance-avoidance ($M = 3.77$, $SD = 0.90$), and work-avoidance ($M = 2.31$, $SD = 1.04$) goals than the high-competence conditions (Conditions 1, 3; mastery avoidance: $M = 2.96$, $SD = 0.96$; performance avoidance: $M = 3.52$, $SD = 0.84$; work avoidance: $M = 2.12$, $SD = 0.93$).

The between-subject tests for social interdependence were marginally significant for mastery-avoidance goals, $F(1, 494) = 2.71$, $p = .10$, $\eta_p^2 = 0.01$, and significant for performance-approach goals, $F(1, 494) = 37.24$, $p < .001$, $\eta_p^2 = 0.07$, whereas they were non-significant for mastery-approach goals, $F(1, 494) = 0.01$, $p = .95$, $\eta_p^2 < 0.001$, performance-avoidance goals, $F(1, 494) = 0.48$, $p = .49$, $\eta_p^2 = 0.001$, and work-avoidance goals, $F(1, 494) = 0.44$, $p = .51$, $\eta_p^2 = 0.001$. Specifically, the negative-interdependence conditions (Conditions 3, 4) showed higher mastery-avoidance ($M = 3.39$, $SD = 1.01$) and performance-approach ($M = 3.73$, $SD = 0.86$) goals than the positive-interdependence conditions (Conditions 1, 2; mastery avoidance: $M = 3.29$, $SD = 1.03$; performance approach: $M = 3.25$, $SD = 0.90$). However, the result about mastery-avoidance goals should be interpreted with caution, as the between-subject test was only marginally significant.

The between-subject tests for the competence × social interdependence interaction was significant for performance-approach goals, $F(1, 494) = 7.72$, $p = .01$, $\eta_p^2 = 0.02$, and marginally significant for performance-avoidance goals, $F(1, 494) = 3.26$, $p = .07$, $\eta_p^2 = 0.01$. Mastery-approach goals, $F(1, 494) = 1.12$, $p = .29$, $\eta_p^2 = 0.002$, mastery-avoidance goals, $F(1, 494) = 0.09$, $p = .77$, $\eta_p^2 < 0.001$, and work-avoidance goals, $F(1, 494) = 0.09$, $p = .76$, $\eta_p^2 < 0.001$, did not show significant results from the interaction. Specifically, for performance-approach goals (see Figure 14), the difference between high- and low-competence conditions within positive-interdependence conditions (Condition 1: $M = 3.26$, $SD = 0.94$; Condition 2: $M = 3.24$, $SD = 0.87$), $t(235) = 0.17$, $p = .87$, was smaller than that within negative-interdependence conditions (Condition 3: $M = 3.96$; $SD = 0.81$; Condition 4: $M = 3.51$; $SD = 0.85$) , $t(262) = 4.48$, $p < .001$, $|d| = 0.55$. In contrast, for performance-avoidance goals (see Figure 15), the difference between high- and low-competence conditions within positive-interdependence conditions (Condition 1:

M = 3.41; *SD* = 0.88; Condition 2: *M* = 3.81; *SD* = 0.89), *t*(265) = 3.52, *p* = .001, |*d*| = 0.45, was larger than that within negative-interdependence conditions (Condition 3: *M* = 3.61; *SD* = 0.81; Condition 4: *M* = 3.74; *SD* = 0.91), *t*(262) = 1.15, *p* = .25. However, the result about performance-avoidance goals should be interpreted with caution, as the between-subject test for the interaction was only marginally significant.

Critical reasoning. Excluding the two outliers, Model 1 revealed that there was no significant predictor among the covariates. In Model 2, ANOVA results did not show a significant between-subject test for competence, *F*(1, 498) = 0.90, *p* = .34, η_p^2 = .002, but did show a significant between-subject test for social interdependence, *F*(1, 498) = 13.25, *p* < .001, η_p^2 = .03. Specifically, the positive-interdependence conditions (Conditions 1, 2) showed higher critical reasoning (*M* = 3.93, *SD* = 0.67) than the negative-interdependence conditions (Conditions 3, 4; *M* = 3.70, *SD* = 0.72).

The ANOVA results showed a significant between-subject test for the competence × social interdependence interaction, *F*(1, 498) = 12.86, *p* < .001, η_p^2 = .03. Within positive-interdependence conditions, critical reasoning was higher in the high-competence condition (Condition 1; *M* = 4.01, *SD* = 0.65) than in the low-competence condition (Condition 2; *M* = 3.86, *SD* = 0.68), *t*(234) = 1.88, *p* = .06, |*d*| = 0.24. However, within negative-interdependence conditions, critical reasoning was higher in the low-competence condition (Condition 4; *M* = 3.85, *SD* = 0.64) than in the high-competence condition (*M* = 3.57, *SD* = 0.77), *t*(264) = 3.21, *p* = .002, |*d*| = 0.40 (Figure 16).

Discussion

In Study 1, I aimed to replicate the Pilot Study's findings using the new measures of socio-cognitive conflict regulation with the four revised items. Plus, I aimed to ensure

measurement invariance for the factor structure of the 2 × 2 socio-cognitive conflict regulation model over gender and ethnicity, using multi-group confirmatory factor analyses. In this section, I overview the findings from Study 1 briefly, address how the results are similar to or different from those in Pilot Study, and then proceed to discuss what needs to be revised, replicated, and further investigated in Study 2. Broader implications of this research for theory, research, and practice are addressed in General Discussion (Chapter 7).

RQ 1-1 (replication of Pilot RQ 1): Does the 2 × 2 model consisting of constructive-epistemic, concurrence-seeking epistemic, competitive-relational, and protective-relational regulation subscales fit the data well?

Most of the pilot study's results following the three stated objectives were replicated in Study 1. First, the measure of four-factor model of socio-cognitive conflict regulation fit the data well with good internal consistency of each factor, even with the several revised items since Pilot Study. Second, the mean scores of concurrence-seeking epistemic and protective-relational regulations were operative. Intercorrelations among different regulation types were consistent with the hypotheses in general. Third, each of the regulation types was differentially correlated with antecedent variables.

Factor structure and internal consistencies. As in Pilot Study, EFA supported that each of the regulations in the hypothesized 2 × 2 model represent distinct constructs, with one exception of one of the concurrence-seeking epistemic regulation items (i.e., "I would accept the other employee's opinion without worrying about my original idea."). The EFA showed that this item was more loaded onto the factor of protective-relational regulation. At the conceptual level, "without worrying about my original idea" could be interpreted as not caring about the problem, which overlaps with protective-relational regulation because it can emphasize ignoring the

conflict and disengaging in the discussion or debate. Thus, for Study 2, I revised the item by addressing epistemic concerns more directly but a passive way of regulation (see Table 3), which is "I easily substituted other students' ideas for my own."

After excluding that item, the EFA, the CFA, and reliability data indicate that the four socio-cognitive conflict regulation measures represent empirically separable and internally consistent ($\alpha s \geq .83$) variables, which is additional evidence of the validity of a 2 × 2 regulation model along with the pilot study's findings. Furthermore, to achieve even better model fit, I revised one more concurrence-seeking epistemic regulation (i.e., "I would go along with the other employee's idea without hesitation.") for Study 2, because it showed a slightly high factor loading for protective-relational regulation ($\lambda = .31$) while also maintaining a highest factor loading for concurrence-seeking epistemic regulation ($\lambda = -.51$). One possible reason may be that this item does not clearly include the content about epistemic concern, so it could overlap with the concept of protective-relational regulation in terms of passive regulating behavior. Thus, I revised the item by more clearly addressing passive regulating styles for epistemic concerns, which is "I freely replaced my opinion with other students'."

Descriptive statistics and intercorrelations among conflict regulations. As in Pilot Study, the means for concurrence-seeking epistemic and protective-relational regulations were lower than the scale midpoint, but the mean for concurrence-seeking epistemic regulation was higher than that for protective-relational regulation. Mean comparisons by condition showed the possibility that manipulations by competence level and social interdependence leads to different types of socio-cognitive conflict regulation. As found in Pilot Study, constructive-epistemic regulation was highest when participants were competent and their goals were cooperative. Concurrence-seeking epistemic regulation was highest when participants were incompetent and

their goals were cooperative. Competitive-relational regulation was highest when participants were competent and their goals were competitive. Lastly, unlike the pilot study, protective-relational regulation was highest when participants were incompetent and their goals were competitive, as predicted based on the proposed model. Thus, the descriptive statistics in Study 1 supports the proposed model of regulation more, but it needs to be tested with inferential statistics (e.g., MANOVAs) for more rigorous evidence (RQ 1-3).

The intercorrelations among different types of conflict regulation were replicated, except for the correlation between competitive-relational and protective-relational regulations. Both Pilot Study and Study 1 showed that constructive-epistemic regulation was negatively correlated with competitive-relational regulation and protective-relational regulation. One notable finding was that negative correlation between constructive-epistemic and competitive-relational regulation was stronger in Study 1 (r = -.46) than that in Pilot Study (r = -.14), suggesting that their negative correlation is more supported. This finding, however, is inconsistent with the prior findings where there were significantly positive correlations between epistemic and competitive-relational regulation (e.g., Darnon et al., 2006; Saltarelli & Roseth, 2014). This inconsistency is less likely to be from the item revisions in the present study, because the item contents had not been conceptually changed from the original items (see Table 5). It may be originated from a non-shared antecedent of social interdependence, as suggested by the proposed model in this study: constructive-epistemic regulation is associated with positive interdependence, but competitive-relational regulation is associated with negative interdependence. Another possible reason is different contexts of studies because the contexts of previous studies were laboratories or online college course, which were different from a hypothetical workplace in the present study. In Study 2, the context of study was a real classroom where students were interacting with

each other in person which is different from that in Study 1, so I focused on whether the correlation between these two regulation types was also replicated in Study 2, and discussed their correlation in different contexts in more depth.

Consistent with the findings in Pilot Study, concurrence-seeking epistemic regulation was negatively correlated with competitive-relational regulation but positively correlated with constructive-epistemic and protective-relational regulations. Again, consistent with the finding in Pilot Study, the positive correlation between concurrence-seeking epistemic and protective-relational regulations was strong (r = .54), but these two were differentiated by the correlation with constructive-epistemic regulation. Concurrence-seeking epistemic regulation was positively correlated with constructive-epistemic regulation (r = .21), whereas protective-relational regulation was negatively correlated with constructive-epistemic regulation (r = -.14).

Unlike the finding from Pilot Study (r = -.24), competitive-relational regulation was not significantly correlated with protective-relational regulation (r = -.06). The Study 1's finding is not consistent with the prior findings showing the significantly negative correlations (Study 3 in Sommet et al., 2014; Study 1 and 3 in Sommet et al., 2015), although one prior study showed a non-significant correlation using a behavioral measure (i.e., occurrences of actual regulation behaviors; Study 4 in Sommet et al., 2015) instead of a self-reported measure. Considering the conceptual meanings of each type of regulation, they have both shared and non-shared antecedents. Both regulations may be more positively related to one's competitive perceptions, whereas they may also be differentiated by the relation to one's perceived competence level. Under competitive contexts, when one's perceived competence is high, one tends to engage more in competitive-relational regulation, whereas when one's perceived competence is low, one tends to engage more in protective-relational regulation. This suggests that these two regulations can

be related either positively or negatively, which might be canceled out to each other, leading to the non-significant correlation in Study 1. In Study 2, it needs to focus on how these two regulations are correlated to each other in a real classroom setting.

Correlations between conflict regulations and antecedent and consequence variables. The intercorrelations between each type of regulation and competence-related and social-interdependence variables were largely replicated, suggesting perceived competence and social interdependence are linked to the 2 × 2 conflict regulations. Specifically, constructive-epistemic (r = .08) and competitive-relational (r = .38) regulations may emerge from higher perceived competence, with a more strongly positive correlation for the competitive-relational regulation, whereas concurrence-seeking epistemic (r = -.24) and protective-relational (r = -.47) regulations may emerge from lower perceived competence, with a more strongly negative correlation for the protective-relational regulation. These correlation patterns were also found in Pilot Study.

Competence threat was also differentially correlated with different types of regulation. It negatively related with constructive-epistemic regulation only, but it positively related with the other three types of regulation. In Pilot Study, competence threat was significantly negatively correlated with only concurrence-seeking epistemic and protective-relational regulations, and non-significantly correlated with the other two types of regulation. In Study 1 with a larger sample, however, all types of regulation showed significant correlations with competence threat. This finding suggests that only constructive-epistemic regulation is negatively associated with concerns about relative competence, whereas the other three types of regulation may be associated with concerns about competence threats (as opposed to concerns about understandings), specifically concerns about competence relative to others.'

It is noteworthy that competence threat was stronger for protective-relational (r = .42) and competitive-relational (r = .25) regulations than concurrence-seeking epistemic regulation (r = .13), although competitive-relational regulation was associated with higher perceived competence and concurrence-seeking epistemic regulation was associated with lower perceived competence. This suggests that concurrence-seeking epistemic regulation may be less originated from social concerns such as competence threat than protective-relational and competitive-relational regulations, which is in line with the proposed model of conflict regulation, as concurrence-seeking epistemic regulation is expected to be more prevalent under cooperative contexts, so it may be less related with concerns about social comparison. In contrast, competitive-relational regulation may be positively associated with competence threat although it is also positively associated with higher competence, because it stems from concerns about social comparison. Previous work indirectly supports the current finding, in that Sommet et al. (2015) found that performance-approach goals were associated with more competitive-relational regulation when the partner's competence was higher than when it was equal or lower, and performance-avoidance goals were associated with protective-relational regulation when the partner's competence was higher than when it was equal or lower. Both the previous and current findings suggest that concerns about others' higher competence are associated with competitive-relational and protective-relational regulations.

Regarding social interdependence as an antecedent, consistent with the pilot data, constructive-epistemic (r = .69) and concurrence-seeking epistemic (r = .24) regulations may emerge from higher cooperative perceptions, with a stronger correlation for the constructive-epistemic regulation, whereas competitive-relational (r = -.33) and protective-relational (r = -.17) regulations may emerge from lower cooperative perceptions, with a more strongly negative

correlation for the competitive-relational regulation. As also in Pilot Study, competitive-relational regulation may emerge from higher competitive perceptions (r = .69), whereas the other three types of regulations may emerge from lower competitive perceptions, with a stronger correlation for the constructive-epistemic regulation (r = -.25). Lastly, competitive-relational (r = .52) and protective-relational (r = .10) regulations may emerge from higher individualistic perceptions, with a stronger correlation for the competitive-relational regulation, whereas constructive-epistemic (r = -.50) and concurrence-seeking epistemic (r = -.24) regulations may emerge from lower individualistic perceptions, with a more strongly negative correlation for the constructive-epistemic regulation.

These correlations between socio-cognitive conflict regulations and social interdependence suggest that cooperative perceptions are strongly associated with constructive-epistemic regulation, and competitive and individualistic perceptions are strongly associated with competitive-relational regulation, which is consistent with prior findings (Roseth et al., under review; Saltarelli & Roseth, 2014). Interestingly, both Pilot Study and Study 1's findings suggest that protective-relational regulation may be negatively associated with competitive (and cooperative) perceptions, but positively associated with individualistic perceptions. This suggests that the label of horizontal dimension may need to be re-considered. The proposed model's horizontal dimension was *negative* interdependence vs. *positive* interdependence, but Study 1's findings suggests that it may be more accurate to label no interdependence vs. positive interdependence, since individualistic perceptions were positively associated with protective-relational regulation, and competitive perceptions were negatively associated with protective-relational regulation. Or, both negative and no interdependence can be considered, with negative

interdependence representing the upper left quadrant, and no interdependence representing the bottom left quadrant. More discussion regarding this is addressed later in General Discussion.

Lastly, cooperative perceptions were associated with concurrence-seeking epistemic regulation, but this association was weaker than the association between cooperative perceptions and constructive-epistemic regulation. Both competitive and individualistic perceptions were negatively associated with concurrence-seeking epistemic regulation, which was consistent with the proposed model. Especially, the negative correlation between concurrence-seeking epistemic regulation and individualistic perceptions was not significant in the pilot data, but it was significant in Study 1. Thus, this finding provides additional support for how the new type of regulation, concurrence-seeking epistemic regulation, is differentiated from protective-relational regulation: both types of regulation were positively associated with lower perceived competence, but they were associated with their perceptions of cooperation and individualism in the opposite directions, which supports the needs for the differentiation between these two passive types of conflict regulation.

Achievement goals have been considered as antecedents of socio-cognitive conflict regulation in prior literature (e.g., Darnon et al., 2006; Sommet et al., 2014, 2015): mastery-approach goals are more associated with epistemic (constructive-epistemic) regulation; performance-approach goals are more associated with competitive-relational regulation; and performance-avoidance goals are more associated with protective-relational regulation. Consistent with prior findings, constructive-epistemic regulation was only positively correlated with mastery-approach goals (r = .50). However, it was negatively correlated with concurrence-seeking epistemic (r = -.14) and protective-relational (r = -.41) regulations, with a more strongly negative correlation for the protective-relational regulation. Again, consistent with prior findings,

competitive-relational regulation was only positively correlated with performance-approach goals (r = .66), but negatively correlated with the other types of conflict regulation. These consistent findings support the validity of the new measure in relation to mastery-approach and performance-approach goals.

Unexpectedly, performance-avoidance goals were positively correlated with all types of conflict regulation to the similar extent (rs = .12 to 16), which is inconsistent with the prior findings that performance-avoidance goals were relatively strongly positively correlated with protective-relational regulation (Sommet et al., 2014, 2015). Instead, the current finding showed that work-avoidance goals were more positively correlated with protective-relational regulation (r = .63) than concurrence-seeking epistemic (r = .41) and competitive-relational (r = .19) regulations, but work-avoidance goals were negatively correlated with constructive-epistemic regulation. The correlations between conflict regulations and work-avoidance goals were consistent with the hypotheses. The items of protective-relational regulation have been revised by focusing more on protecting one's competence by disengaging from the conflict, which is different from Sommet et al.'s (2014, 2015) original items that address complying with others' opinion in a broader way. The revision on protective-relational regulation might lead to a stronger correlation with work-avoidance goals that aim to reduce the amount of effort into the task, than performance-avoidance goals. Although concurrence-seeking epistemic regulation also showed a positive correlation with work-avoidance goals (r = .41), its correlation extent was weaker than that between protective-relational regulation and work-avoidance goals (r = .63). Concurrence-seeking epistemic and protective-relational regulations may also be differentiated from each other, in that protective-relational regulation was more strongly negatively correlated with mastery-approach goals (r = -.41) than concurrence-seeking epistemic regulation (r = -.14).

Lastly, mastery-avoidance goals were negatively correlated with competitive-relational regulation only, whereas mastery-avoidance goals were positively correlated with the other three types of regulation. The nature of mastery-avoidance goals, concerns about learning (i.e., cognitive concerns) and avoidance-oriented motivation, is opposite to the nature of competitive-relational regulation, concerns about relative competence (i.e., social concerns) and approach-oriented motivation, which may lead to the negative correlation between mastery-avoidance goals and competitive-relational regulation. In contrast, the concerns about learning in mastery-avoidance goals may lead to positive correlations with constructive-epistemic regulation, and the avoidance-oriented motivation in mastery-avoidance goals may lead to positive correlations with protective-relational regulation. And, both the concerns about learning and avoidance-oriented motivation in mastery-avoidance goals may lead to the positive correlation with concurrence-seeking epistemic regulation.

Overall, achievement goals function as antecedents of different types of conflict regulation in consistent directions with prior findings, except for performance-avoidance goals. Mastery-approach goals may be a unique antecedent of constructive-epistemic regulation, whereas performance-approach and mastery-avoidance goals may be unique antecedents of competitive-relational regulation. Work-avoidance goals may be a unique antecedent of protective-relational regulation. Concurrence-seeking epistemic regulation showed relatively less unique patterns of correlations with different achievement goals, but they were also fairly differentiated from the correlations between other types of regulation and achievement goals. These consistent findings with the prior ones are meaningful because the current findings resulted from the fact that the measures of conflict regulation have been revised to separate regulation *behavior* from regulating *motivation*. This helps clarify the relations between socio-

cognitive conflict regulation and achievement goals as antecedents, as the similar correlation patterns were remained without some shared measure variance in terms of underlying motivation. However, the correlation results from performance-avoidance goals were quite different from the previous findings, due to the revised measure of protective-relational regulation at least in part. Therefore, I continued to examine their relations in Study 2.

Finally, critical reasoning was found to be positively correlated with cooperation-based regulations including constructive-epistemic and concurrence-seeking epistemic regulations, whereas it was found to be negatively correlated with competition-based regulations including competitive-relational and protective-relational regulations. Importantly, constructive-epistemic regulation was strongly correlated with critical reasoning the most, suggesting constructive-epistemic regulation may be a stronger predictor for critical reasoning than the other types of conflict regulation. It also should be noted that concurrence-seeking epistemic regulation was positively correlated with critical reasoning, although this type of regulation was related to lower perceived competence. This suggests that concurrence-seeking epistemic regulation may also be associated with concerns about the problem itself and critical thinking, so it is appropriate to be understood as part of "epistemic" regulation. In contrast, competition-based regulations including competitive-relational and protective-relational regulations were negatively correlated with critical reasoning, despite the fact that competitive-relational regulation was still positively correlated with perceived competence. These two types of regulations are more related to demonstrating one's competence or avoiding showing one's incompetence, so these regulations are negatively related to concerns about the problem itself (as opposed to concerns about social competence) through critical reasoning. In Study 2, I continued to focus on whether these findings were replicated in real classrooms, especially on whether the positive correlation

between critical reasoning and concurrence-seeking epistemic regulation and negative correlation between critical reasoning and competitive-relational regulation were replicated.

RQ 1-2: Is the four-factor model of socio-cognitive conflict regulation invariant across students' gender and ethnicity?

A series of multi-group CFAs revealed that there is measurement and structural invariance across different groups of gender and ethnicity. Support for the series of models indicate that, across different gender and ethnic groups, the hypothesized patterns of fixed and free factor loadings (i.e., the items for each regulation load only on their respective latent factor) are the same (i.e., configural invariance), common factors have the same meaning (i.e., weak invariance), the items have the same intercepts (i.e., strong invariance), the items are equally reliable (i.e., strict invariance), and factor correlations are the same (i.e., factor variances/covariances invariance). In short, strong evidence for invariance across gender and ethnicity was observed, which supports the generalizability of the structure of socio-cognitive conflict regulation over gender and ethnicity. This suggests that the new scales measure the same constructs for everyone regardless of their gender and ethnicity, leading to its utility for a broader population. I conducted measurement tests again with undergraduates in an actual class setting to determine whether the new scales work for students in real classrooms to support the measurement validity of the new scales with further evidence of measurement invariance.

RQ 1-3: How do a variety of outcomes differ among four different conditions depending on the perceptions of competence and social interdependence?

Competence and social interdependence. The MANCOVA results about perceived competence and competence threat were replicated, meaning the high-competence conditions

showed higher perceived competence and lower competence threat than the low-competence conditions. Unlike the finding from the pilot study, there was a significant interactive effect of competence and social interdependence on competence threat. The negative-interdependence conditions led to a higher level of competence threat than the positive-interdependence conditions, but the difference between two different interdependence conditions was smaller when participants' competence was low. In other words, when participants' competence was low, their competence threat was similarly high under the positive- and negative-interdependence conditions, whereas when participants' competence was high, their competence threat was much lower under the positive interdependence condition than the negative interdependence condition. This finding is in line with social interdependence theory (Johnson & Johnson, 2005a, 2009a), in that under negative interdependence, others' success means one's failure, so one may be more threatened by others' competence, and this threat may be even worse when one is incompetent about the task. In contrast, under positive interdependence, others' success means one's success, so other's competence does not necessarily threaten one's competence. But when one is incompetent, one's competence threat may still be increased under positive interdependence.

The MANOVA results about perceptions of social interdependence were replicated. The main effects of both competence and social interdependence were replicated, and the main effect of competence on individualistic perceptions was additionally found. This indicates that social interdependence was well manipulated, and participants in the high-competence conditions showed higher competitive and individualistic perceptions than participants in the low-competence conditions. High competence may trigger behaviors of competing with others or completing the task independently through more dominant- or approach-based motivation (Cohen & Lazarus, 1979).

The interactive effects of competence and social interdependence on cooperative and competitive perceptions were also replicated. Specifically, the effect of positive-interdependence conditions on cooperative perceptions and the effect of negative-interdependence conditions on competitive perceptions were more salient for competent participants than incompetent participants: when participants were in the low-competence conditions, their cooperative and competitive perceptions were not much different between the positive- and negative-interdependence conditions. Unlike the finding from the pilot study, there was also an interactive effect on individualistic perceptions, which showed the same pattern as that of competitive perceptions: the negative-interdependence conditions led to a higher level of individualistic perceptions than the positive-interdependence conditions, but it was not always the case when participants' perceived competence was low. When participants were in the low-competence conditions, their individualistic perceptions were similarly low across positive- and negative-interdependence conditions.

These results suggest that the effects of social interdependence may be more sensitive to competent students than incompetent students. If they are not competent about the task, their immediate concern may be their personal competence level rather than social context, so incompetent participants may be less influenced by social context. This may result in incompetent participants' higher cooperative perceptions than competent ones' cooperative perceptions under the negative-interdependence condition, and incompetent participants' lower competitive and individualistic perceptions than competent ones' competitive and individualistic perceptions under positive-interdependence condition.

Socio-cognitive conflict regulation. The MANOVA results about four types of socio-cognitive conflict regulation were replicated, as there were the main effects of competence on

concurrence-seeking epistemic, competitive-relational, and protective-relational regulations, the main effects of social interdependence on concurrence-seeking epistemic and competitive-relational regulations, and the interactive effects on constructive-epistemic and competitive-relational regulations. In Study 1, there were additional significant main effects on constructive-epistemic regulation: there were a marginally significant main effect of competence and a significant main effect of social interdependence.

First, the main effects of competence on conflict regulations were in line with the proposed model except for constructive-epistemic regulation: competent participants showed higher engagement in competitive-relational regulation than incompetent participants, whereas incompetent participants showed higher engagement in concurrence-seeking epistemic and protective-relational regulations than competent participants. Surprisingly, incompetent participants engaged more in constructive-epistemic regulation than competent participants, but this result should be interpreted with caution for two reasons. First, this finding was only marginally significant (p = .06). Second, there was a significant interactive effect of competence and social interdependence on constructive-epistemic regulation, as in Pilot Study. Specifically, competent participants showed slightly higher constructive-epistemic regulation under the positive-interdependence condition, but they rather showed lower constructive-epistemic regulation than incompetent participants under the negative-interdependence condition. Thus, the marginally significant main effect of competence on constructive-epistemic regulation is not discussed in depth, but the interactive effect should be more considered in this discussion.

Second, the main effects of social interdependence were also in line with the proposed model: the positive-interdependence conditions showed higher constructive-epistemic and concurrence-seeking epistemic regulations and lower competitive-relational regulation than the

negative-interdependence conditions. However, there was still no significant effect of social interdependence on protective-relational regulation. Considering the positive correlation between protective-relational regulation and individualistic perceptions (see Table 17), it is possible that individualistic perceptions may be a critical factor for protective-relational regulation, instead of cooperative or competitive perceptions. The relation between individualistic context and protective-relational regulation should be investigated in future study using randomized experimental design.

Finally, the interactive effects of competence and social interdependence were replicated. There were significant interactions only for constructive-epistemic and competitive-relational regulations which are related to one's high competence, and the specific interaction patterns were the same as those in the pilot data. For the incompetence-based regulating types, there were only main effects of competence, but there was an additional main effect of social interdependence on concurrence-seeking epistemic regulation. This suggests that concurrence-seeking epistemic regulation may be differentiated from protective-relational regulation in terms of the perceptions of social interdependence as one of the antecedents: the positive-interdependence conditions led to a higher engagement in concurrence-seeking epistemic regulation than the negative-interdependence conditions, whereas there was no difference in protective-relational regulation engagement between different conditions of social interdependence. Therefore, both concurrence-seeking epistemic and protective-relational regulations may emerge from lower perceived competence, but only concurrence-seeking epistemic regulation may emerge from the positive-interdependence conditions (e.g., cooperative contexts).

Achievement goals. As expected, the MANCOVA results showed that there were significant main effects of competence on all types of achievement goals. All approach-based

goals were higher in the high-competence conditions than the low-competence conditions, whereas all avoidance-based goals were higher in the low-competence conditions than the high-competence conditions. When individuals perceive themselves to have enough abilities to deal with the task or situation, they consider it as a challenge and focus on approaching a possible gaining (Cohen & Lazarus, 1979), which is in line with approach-based goals, such as mastery-approach and performance-approach goals. In contrast, when individuals perceive themselves to have limited abilities to deal with the task or situation, they consider it as a threat and focus on avoiding losing what they already have (Cohen & Lazarus, 1979), which is in line with avoidance-based goals, such as mastery-avoidance, performance-avoidance, and work-avoidance goals.

Next, the MANCOVA results showed there were significant main effects of social interdependence on only performance-approach goals and mastery-avoidance goals. First, higher performance-approach goals in the negative-interdependence conditions than positive-interdependence conditions are in line with previous findings, because performance-approach goals were found to be higher for students in traditional lecture-style classrooms than those in cooperative learning classrooms (Summers & Svinicki, 2007). Under competitive contexts, students might tend to compare themselves to others and aim to perform better than others, leading them to focus more on norm-based evaluation, which in turn increases their endorsement of performance-approach goals (Elliot et al., 2016).

Surprisingly, the negative-interdependence conditions also showed higher mastery-avoidance goals than positive-interdependence conditions. In fact, Elliot and his colleagues (2016) also found the similar relation between a competitive attitude and mastery-avoidance goals in undergraduate courses. One explanation is that task- or self-based goals, such as mastery

goals, may also be increased to facilitate other-based attitudes under competitive contexts (Elliot et al., 2016). According to this explanation, however, mastery-approach goals also need to be higher in the negative-interdependence conditions than the positive-interdependence conditions, but only mastery-avoidance goals were higher in the negative-interdependence conditions. Moreover, this finding was only marginally significant (p = .10). Thus, it needs to be replicated in future study to clarify the relation between the perceptions of social interdependence and mastery-avoidance goals.

Unexpectedly, I did not find significant main effects of social interdependence on mastery-approach and performance-avoidance goals (as well as a significant interactive effect on mastery-approach goals). These non-significant results are not consistent with the prior findings that a cooperative attitude positively predicted mastery-approach goals and a competitive attitude predicted performance-avoidance goals (Elliot et al., 2016). One possible reason for these inconsistent findings might be originated from different research methods. For example, in the current study, I asked participants their feelings about hypothetical workplace situations, but Elliot et al. (2016) measured students' perceptions of their real classrooms and their goals were related to academic tasks. Thus, in Study 2, I focused on the relations between students' perceptions of social interdependence and different types of achievement goals in real classrooms to clarify these mixed findings.

Lastly, the MANCOVA results showed there were significant interactive effects on performance goals, including performance-approach and performance-avoidance goals. Specifically, when participants were competent, their performance-approach goals were higher than incompetent participants,' but this pattern was more salient under the negative-interdependence conditions than the positive-interdependence conditions. When competent

participants were under the positive-interdependence conditions, their performance-approach goals were similarly low to incompetent participants,' because cooperative contexts might buffer participants' concerns about social comparison in general (Hänze & Berger, 2007), regardless of their competence level. In contrast, the competitive contexts may facilitate competent participants' endorsement of performance-approach goals.

When participants were incompetent, their performance-avoidance goals were higher than competent participants.' However, under negative-interdependence condition, competent participants' performance-avoidance goals also increased, because competitive contexts might induce participants' other-based goals in general (Elliot et al., 2016), regardless of their competence level. However, the interactive effect on performance-avoidance goals was only marginally significant (p = .07), and thus it needs to be replicated in future research to clarify the finding.

Critical reasoning. Unexpectedly, the ANOVA results did not show a main effect of competence on critical reasoning, whereas there was a significant main effect of social interdependence. Specifically, the positive-interdependence conditions showed higher critical reasoning than the negative-interdependence conditions, which is in line with social interdependence theory (Johnson & Johnson, 2005a). When goals are positively interdependent, individuals tend to engage in promotive interactions such as higher-level reasoning and perspective taking. In contrast, when goals are negatively interdependent, individuals tend to engage in destructive interactions such as lower-level reasoning and less accurate perspective taking.

Although there was no significant main effect of competence, the results showed a significant interactive effect of competence and social interdependence on critical reasoning.

Specifically, critical reasoning was higher in the positive-interdependence condition in the negative-interdependence condition, but it was the case only when participants were competent. When participants were incompetent, their level of critical reasoning was similar across positive- and negative-interdependence conditions. In other words, under negative-interdependence conditions, competent participants may focus more on competing with or winning others than epistemic concern, so they may show lower critical reasoning although they are competent about the task. Thus, both competence and social interdependence are critical for critical reasoning.

Summary

In sum, the results of Study 1 confirmed validity of both the new model of socio-cognitive conflict regulation and the new type of regulation (i.e., concurrence-seeking epistemic regulation), by replicating the pilot study's findings including factor structure, reliability of each measure, intercorrelations between the measures, and the effects of competence and social interdependence on each type of regulation. I also ensured measurement invariance for the new measures of socio-cognitive conflict regulation across gender and ethnicity. Furthermore, I examined the effects of competence and social interdependence on achievement goals and critical reasoning.

In Study 1, there were several noteworthy results that were not found in the pilot data: (a) the three of four revised items (one for concurrence-seeking epistemic regulation and the other two for protective-relational regulation) worked well, and the revised measure's measurement invariance was ensured; (b) competitive-relational regulation was not significantly correlated with protective-relational regulation; (c) competence threat was negatively correlated with constructive-epistemic regulation, and positively correlated with competitive-relational regulation; (d) individualistic perceptions were negatively correlated with concurrence-seeking

epistemic regulation; (e) achievement goals may function as antecedents of different types of conflict regulation, except for performance-avoidance goals, (f) critical reasoning may function as a consequence of different types of conflict regulation; (g) there were additional significant interactive effects of competence and social interdependence on competence threat and individualistic perceptions; and (h) achievement goals and critical reasoning were also influenced by competence and social interdependence.

In Study 2, in order to replicate the findings or clarify some unclear or mixed findings in Pilot Study and Study 1, I need to focus more on the followings in Study 2: (a) the four-factor structure with the two revised items of concurrence-seeking epistemic regulation (still good fit?); (b) the correlation between competitive-relational and protective-relational regulations (negative or non-significant?); and (c) the relations between competitive/individualistic perceptions and protective-relational regulation to provide implications for the horizontal dimension of the proposed model of socio-cognitive conflict regulation. Most importantly, the main goal of Study 2 is to test the conceptual model of socio-cognitive conflict regulation (Figure 1) outside the experimental condition and in the field.

CHAPTER 6:

Study 2

As an extension of Study 1, the main purpose of Study 2 is provide additional empirical evidence of the internal structure of socio-cognitive conflict regulation in a real classroom setting.

Method

Study 2 was a field study conducted in a college anatomy course, using self-reported measures including the developed measure of socio-cognitive conflict regulation. The sponsoring university's Institutional Review Board (IRB No. x16-258e) approved all study procedures.

Participants

Recruitment and eligibility. I recruited participants by contacting the main instructor who in turn invited students to participate by giving them course credit for their participation. Students who did not agree to participate in this study were provided with an alternative assignment for the course credit. I aimed to collect at least 200 eligible participants because some researchers consider $N = 200$ the minimum sample size for conducting structural equation modeling (Boomsma & Hoogland, 2001; Kline, 2005), although there are substantially various suggestions it (Wolf, Harrington, Clark, & Miller, 2013).

Two hundred fifty four students enrolled in the course. Eligibility criteria included voluntary participation and the signed consent of undergraduate students. Exclusion criteria included those younger than 18 years old and those whose answers were considered insincere (e.g., considerable number of answers were the same in a row).

Context. This study was conducted in laboratories of an introductory anatomy course at a large, public university in the Midwest, in the Spring 2017 semester. This course was required of all pre-medicine and pre-health students, and consisted of two lectures and two laboratories per week, all 75 minutes in length. There were undergraduate students who registered one of 14 lab sections taught by 10 instructors. Six instructors taught one section each, and four instructors taught two sections each. Importantly, students were working with other people in small groups consisting of three or four students throughout all lab sessions over one semester; thus, the students in this lab context were appropriate for this study in that they had experienced weekly peer learning activities in which they were likely to confront peers holding views that differed from their own.

More specifically, in every lab session, the Jigsaw procedure (Aronson, 1978; Johnson, Johnson & Holubec, 2013) was employed throughout one semester. Students met with other students who have been assigned the same part of the topic as a temporary "expert" group (e.g., a group for the students who were assigned to the frontal lobe). They had an opportunity to master their part by studying in their expert group for 10-15 minutes. Next, "jigsaw" groups gathered, and each member played a role as a tutor to the other members for his or her assigned part for 45 minutes. Eventually, every member in the jigsaw group was expected to master every part of the lesson. At the end of every lab session, students took a quiz on the day's lesson, and if their jigsaw group members' average score was 10 points or more (out of 12 points) every group member received one bonus point on each quiz. This quiz achievement over the semester took 8-9% of the final grade for this course.

Demographics. Table 19 presents participants' demographic information. The vast majority was European American or White (n = 193, 84%), 18 to 21 years old (n = 194, 84%),

and used English as their native language (n = 224, 97%). There were more females (n = 142, 62%) than males (n = 87, 38%). More than half of the students had experience with taking anatomy and/or physiology courses in high school (n = 125, 54%), but majority of the students did not have experience with taking a prerequisite undergraduate course (n = 171, 74%) or the same course (n = 190, 83%). The majority considered becoming a pre-health professional (e.g., pre-med, PT, PA, nursing; n = 174, 76%).

Procedure

The Study 2 survey was administered in February of 2017, in week 7 (out of 15 weeks in total) of the spring semester. The decision criteria for this time were (a) students had sufficient experiences with small-group discussion and, (b) there was neither exam nor the Spring Break right before the survey administration. The exam or break could influence students' thoughts and behavior in the classroom and result in different responding patterns from those in usual class periods. Graduate assistants unfamiliar with the study's purpose and hypotheses administered the questionnaires in a lab session.

Measures

Participants responded to the questions about the same variables as those in Study 1, with the exception of work-avoidance goals. Participants also answered questions about perceived conflicts, interpersonal goals, and behavioral engagement and disengagement. All variables were based on scale items ranging from *strongly disagree* (1) to *strongly agree* (5). Items were modified according to the context (i.e., small group activities in lab) of this study, and all questions were about students' experiences during the most recent three labs in order to control

for students' different feelings about specific learning content. Complete items are presented in Appendix D.

Importantly, the prompts of the questions about socio-cognitive conflict regulation were different from those about the other variables because, in order to answer the questions about socio-cognitive conflict regulation, students needed to think about the situation where disagreements occurred when working with others in lab. Accordingly, there were two different versions of the survey, consisting of Part 1 (all questions except for those about socio-cognitive conflict regulation) and Part 2 (questions about socio-cognitive conflict regulation only). Part 1 was asked first for Version 1 survey (n = 116, 50%), and Part 2 was asked first for Version 2 survey (n = 114, 50%), and these two different versions were randomly distributed to the students. Before main analyses, I checked whether there was any significant effect of order of parts on the variables in the survey.

For the structural equation models for RQ 2-3, I ensured validity of measurement models for (a) perceived competence, (b) cooperative perceptions, (c) competitive perceptions, (d) four types of achievement goals, (e) behavioral engagement and disengagement, (f) critical reasoning, and (g) four types of socio-cognitive conflict regulation (as part of RQ 2-1).

Perceived conflicts. Perceived conflicts were assessed following Buchs et al.'s (2010) procedure. There were three items (α = .50) and they asked how much individuals think they confronted different points of view or disagreements while they were working with other people in the lab. Because the existence of perceived conflicts is necessary to induce students' socio-cognitive conflict regulation, students' perceived degree of conflicts (M = 2.79, SD = 0.69) was used as a covariate in the analyses for RQ 2-3, particularly for competitive-relational (r = .16, p = .01) and protective-relational (r = -.19, p = .004) regulations that show significant correlations

with perceived degree of conflicts. However, for the final results and discussion, I focused only on the analyses without this variable, since they showed a low reliability and the main significant findings remained the same as those with this variable.

Competence threat. Competence threat showed good reliability (α = .79).

Perceived competence. The three items of perceived competence showed good reliability (α = .76), and its one-factor measurement model was a saturated model because there were three items. All factor loadings were within an acceptable range (> .66).

Social interdependence. The confirmatory factor analyses (CFAs) were conducted for one-factor measurement models for cooperative perceptions and competitive perceptions separately, because these two constructs were independently included in different structural equation models for RQ 2-3. The one-factor measurement model of cooperative perceptions showed mixed results of fit indices, $\chi^2(5) = 32.77$, $p < .001$, CFI = .94, TLI = .88, RMSEA = .16, SRMR = .06. The factor loadings were within an acceptable range (> .52), except for one of the items (λ = .34; i.e., "I liked sharing my ideas with other students in lab."). Excluding this item, the model fit the data better, $\chi^2(2) = 5.53$, $p = .06$, CFI = .99, TLI = .98, RMSEA = .09, SRMR = .02, and all factor loadings were within an acceptable range (> .51). The four items of cooperative perceptions showed good reliability (α = .82).

The one-factor measurement model of competitive perceptions did not fit the data well, $\chi^2(5) = 50.01$, $p < .001$, CFI = .88, TLI = .77, RMSEA = .20, SRMR = .06. But all factor loadings were within an acceptable range (> .65). Excluding the item whose factor loading was lowest (i.e., "I wanted to do better than other students in lab."), the model fit the data much better, $\chi^2(2) = 8.04$, $p = .02$, CFI = .98, TLI = .93, RMSEA = .12, SRMR = .03, and all factor

loadings were within an acceptable range (> .59). The four items of competitive perceptions showed good reliability (α = .79).

The five items of individualistic perceptions showed good reliability (α = .93).

Socio-cognitive conflict regulation. Socio-cognitive conflict regulation was assessed with the two revised items of concurrence-seeking epistemic regulation based on the results from Study 1 (see Table 3). Reliabilities and model fit are presented in Results.

Achievement goals. The CFA showed that the four-factor measurement model of achievement goals fit the data well, $\chi^2(48) = 82.73$, p = .001, CFI = .96, TLI = .95, RMSEA = .06, SRMR = .06. All factor loadings were within an acceptable range (> .57). Three items of each type of achievement goals showed good reliabilities: mastery-approach goals (α = .68), mastery-avoidance goals (α = .85), performance-approach goals (α = .86), and performance-avoidance goals (α = .73).

Interpersonal goals. Four different types of interpersonal goals were assessed following Dryer and Horowitz's (1997) procedure: friendly goals (α = .57), friendly submissive goals (α = .41), dominant goals (α = .47), and hostile submissive goals (α = .63). There were four items for each subscale, and all items asked about individuals' importance of different goals for interpersonal relationship. However, the low reliabilities for all types of interpersonal goals in the current data were less likely to ensure measurement validity. There was no item that decreases the overall reliability for friendly, friendly submissive, and hostile submissive goals. Only dominant goals showed a slight increase in their reliability if one of the items ("It was important to me to be aggressive when the situation called for it.") was excluded, but it was still not high enough (α = .52). Thus, the responses to interpersonal goals were not used for the analyses in this study.

Behavioral engagement and disengagement. Behavioral engagement and disengagement were assessed following Furrer and Skinner's (2003) procedure. There were five items and they asked how much individuals engaged in course work during group activities. The CFA showed that the two-factor measurement model of behavioral engagement and disengagement did not fit the data well, $\chi^2(34) = 212.14$, $p < .001$, CFI = .78, TLI = .71, RMSEA = .15, SRMR = .08, but all factor loadings were within an acceptable range (> .51). Excluding three items that were suggested by modification indices, or whose factor loadings were low (all items were behavioral disengagement; i.e., "I just acted like I was concentrating in lab," "I didn't try very hard in lab," "I did just enough to get by in lab."), the model fit the data much better, $\chi^2(13) = 57.00$, $p < .001$, CFI = .92, TLI = .87, RMSEA = .12, SRMR = .06, and all factor loadings were within an acceptable range (> .53). The five items of behavioral engagement (α = .79) and the two items of behavioral disengagement (α = .83) showed good reliabilities.

Critical reasoning. The one-factor measurement model of critical reasoning showed mixed results of fit indices, $\chi^2(5) = 17.55$, $p = .004$, CFI = .90, TLI = .81, RMSEA = .10, SRMR = .05. The factor loadings were within an acceptable range in general (> .50), but one of the items showed a somewhat low factor loading (λ = .44; i.e., "I challenged other students' thinking."). However, excluding any of the items considerably decreased the overall reliability, so all of the five items were used for analyses (α = .65).

Data Analyses

As in Study 1, I aimed to validate the independence of the four socio-cognitive conflict regulations, but I focused more on confirmatory factor analyses (CFAs) than exploratory factor analyses (EFAs) for RQ 2-1, because my priori hypothesis about factors or patterns of measured variables was supported in both Pilot Study and Study 1. For RQ 2-2, I used multi-group CFAs

to test for the measurement invariance of the hypothesized model over gender (male vs. female), ethnicity (minority vs. non-minority [Whites]), and prior course experience (first-taking vs. re-taking).

Structural equation modeling (SEM). For RQ 2-3, I used structural equation modeling (SEM) in Mplus (Muthén & Muthén, 1998–2010) to examine structural relations among four types of socio-cognitive conflict regulation and their antecedents and consequences. This is useful to specify the ways different antecedents (i.e., perceived competence, social interdependence, achievement goals) are differentially associated with different types of socio-cognitive conflict regulation and the ways different types of socio-cognitive conflict regulation are differentially associated with different consequences (i.e., behavioral engagement/disengagement, critical reasoning). For the analyses, I used latent variables for each construct, which helps correct measurement error, and the control variables were included in all models as additional predictor variables. The covariances between the predictor variables were freely estimated.

Importantly, I tested the latent interaction effect of perceived competence and social interdependence (cooperative perceptions and competitive perceptions separately) on socio-cognitive conflict regulation. Specifically, perceived competence, either cooperative perceptions or competitive perceptions, and their interaction, as predictors, were used in predicting the outcome variables, the four types of socio-cognitive conflict regulation, which were consistent with the theoretical idea based on the proposed model and the MANOVAs in Study 1. The latent interaction model or latent moderated structural (LMS) equations approach (Klein & Moosbrugger, 2000; Trautwein et al., 2012) provides unbiased estimates of interactive effects between latent variables because it addresses measurement error, which is one of the advantages

over conventional multiple moderated regression analyses. Mplus software is useful to test latent interaction effects with LMS easily, as they can be specified by a single command in the model syntax (see Appendix E for an annotated example syntax) and their parameter estimates are also directly obtained. To facilitate the interpretability of the results, I standardized all indicators before running the analyses. I used the full information maximum likelihood (FIML) to handle missing values.

I investigated five structural models with different antecedents or consequences[4]: (a) perceived competence, cooperative perceptions, and their interaction as antecedents (Model 36; Figure 17); (b) perceived competence, competitive perceptions, and their interaction as antecedents (Model 37; Figure 18); (c) achievement goals as antecedents (Model 38; Figure 19); (d) behavioral engagement and disengagement as consequences (Model 39; Figure 20); and (e) critical reasoning as a consequence (Model 40; Figure 21).

Results

Participant Flow and Missing Data

Of the 254 students enrolled in the course, 250 (98.4%) completed the survey. Of the four students who did not complete the survey, two students were from the same section, and the other two were from different sections. Of the 250 students, $n = 232$ were eligible, because one participant was a master's student and $n = 17$ students did not agree to participate in the study. Two students were also excluded because one student was younger than 18 years old ($n = 1$) and the other student's answers were considered insincere (e.g., significant number of answers were the same in a row; $n = 1$). Thus, $N = 230$ were included in the analyses. Little's MCAR test was

[4] My original plan for the analyses was to investigate whole structural relations including both antecedents and consequences of socio-cognitive conflict regulation in the same model, but these analyses were not allowed due to the limited sample size.

significant, $\chi^2(3465) = 3728.92$, $p = .001$, but missing data proportions were less than 5% (< 1.3% across all items but GPA [6.5%]), allowing for the use of listwise deletion (Allison, 2001; Graham, 2009). Grubbs' test (Grubbs, 1969) showed that there was one univariate outlier each for cooperative perceptions, constructive-epistemic regulation, master-approach goals, and critical reasoning, using a $p < .01$.

Preliminary Analyses

Order effect. I checked whether the order of two parts in the survey was associated with participants' responses to the variables. I conducted *t*-tests for perceived conflict, perceived competence, competence threat, cooperative perceptions, competitive perceptions, and critical reasoning, and multivariate analyses of variance (MANOVAs) for social interdependence, socio-cognitive conflict regulation, achievement goals, and behavioral engagement/disengagement. I found that there was a significant order effect only on socio-cognitive conflict regulation, Wilks' $\lambda = 0.93$, $F(4, 225) = 4.12$ $p = .003$, $\eta^2 = 0.07$. The between-subject tests were significant for constructive-epistemic regulation, $F(1, 228) = 8.47$, $p = .004$, $\eta_p^2 = 0.04$, and protective-relational regulation, $F(1, 228) = 5.68$, $p = .02$, $\eta_p^2 = 0.02$. Specifically, Version 2 showed higher constructive-epistemic (Version 1: $M = 3.80$, $SD = 0.45$; Version 2: $M = 3.98$, $SD = 0.50$) and protective-relational (Version 1: $M = 2.43$, $SD = 0.73$; Version 2: $M = 2.66$, $SD = 0.77$) regulations than Version 1, indicating that students who answered the questions about socio-cognitive conflict regulation first responded that, on average, they engaged more in constructive-epistemic and protective-relational regulations than those who answered the questions about socio-cognitive conflict regulation later. The between-subject tests were not significant for concurrence-seeking epistemic regulation, $F(1, 228) = 0.11$, $p = .74$, $\eta_p^2 < 0.001$, and

competitive-relational regulation, $F(1, 228) = 0.87$, $p = .35$, $\eta_p^2 = 0.004$. Therefore, I controlled for the order effect in the following analyses in two different ways. For factor analyses (i.e., exploratory factor analyses, confirmatory factor analyses, multi-group confirmatory factor analyses), I used item scores of socio-cognitive conflict regulation that were standardized by survey version, and for structural equation modeling, I included the variable of survey version as a covariate in each model.

Individual differences. Students' individual differences often influence their academic performance. As such, I tested for possible differences in students' gender, ethnicity, age, first language, school year, prior course experiences (any high school anatomy and/or physiology, a pre-requisite course in the department, and the same course), consideration of pre-health professional (e.g., pre-med, PT, PA, nursing), and GPA on all variables of interest used for RQ 2-3. To this end, I conducted ANOVAs (for perceived competence, critical reasoning, cooperative perceptions, and competitive perceptions), MANOVAs (for achievement goals, and behavioral engagement and disengagement), a MANCOVA (only for socio-cognitive conflict regulation with the survey version as a covariate), or a correlation analysis (for GPA). I report only significant results about the individual differences.

For socio-cognitive conflict regulation, the MANCOVA result showed a significant gender effect, Wilks' $\lambda = 0.92$, $F(4, 223) = 4.98$, $p = .001$, $\eta_p^2 = 0.08$. The between-subject test for competitive-relational regulation was marginally significant, $F(1, 226) = 2.86$, $p = .09$, $\eta_p^2 = 0.01$, and the test for protective-relational regulation was significant, $F(1, 226) = 12.48$, $p < .001$, $\eta_p^2 = 0.05$. Specifically, male students showed higher competitive-relational regulation ($M = 2.64$, $SD = 0.77$), but lower protective-relational regulation ($M = 2.68$, $SD = 0.74$) than female students (competitive relational: $M = 2.47$, $SD = 0.69$; protective-relational: $M = 2.68$, $SD =$

0.74). Next, MANCOVA also showed a significant effect of consideration of pre-health professional, Wilks' $\lambda = 0.92$, $F(4, 222) = 5.18$, $p = .001$, $\eta_p^2 = .09$. The between-subject tests for competitive-relational regulation, $F(1, 225) = 8.54$, $p = .004$, $\eta_p^2 = 0.04$, and protective-relational regulation, $F(1, 225) = 10.32$, $p = .002$, $\eta_p^2 = 0.04$, were significant. Specifically, students who considered themselves to become pre-health professional showed higher competitive-relational regulation ($M = 2.60$, $SD = 0.72$), but lower protective-relational regulation ($M = 2.46$, $SD = 0.74$) than those who did not consider themselves to become pre-health professional (competitive relational: $M = 2.28$, $SD = 0.69$; protective-relational: $M = 2.82$, $SD = 0.74$). Lastly, correlation analyses showed a significantly negative relation between GPA and concurrence-seeking epistemic regulation ($r = -.16$, $p = .02$) and a significantly positive relation between GPA and competitive-relational regulation ($r = .15$, $p = .03$).

For perceived competence, the ANOVA result showed a significant effect of consideration of pre-health professional, $F(1, 226) = 11.87$, $p = .001$, $\eta_p^2 = .05$. Specifically, students who considered themselves to become pre-health professional showed higher perceived competence ($M = 3.80$, $SD = 0.61$) than those who did not consider themselves to become pre-health professional ($M = 3.45$, $SD = 0.78$). The correlation analysis also showed a significantly positive relation between GPA and perceived competence ($r = .18$, $p = .01$).

For cooperative perceptions, the ANOVA result showed a significant gender effect, $F(1, 226) = 8.64$, $p = .004$, $\eta_p^2 = .04$. Specifically, male students showed lower cooperative perceptions ($M = 3.99$, $SD = 0.72$) than female students ($M = 4.25$, $SD = 0.63$).

For competitive perceptions, the ANOVA result showed a significant gender effect, $F(1, 227) = 34.13$, $p < .001$, $\eta_p^2 = .13$. Specifically, male students showed higher competitive perceptions ($M = 3.18$, $SD = 0.86$) than female students ($M = 2.55$, $SD = 0.73$). The ANOVA

result also showed a significant effect of consideration of pre-health professional, $F(1, 226) = 3.71$, $p = .06$, $\eta_p^2 = .02$. Specifically, students who considered themselves to become pre-health professional showed higher competitive perceptions ($M = 2.84$, $SD = 0.86$) than those who did not consider themselves to become pre-health professional ($M = 2.59$, $SD = 0.71$).

For achievement goals, the MANOVA result showed a significant gender effect, Wilks' $\lambda = 0.93$, $F(4, 223) = 4.19$, $p = .003$, $\eta_p^2 = 0.07$. The between-subject tests for mastery-approach goals, $F(1, 226) = 3.30$, $p = .07$, $\eta_p^2 = 0.01$, and performance-approach goals, $F(1, 226) = 3.17$, $p = .08$, $\eta_p^2 = 0.01$, were marginally significant, and the test for performance-avoidance goals was significant, $F(1, 226) = 8.67$, $p = .004$, $\eta_p^2 = 0.04$. Specifically, male students showed lower mastery-approach goals ($M = 4.36$, $SD = 0.57$) and performance-avoidance goals ($M = 3.86$, $SD = 0.83$) but higher performance-approach goals ($M = 3.30$, $SD = 0.91$) than female students (mastery approach: $M = 4.49$, $SD = 0.48$; performance avoidance: $M = 4.17$, $SD = 0.72$; performance approach: $M = 3.08$, $SD = 0.89$). MANOVA also showed a significant effect of consideration of pre-health professional, Wilks' $\lambda = 0.95$, $F(2, 222) = 3.18$, $p = .02$, $\eta_p^2 = 0.05$. The between-subject test for mastery-approach goals was marginally significant, $F(1, 225) = 3.84$, $p = .05$, $\eta_p^2 = 0.02$, and the test for mastery-avoidance goals was significant, $F(1, 225) = 7.22$, $p = .01$, $\eta_p^2 = 0.03$. Specifically, students who considered themselves to become pre-health professional showed higher mastery-approach goals ($M = 4.48$, $SD = 0.51$) but lower mastery-avoidance goals ($M = 3.26$, $SD = 1.03$) than those who did not consider themselves to become pre-health professional (mastery approach: $M = 4.32$, $SD = 0.55$; mastery avoidance: $M = 3.68$, $SD = 0.89$). Lastly, the correlation analysis showed a marginally significantly positive relation between GPA and performance-approach goals ($r = .12$, $p = .08$).

For behavioral engagement and disengagement, the MANOVA result showed a significant gender effect, Wilks' $\lambda = 0.95$, $F(2, 225) = 5.38$, $p = .01$, $\eta_p^2 = 0.05$. Both the between-subject tests for behavioral engagement, $F(1, 226) = 9.83$, $p = .002$, $\eta_p^2 = 0.04$, and behavioral disengagement, $F(1, 226) = 3.89$, $p = .05$, $\eta_p^2 = 0.02$, were significant. Specifically, male students showed lower behavioral engagement ($M = 4.14$, $SD = 0.52$) and higher behavioral disengagement ($M = 2.76$, $SD = 1.06$) than female students (engagement: $M = 4.33$, $SD = 0.43$; disengagement: $M = 2.49$, $SD = 0.99$). The correlation analyses showed a marginally significantly positive relation between GPA and behavioral engagement ($r = .13$, $p = .07$).

Finally, for critical reasoning, the ANOVA results showed a significant effect of students' first language, $F(1, 227) = 4.59$, $p = .03$, $\eta_p^2 = 0.02$. Specifically, students whose first language was English showed higher critical reasoning ($M = 3.52$, $SD = 0.50$) than those whose first language was not English ($M = 3.04$, $SD = 0.09$). However, I should note that the group sizes were considerably unbalanced ($n = 5$ for non-native speakers). The ANOVA also showed a significant effect of consideration of pre-health professional, $F(1, 226) = 4.38$, $p = .04$, $\eta_p^2 = 0.02$. Specifically, students who considered themselves to become pre-health professional showed higher critical reasoning ($M = 3.54$, $SD = 0.52$) than those who did not consider themselves to become pre-health professional ($M = 3.38$, $SD = 0.44$).

Based on the results above, I used different covariates for different models for RQ 2-3, depending on which variables were used in the model. For all models, I controlled for the effect of survey version on constructive-epistemic regulation, the effect of GPA on concurrence-seeking epistemic regulation, the effects of the consideration of gender, GPA, and the consideration of pre-health professional on competitive-relational regulation, and the effects of survey version, gender, and the consideration of pre-health professional on protective-relational

regulation. For the perceived competence and cooperative perceptions model, I controlled for the effect of the consideration of pre-health professional on perceived competence and the effect of gender on cooperative perceptions. For the perceived competence and competitive perceptions model, I controlled for the effect of the consideration of pre-health professional on perceived competence and the effects of gender and the consideration of pre-health professional on competitive perceptions. For the achievement goals model, I controlled for the effects of gender and the consideration of pre-health professional on mastery-approach goals, the effect of the consideration of pre-health professional on mastery-avoidance goals, the effects of gender and GPA on performance-approach goals, and the effect of gender on performance-avoidance goals. For the behavioral engagement and disengagement model, I controlled for the effects of gender and GPA on behavioral engagement, and the effect of gender on behavioral disengagement. For the critical reasoning model, I controlled for the effects of first language and the consideration of pre-health professional on behavioral disengagement.

Section-level variance in socio-cognitive conflict regulation. The intraclass correlation coefficients (ICCs) for the unconditional models indicated that lab section explained less than 1% of variance in each type of socio-cognitive conflict regulation. This suggests that students' socio-cognitive conflict regulation did not vary among lab sections, and therefore I did not employ hierarchical linear modeling for the following analyses.

RQ 2-1 (replication of RQ 1-1): Does the 2 × 2 model consisting of constructive-epistemic, concurrence-seeking epistemic, competitive-relational, and protective-relational regulation subscales fit the data well?

Confirmatory factor analyses (CFAs). Using the standardized scores of socio-cognitive conflict regulation, I conducted a CFA on the hypothesized model where the 24 items were

loaded on the corresponding latent factor of conflict regulation. However, the results did not support the hypothesized model, as fit statistics did not meet the criteria for a good fitting model: $\chi^2(246) = 580.99$, $p < .001$, CFI = .79, TLI = .76, RMSEA = .08, SRMR = .09. As an ancillary analysis, I ran an EFA in order to investigate which factor loadings of the items for the corresponding latent factor were relatively small (< .40) and which factor loadings of the items for unexpected latent factors were relatively large (> .20). Based on the EFA result (see Table 20), I excluded three items each for concurrence-seeking epistemic, competitive-relational, and competitive-protective regulations, and conducted a CFA again (see Appendix D for the final items). Overall, the results supported the hypothesized model (Figure 22): $\chi^2(84) = 151.33$, $p < .001$, CFI = .92, TLI = .90, RMSEA = .06, SRMR = .06. Standardized factor loadings and residual variances of items are presented in Table 8, and all factor loadings were moderate to strong (ranging from .51 to .82). Note that I did not use the nine excluded items for the subsequent analyses.

I conducted additional analyses to compare the fit of the hypothesized model with a series of four alternative models that were investigated in Pilot Study and Study 1, including (a) a three-factor model A, (b) a three-factor model B, (c) an epistemic-relational model, and (d) an agentic[approach]-submissive[avoidance] model. As presented in Table 10, the results from these analyses indicated that none of the alternative models provided a good fit to the data, and the hypothesized model provided a better fit than any of the alternative models.

Descriptive statistics, internal consistencies, and intercorrelations. Table 21 presents the descriptive statistics and internal consistencies for all variables including the conflict regulations. The mean for constructive-epistemic regulation was highest, followed by concurrence-seeking epistemic regulation, and competitive-relational regulation and protective-

relational regulation showed similar lowest mean levels. Only constructive-epistemic regulation was higher than the scale midpoint (i.e., 3.0).

Each of the conflict regulations demonstrated a high level of reliability (ranging from .71 to .79). Table 21 presents intercorrelations among all variables. Focusing on the intercorrelations among the conflict regulation variables, constructive-epistemic regulation was negatively correlated with competitive-relational regulation, and it was not significantly correlated with the other types of regulation. Concurrence-seeking epistemic regulation was positively correlated with protective-relational regulation and, unexpectedly, it was also positively competitive-relational regulation. Competitive-relational regulation was not significantly correlated with protective-relational regulation.

Regarding the correlations between competence-related variables and socio-cognitive conflict regulation types, perceived competence was positively correlated with constructive-epistemic regulation and competitive-relational regulation, whereas it was negatively correlated with concurrence-seeking epistemic and protective-relational regulations, which were consistent with the expectations based on the proposed model. Also, interestingly, the positive correlation was stronger for constructive-epistemic regulation (r = .22) than competitive-relational regulation (r = .13), and the negative correlation was stronger for protective-relational regulation (r = -.25) than concurrence-epistemic regulation (r = -.17). Competence threat was positively correlated with competitive-relational and protective-relational regulations, whereas it was marginally negatively correlated with constructive-epistemic regulation, and these correlation patterns were also consistent with the expectations based on the proposed model.

Regarding the correlations between social-interdependence variables and socio-cognitive conflict regulation types, cooperative perceptions were positively correlated with constructive-

epistemic regulation, whereas they were negatively correlated with competitive-relational regulation; the exactly opposite patterns were found in the correlations with individualistic perceptions. Competitive perceptions were positively correlated with competitive-relational regulation. There were no significant correlations between social-interdependence variables and concurrence-seeking epistemic and protective-relational regulations.

Regarding the correlations between achievement-goal variables and socio-cognitive conflict regulation types, mastery-approach goals were positively correlated with constructive-epistemic regulation, whereas they were negatively correlated with concurrence-seeking epistemic regulation. Mastery-avoidance goals were positively correlated with concurrence-seeking epistemic and protective-relational regulations, but the correlation with concurrence-seeking epistemic regulation was only marginally significant. Performance-approach goals were positively correlated with competitive-relational regulation. Performance-avoidance goals were positively correlated with protective-relational regulation. They were also positively correlated with constructive-epistemic and concurrence-seeking epistemic (marginal significance) regulations, but their positive correlations (*r*s = .13) were weaker than the correlation with protective-relational regulation (*r* = .29).

Regarding behavioral engagement and disengagement, behavioral engagement was positively correlated with constructive-epistemic regulation, whereas it was negatively correlated with concurrence-seeking and protective-relational regulations. Behavioral disengagement was negatively correlated with constructive-epistemic regulation, but it was marginally significantly positively correlated with concurrence-seeking epistemic and competitive-relational regulations.

Finally, critical reasoning was positively correlated with concurrence-seeking epistemic regulation, whereas it was negatively correlated with protective-relational regulation.

RQ 2-2: Is the four-factor model of socio-cognitive conflict regulation invariant across students' gender, ethnicity, and prior course experience?

I conducted two-group analyses in which I constrained various sets of parameter estimates to be invariant over gender (male and female), ethnicity (minority and non-minority [White]), and prior course experience (first-taking and re-taking) to test for measurement invariance. I compared fit indices for models with different sets of invariance constraints, ranging from Model 14, 21, and 29 (configural invariance) to the most restrictive, Model 19, 27, and 35 (factor variances/covariances invariance). Fit indices (Table 18) showed that the initial model of the multi-group CFA for gender (Model 14) fitted the data well, $\chi^2(168) = 251.78$, $p < .001$, CFI = .90, TLI = .87, RMSEA = .07, SRMR = .08. The changes in model fit statistics were also acceptable across all consecutive models with allowance of weak partial invariance (e.g., < .01 for CFI; < .015 for RMSEA; Chen, 2007; Cheung & Rensvold, 2002).

The initial model of the multi-group CFA for ethnicity (Model 21) showed that its observed variable error term matrix (theta) was not positive definite, and the issue was originated from the residual variance for one of the competitive-relational items ("I showed that other students were wrong."). Anderson and Gerbing (1984) documented that such issue may be from mere sampling fluctuation, and fixing the offending estimates to be zero is less likely to be problematic in most cases (Gerbing & Anderson, 1987). Accordingly, the residual variance of the potentially problematic item was fixed as zero, and the initial model fitted the data well, $\chi^2(168) = 256.84$, $p < .001$, CFI = .89, TLI = .87, RMSEA = .07, SRMR = .08. The changes in model fit statistics were also acceptable across all consecutive models with allowance of weak partial and strong partial invariances.

Fit indices showed that the initial model of the multi-group CFA for prior course experience (Model 29) fitted the data well, $\chi^2(168) = 256.84$, $p < .001$, CFI = .89, TLI = .87, RMSEA = .07, SRMR = .08. The changes in model fit statistics were also acceptable across all consecutive with allowance of strict partial and factor variances/covariances partial invariances.

This provides evidence of configural invariance (Model 14, 21, 29), weak invariance (Model 16, 23, 30), strong invariance (Model 17, 24, 31), strict invariance (Model 18, 26, 33), and factor variances/covariances invariance (Model 19, 27, 35) across gender, ethnicity, and prior course experience, at least partially. This suggests that the measurement properties of the instrument were reasonably equal for males and females, for minority and White students, and for those with and without the same course experience.

RQ 2-3: What are the structural relations among socio-cognitive conflict regulation and its antecedents and consequences?

Competence and cooperative perceptions model[5]. As presented in Table 22 and Figure 17, perceived competence negatively predicted concurrence-seeking epistemic regulation (B = -.24, p = .02) and protective-relational regulation (B = -.26, p = .03), but positively predicted competitive-relational regulation (B = .25, p = .02). Cooperative perceptions positively predicted constructive-epistemic regulation (B = .41, p = .001), but negatively predicted competitive-relational regulation (B = -.49, p = .002). The Competence × Cooperative perceptions product term negatively predicted concurrence-seeking epistemic regulation (B = -.36, p = .02) and negatively but marginally significantly predicted protective-relational regulation (B = -.27, p =

[5] Traditional fit indices, standardized coefficients, and *r*-squared are not available for models with latent product terms, so all indicators were standardized before conducting the analyses for the competence and cooperative perceptions model (Model 36) and the competence and competitive perceptions model (Model 37).

.07). The statistically significant predictive effects of the control variables indicated that students who considered to be pre-health professionals tended to show higher competitive-relational regulation (B = .07, p < .001) but lower protective-relational regulation (B = -.08, p < .001). Female students tended to show higher protective-relational regulation than male students (B = .17, p = .01).

Figure 23 and 24 illustrate the nature of the interactive effects on concurrence-seeking epistemic regulation and protective-relational regulation separately, with the model-implied regression lines for different competence-level groups of students. As expected, concurrence-seeking epistemic regulation was particularly high when participants' competence was low, and it was particularly low when students' competence was high (Figure 23). Again, as expected, protective-relational regulation was particularly high when participants' competence was low, and it was particularly low when students' competence was high (Figure 24). However, unexpectedly, both concurrence-seeking epistemic and protective-relational regulations tended to remain the same (or were slightly lower) as students' competence was lower *and* cooperative perceptions were higher. In other words, my interaction hypotheses regarding concurrence-seeking epistemic and protective-relational regulations were supported only when students' competence *and* cooperative perceptions were higher.

Competence and competitive perceptions model. As presented in Table 23 and Figure 18, perceived competence positively predicted constructive-epistemic regulation (B = .25, p = .003), but negatively predicted concurrence-seeking epistemic regulation (B = -.17, p = .08) and protective-relational regulation (B = -.29, p = .01). Competitive perceptions positively predicted competitive-relational regulation (B = .45, p = .002) and protective-relational regulation (B = .22, p = .07). The Competence × Cooperative perceptions product term negatively predicted

protective-relational regulation only (B = -.31, p = .02). The statistically significant predictive effects of the control variables indicated that students who considered to be pre-health professionals tended to show higher competitive-relational regulation (B = .07, p = .02) but lower protective-relational regulation (B = -.14, p < .001), and female students tended to show higher protective-relational regulation than male students (B = .18, p = .01).

Figure 25 illustrates the nature of the interactive effect on protective-relational regulation, with the model-implied regression lines for different competence-level groups of students. As expected, protective-relational regulation was particularly high when participants' competence was low, and it was particularly low when students' competence was high. However, unexpectedly, protective-relational regulations tended to remain the same (or were slightly lower) as students' competence was lower *and* competitive perceptions were higher. In other words, my interaction hypothesis regarding protective-relational regulation was supported only when students' competence *and* competitive perceptions were higher.

Achievement goals model. The model for achievement goals predicting socio-cognitive conflict regulation fit the data well, $\chi^2(390) = 560.88$, $p < .001$, CFI = .91, TLI = .89, RMSEA = .05, SRMR = .06. The model accounted for significant variances in all four types of conflict regulation: constructive-epistemic regulation (R^2 = .15, p = .01, f^2 = .18), concurrence-seeking epistemic regulation (R^2 = .14, p = .02, f^2 = .16), competitive-relational regulation (R^2 = .28, p < .001, f^2 = .39), and protective-relational regulation (R^2 = .28, p < .001, f^2 = .39). As presented in Table 24 and Figure 19, mastery-approach goals positively predicted constructive-epistemic regulation (β = .29, p = .002), but negatively predicted concurrence-seeking epistemic regulation (β = -.26, p = .01). Performance-approach goals positively predicted competitive-relational regulation (β = .47, p < .001), while performance-avoidance goals positively predicted

protective-relational regulation (β = .31, p = .001). The statistically significant predictive effects of the control variables indicated that students with lower GPA tended to show higher concurrence-seeking epistemic regulation (β = -.15, p = .06). And, students who considered to be pre-health professionals tended to show higher competitive-relational regulation (β = .17, p = .03) but lower protective-relational regulation (β = -.20, p = .01). Last, female students tended to show higher protective-relational regulation than male students (β = .21, p = .01).

Behavioral engagement and disengagement model. The model for behavioral engagement and disengagement did not fit the data well, $\chi^2(271) = 446.94$, $p < .001$, CFI = .87, TLI = .85, RMSEA = .06, SRMR = .06. To improve the model fit, I allowed three correlations between residual variances based on the modification indices: Constructive 3 and 4, Protective 4 and 6, and Engage 1 and 2 (see Appendix D for the items). The final model fit the data well, $\chi^2(268) = 391.36$, $p < .001$, CFI = .91, TLI = .89, RMSEA = .05, SRMR = .06. The model accounted for at least marginally significant variances in both behavioral engagement (R^2 = .21, p = .001, f^2 = .27) and behavioral disengagement (R^2 = .07, p = .09, f^2 = .08). As presented in Table 25 and Figure 20, constructive-epistemic regulation positively predicted behavioral engagement (β = .37, $p < .001$), whereas concurrence-seeking epistemic regulation negatively predicted behavioral engagement (β = -.20, p = .04). There was no significant path from conflict regulation to behavioral disengagement. The statistically significant predictive effect of the control variable indicated that female students tended to show higher behavioral engagement than male students (β = .18, p = .02).

Critical reasoning model. The model for critical reasoning did not fit the data well, $\chi^2(250) = 407.35$, $p < .001$, CFI = .86, TLI = .84, RMSEA = .05, SRMR = .07. To improve the model fit, I allowed six correlations between residual variances based on the modification indices:

Constructive1 and 4, Constructive 2 and 4, Protective 4 and 6, Critical 2 and 5, Competitive 5 and Critical 2, and Competitive 5 and Critical 5 (see Appendix D for the items). The final model fit the data well, $\chi^2(244) = 341.12$, $p < .001$, CFI = .91, TLI = .90, RMSEA = .04, SRMR = .07. The model accounted for the significant variance in critical reasoning ($R^2 = .86$, $p < .001$, $f^2 = 6.14$). As presented in Table 25 and Figure 21, constructive-epistemic regulation strongly positively predicted critical reasoning ($\beta = .92$, $p < .001$), whereas protective-relational regulation marginally significantly negatively predicted critical reasoning ($\beta = -.14$, $p = .07$). I should note that the standardized coefficient of constructive-epistemic regulation was relatively large compared to others, which could be from the high correlation between constructive-epistemic regulation and critical reasoning ($r = .58$, $p < .001$) based on some of the similar items between these two variables. For instance, "I evaluated the evidence for the different opinions," "I thought carefully about different views before reaching a conclusion," or "I combined and built on the idea of other students" could overlap with some key ideas of constructive-epistemic regulation, which are considering or integrating different points of view (e.g., "I considered the different points of view," "I integrated the different perspectives"). It would be a good idea that future research measures critical reasoning using actual behavioral measures (e.g., scores on a critical reasoning test) to clarify the relation between socio-cognitive conflict regulation and critical reasoning. The statistically significant predictive effect of the control variable indicated that students whose first language was English tended to show higher critical reasoning than those whose first language was not English ($\beta = .15$, $p = .02$).

Discussion

In Study 2, I aimed to test the utility of the new measures of socio-cognitive conflict regulation in small-group settings in an actual undergraduate lab. I examined the relations among

different types of students' socio-cognitive conflict regulations and their antecedents and consequences. In this section, I overview the findings from Study 2 briefly, address what results were replicated and what new results were found. Broader implications of this research for theory, research, and practice are addressed in General Discussion (Chapter 7).

RQ 2-1 (replication of RQ 1-1): Does the 2 × 2 model consisting of constructive-epistemic, concurrence-seeking epistemic, competitive-relational, and protective-relational regulation subscales fit the data well?

The Study 1's results following the three stated objectives were partly replicated in Study 2. First, the measure of four-factor model of socio-cognitive conflict regulation fit the data well with good internal consistency of each factor, but some of the items had to be dropped for better model fit. Second, the patterns of mean scores of different conflict regulation types in a real classroom were similar to those in the experimental study (Study 1), with a lower mean level of students' competitive-relational regulation in a real classroom. Some of the intercorrelations among different regulation types were replicated, but others were not in a real classroom. Third, the correlations between different regulation types and their expected antecedent and consequent variables were mostly replicated in a real classroom.

Factor structure and internal consistencies. With the two revised items based on the results from Study 1, I conducted CFA on the hypothesized 2 × 2 model with undergraduates in a real classroom setting, but the model did not fit the data well. The model fit improved when I excluded three items whose factor loadings were the lowest for each regulation type, except for constructive-epistemic regulation. This decision for the exclusion of some items was made based on statistics (i.e., factor loadings onto the latent factors), and it is somewhat unclear to explain

what common characteristics or patterns exist among the excluded or the remaining items at the conceptual level.

Some possible explanations for these patterns would be that, for competitive-relational regulation, all excluded items included one common phrase, "resisted," as the following three items were excluded: "I *resisted* other students' view by maintaining my initial position," "I *resisted* by showing my perspective was better than other students'," and "I *resisted* by showing my perspective was right." All three items tended to show relatively higher factor loadings for the factor of protective-relational regulation. Competitive perceptions that are considered as a shared antecedent between competitive-relational and protective-relational regulations may lead "resisting" behavior to be also associated with protective-relational regulation.

For protective-relational regulation, all excluded items tended to highlight withdrawing one's ideas or focus more on what would happen in one's thinking or ideas, as the following items were excluded: "I reluctantly *withdrew my approach*," "I *withdrew my ideas* and waited for the conflict to end," and "I wanted to leave and *thought about something else*." All three items tended to show relatively higher factor loadings for the factor of concurrence-seeking epistemic regulation. One possible explanation is that withdrawing one's own idea could subsequently lead one to align one's ideas with other students (i.e., concurrence-seeking epistemic regulation), which making these three items also load onto concurrence-seeking epistemic regulation. In contrast, all remaining items included the content of ignoring or avoiding confrontation, as the following items were remained: "I *disengaged from any confrontation* and *avoided the conflict*," "I gave up and *withdrew from any confrontation*," and "I backed out and *ignored the conflict*." All three items tended to emphasize avoidance of the conflict or confrontation, which would be more distinguished from the nature of concurrence-

seeking epistemic regulation, as concurrence-seeking epistemic regulation is still involved in epistemic concern (e.g., ideas, thinking).

It is most difficult to find patterns of excluded or remaining items for concurrence-seeking epistemic regulation. It turned out all three excluded items showed relatively higher factor loadings for all different conflict regulation types. The first item was cross-loaded onto constructive-epistemic regulation, the second item was cross-loaded onto protective-relational regulation, and the last item was cross-loaded onto competitive-relational regulation (see Table 20). Thus, particularly for this regulation type, my decision for including or excluding items was based only on the statistical suggestion.

After excluding these nine items, the EFA, the CFA, and reliability data indicate that the four socio-cognitive conflict regulation measures represent empirically separable and internally consistent (αs $\geq$ .71) variables, which is additional evidence of the validity of a 2 × 2 regulation model along with the findings from Pilot Study and Study 1. Although considerable number of the items had to be excluded, the validation of this new measure contributes to the prior measure (Sommet et al., 2014, 2015) as the confounding concept of protective-relational regulation was conceptually differentiated from the new avoidance-valenced regulation type, concurrence-seeking epistemic regulation. Furthermore, the prior measure (Sommet et al., 2014, 2015) also had only three items each for each conflict regulation and indeed, many existing measures of psychological constructs consist of three items for subscale (e.g., Achievement Goal Questionnaire by Elliot and McGregor [2001]). Thus, the three items for each subscale—but six items for constructive-epistemic regulation—are expected to be sufficient to be operative in measuring students' socio-cognitive conflict regulation. However, it may be worthwhile testing all six items originally proposed for each regulation type again with a larger sample size of

students in real classrooms, since the current findings were only from a single small sample (N = 230 for four latent factors) and the measures with the entire items have empirically been supported in Pilot Study and Study 1.

Descriptive statistics and intercorrelations among conflict regulations. Each conflict regulation type was generally operative in the undergraduate classroom, as the means were close to or higher than the midpoint (i.e., 3.0), and broad range of scores was used. As in Study 1, the mean level of constructive-epistemic regulation was highest, and that of concurrence-seeking epistemic regulation was slightly higher than that of protective-relational regulation. Unlike Study 1, the mean level of competitive-relational regulation was similarly lowest (M = 2.68, SD = 0.78) to that of protective-relational regulation (M = 2.54, SD = 0.76) in the actual undergraduate class. It may be from the nature of subject matter (i.e., anatomy) and instructional approach (i.e., jigsaw cooperative instruction) employed to the labs throughout the entire semester. In this particular context, students might not often need to win others or even compete with others because the discussion topic was more factual based—understanding different anatomical structures—as opposed to controversial issues that may be more prevalent in social-science courses. It may be interesting to investigate students' socio-cognitive conflict regulation in small-small groups in actual social-science courses.

Regarding the intercorrelations among different types of conflict regulation, the negative correlation between constructive-epistemic and competitive-relational regulations (r = -.17) and the positive correlation between concurrence-seeking epistemic and protective-relational regulation (r = .19) were replicated. Also, the correlation between competitive-relational and protective-relational regulations was not statistically significant, which was consistent with that in Study 1, but inconsistent with the prior findings from Sommet and his colleagues' studies

(negative correlation in Sommet et al., 2014, 2015). However, unlike in Study 1, the positive correlation between constructive-epistemic and concurrence-seeking epistemic regulations and the negative correlation between constructive-epistemic and protective-relational regulations were not statistically significant. The most inconsistent finding was the positive correlation between concurrence-seeking epistemic and competitive-relational regulations (r = .17), which were found to be negatively correlated between each other (r = -.23) in Study 1. Considering the proposed model (Figure 1), these two regulations do not share any of antecedents in terms of the level of competence and perceptions of social interdependence, and therefore theoretically a negative correlation is expected between these two regulations.

This unexpected-directional correlation might reflect on very mixed, complicated group dynamics in a real classroom setting. It is not clear why their correlation was not consistent with theoretical expectation, but one possible explanation is that students' regulating styles might change depending on with whom they were working in the classroom. In fact, students' group members changed biweekly, and the students' regulating strategies might not be consistent due to the influence of perceptions of their partners' competence. Or, their regulating strategies in expert groups might be different from those in jigsaw groups, in that students shared the same learning materials in expert groups but they taught different learning materials to group members in jigsaw groups. For example, when students were in jigsaw groups, students might be more likely to follow other group members' thinking, because they do not know about others' materials very well. It may be interesting to investigate how students' regulating styles differ depending on with whom they are working or whether they share resources or not in groups. However, it is more important for future research to clarify the correlation between students' competitive-relational regulation and concurrence-seeking epistemic regulation in real

classrooms. In addition, future research needs to determine whether the non-significant correlations in Study 2 are replicated or shown to be rather consistent with the theoretical expectations in real classrooms, since the current study was the first attempt to examine the intercorrelations among different regulation types of students in a real classroom setting.

Correlations between conflict regulations and antecedent and consequence variables. The overall patterns of correlations between each type of regulation and competence-related and social-interdependence variables were replicated, but less number of significant correlations were found in the real classroom (Study 2) than in the experimental setting (Study 1). In Study 2, constructive-epistemic (r = .22) and competitive-relational (r = .14) regulations may emerge from higher perceived competence, whereas concurrence-seeking epistemic (r = -.17) and protective-relational (r = -.25) regulations may emerge from lower perceived competence. Constructive-epistemic regulation and protective-relational regulation showed stronger correlations with perceived competence than competitive-relational regulation and concurrence-seeking epistemic regulation separately, but their correlation strengths were not much different.

The correlations between each type of regulation and competence threat were also replicated and consistent with theoretical expectations. Competence threat was marginally significantly negatively correlated with constructive-epistemic regulation, but it was positively correlated with both types of relational regulations. This means competitive-relational regulation may emerge from higher perceived competence and, at the same time, emerge from higher competence threat. Concerns about relative competence as an antecedent of competitive-relational regulation may lead to higher competence threat. Also, concurrence-seeking epistemic regulation was not statistically significantly correlated with competence threat, which was

differentiated from protective-relational regulation that was positively correlated with competence threat. Cooperative perceptions as an antecedent of concurrence-seeking epistemic regulation may lead to no relation to competence threat, although this type of regulation was negatively correlated with perceived competence. Therefore, two competence-related variables, perceived competence and competence threat, function as differentiated antecedents of four different types of socio-cognitive conflict regulation.

Unexpectedly, some of the correlations between social-interdependence variables and different regulation types were not statistically significant in the real classroom, which was different from those in Study 1. Based on the Study 2's findings, constructive-epistemic regulation may emerge from higher level of cooperative perceptions and lower level of individualistic perceptions, which was also found in Study 1. In contrast, competitive-relational regulation may emerge from lower level of cooperative perceptions and higher levels of competitive and individualistic perceptions, which was also found in Study 1 and consistent with the theoretical expectations. Unlike in Study 1, there were no statistically significant correlations between the social-interdependence variables and both types of regulation that may emerge from lower level of perceived competence (i.e., concurrence-seeking epistemic and protective-relational regulations). This suggests that submissive type of conflict regulation may be equally prevalent regardless of the perceptions of social interdependence in the real classroom. Future research needs to clarify the correlations between the perceptions of social interdependence and concurrence-seeking epistemic and protective-relational regulations.

I should note that constructive-epistemic regulation was not statistically significantly correlated with competitive perceptions, but instead it was negatively correlated with individualistic perceptions. According to the theoretical expectations, it should also be negatively

correlated with competitive perceptions. This result might be related to the non-significant correlation between cooperative and competitive perceptions in the real classroom (r = -.07, p = .30). It is not uncommon that cooperative and competitive perceptions are not negatively correlated with each other in reality. However, the proposed model (Figure 1) can still be sufficiently supported by the consistent finding about the positive relation between constructive-epistemic regulation and cooperative perceptions across all three studies in this dissertation.

The correlations between achievement goals and different types of conflict regulation were largely replicated, and the correlations between two avoidance-valenced goals (i.e., mastery-avoidance and performance-avoidance goals) and regulation types were even more consistently appeared with the theoretical expectations. Specifically, mastery-approach goals may be an antecedent of constructive-epistemic regulation, which was in line with the findings from prior research (Darnon et al., 2006) and Study 1. In contrast, mastery-approach goals may not be likely to lead to concurrence-seeking epistemic regulation, which was also found in Study 1 and consistent with the hypotheses. Performance-approach goals may be an antecedent of competitive-relational regulation, which was in line with the findings from prior research (Darnon et al., 2006; Sommet et al., 2014, 2015) and Study 1. And, protective-relational regulation showed the strongest correlation with performance-avoidance goals, in line with the prior findings (Sommet et al., 2014, 2015), although it was also weakly positively correlated with constructive-epistemic (r = .13, p = .05) and concurrence-seeking epistemic (r = .13, p = .06) regulations. The most interesting finding added to the prior findings was that mastery-avoidance goals were positively correlated with only submissive types of regulation, which were concurrence-seeking epistemic (r = .12, p = .08) and protective-relational (r = .17, p = .01) regulations. Taken together, the findings suggest that achievement goals still function as

differentiated antecedents of four different types of socio-cognitive conflict regulation, as prior literature has suggested (Darnon et al., 2006; Sommet et al., 2014, 2015), even though the variables of concurrence-seeking epistemic regulation and mastery-avoidance goals are added in investigating their relations. This is one of the contributions to the literature on the relations between socio-cognitive conflict regulation and achievement goals as antecedents. However, since these results were the first finding about the correlations between mastery-avoidance goals and different types of regulation including concurrence-seeking epistemic regulation in the real classroom, they need to be replicated in future research.

Regarding the correlations between behavioral engagement and disengagement and different types of regulation, the findings were largely consistent with the hypotheses. As expected, constructive-epistemic regulation was positively correlated with behavioral engagement but negatively correlated with behavioral disengagement. As expected, protective-relational regulation was negatively correlated with behavioral engagement. It was hard to set clear hypotheses regarding concurrence-seeking epistemic and competitive-relational regulations. Concurrence-seeking epistemic regulation was negatively correlated with behavioral engagement, and both concurrence-seeking epistemic and competitive-relational regulations were marginally significantly positively correlated with behavioral disengagement. Thus, in terms of behavioral engagement and disengagement, only constructive-epistemic regulation showed adaptive patterns in a learning setting.

Lastly, constructive-epistemic regulation was positively correlated with critical reasoning but negatively correlated with protective-relational regulation. These findings are interesting in that competitive-relational regulation was not statistically significantly related with critical thinking, although it was positively correlated with being competent about the task. The concerns

about relative competence may hinder students' critical thinking through competitive-relational regulation when they are faced with intellectual conflicts. Also, critical reasoning may function as a consequence differentiating protective-relational regulation from concurrence-seeking epistemic regulation, as it was negatively related with protective-relational regulation only.

In sum, examining correlations between different types of regulation and different consequences were the first attempt in the literature on socio-cognitive conflict regulation, which is one of the highlighted findings in the current study. And, these findings can place a more emphasis on the importance of socio-cognitive conflict regulation in learning by answering the question about why we should care about students' conflict regulating types in peer learning.

RQ 2-2: Is the four-factor model of socio-cognitive conflict regulation invariant across students' gender, ethnicity, and prior course experience?

As in Study 1, measurement and structural invariance across different groups of gender and ethnicity was established with undergraduate students who were actually being participated in small-group activities in lab. Moreover, measurement and structural invariance was also established across students who had taken the same course before and those who were taking the course for the first time. Prior experience with the same course might positively affect students' competence level. Or, re-taking students might have stronger motivation for this course because they were likely to decide to re-take the course to obtain higher course grade. Despite these possibilities, a series of multi-group CFA indicate that, across not only different gender (males and females) and ethnic (minority and non-minority [Whites]) groups but also different groups of students with or without the same course experience, the hypothesized patterns of fixed and free factor loadings (i.e., configural invariance), factor loadings (i.e., weak invariance), item intercepts (i.e., strong invariance), variance residuals for each item (i.e., strict invariance), and

factor correlations (i.e., factor variances/covariances invariance) were the same. However, unlike Study 1, I allowed partial invariance for some models in Study 2. It is also important to keep in mind that residual variance of one competitive-relational regulation item ("I showed that other students were wrong.") was set as zero due to the non-positive definite error term matrix. In future research, it is necessary to ensure measurement invariance over students' ethnicity in a real classroom setting with a larger sample.

In short, strong evidence for invariance across gender and ethnicity was observed, which supports the generalizability of the structure of socio-cognitive conflict regulation over gender, ethnicity, and prior course experience. This suggests that the new scales measure the same constructs for everyone regardless of their gender, ethnicity, and whether or not they have experience with the same course, leading to its utility for a broader population.

RQ 2-3: What are the structural relations among socio-cognitive conflict regulation and its antecedents and consequences?

To extend the findings about simple correlations between different types of socio-cognitive conflict regulation and their antecedents and consequences from RQ 2-1, I tested structural relations among these variables, along with the tests of the interaction between perceived competence and social interdependence.

Competence and social interdependence models. For the first two models testing the interactive effects of perceived competence and social interdependence, I applied a modern approach to model latent interactions within the framework of structural equation modeling (Klein & Moosbrugger, 2000; Trautwein et al., 2012), which may be one of the important contributions to research on socio-cognitive conflict theory. One of the advantages of latent moderated structural (LMS) equations approach is to correct measurement error that could

increase the likelihood of Type 2 errors, and therefore more unbiased results about the interactive effects could be obtained in this study. Also, the use of this approach may provide an important conceptual point of view on understanding the Person × Context on individuals' learning behavior more broadly.

For the competence and cooperative perceptions model (Table 22), higher perceived competence predicted more competitive-relational regulation and less concurrence-seeking epistemic and protective-relational regulations. And, higher cooperative perceptions predicted more constructive-epistemic regulation and less competitive-relational regulation. All statistically significant paths were consistent patterns with the theoretical expectations based on the proposed model (Figure 1). The most interesting findings were the significant interactions of perceived competence and cooperative perceptions on concurrence-seeking epistemic (Figure 23) and protective-relational (Figure 24) regulations. The results indicate that as perceived competence is higher, higher cooperative perceptions lead to even lower concurrence-seeking epistemic and protective-relational regulations; in this case, students are expected to show greater constructive-epistemic regulation according to the theoretical expectation. As perceived competence is lower, the relations between the level of cooperative perceptions and the level of concurrence-seeking epistemic or protective-relational regulation are not very strong, meaning lower perceived competence generally tends to lead to higher concurrence-seeking epistemic or protective-relational regulations regardless of the level of cooperative perceptions. However, the interaction between perceived competence and cooperative perceptions in predicting protective-relational regulation should be interpreted with caution, as it were only marginally statistically significant.

For the competence and competitive perceptions model (Table 23), higher perceived competence predicted more constructive-epistemic regulation and less concurrence-seeking epistemic and protective-relational regulations. And, higher competitive perceptions predicted more competitive-relational and protective-relational regulations. All statistically significant paths were consistent patterns with the theoretical expectations based on the proposed model (Figure 1). However, the path from perceived competence to concurrence-seeking epistemic regulation and the path from competitive perceptions to protective-relational regulation should be interpreted with caution, as these paths were only marginally statistically significant.

The most interesting finding was the significant interaction of perceived competence and competitive perceptions on protective-relational regulation. The results indicate that as perceived competence is higher, higher competitive perceptions lead to even lower protective-relational regulation; in this case, students are expected to show greater competitive-relational regulation according to the theoretical expectation. As perceived competence is lower, the relation between the level of competitive perceptions and the level of protective-relational regulation is not very strong, meaning lower perceived competence generally tends to lead to higher protective-relational regulation regardless of the level of competitive perceptions.

It is noteworthy to point out that all significant interactive effects indicated that as perceived competence was higher, the role of social interdependence was stronger. But as perceived competence was lower, the role of social interdependence was weaker. It may suggest that individuals' concerns about personal competence may be more salient when their competence is low (because it is perceived as a more immediate concern), but the perceptions of social contexts can also be noticeable to individuals when their competence is high; simply, when individuals are worried about their personal competence, this worry may be more

important than goal structures in the social contexts. For example, when personal competence is low, students may have no room to actively cooperate with others for the shared goals under cooperative contexts, so they may just withdraw from cooperation. Likewise, when personal competence is low, students may have no room to maintain their perspective to win the argument under competitive contexts, so they may just ignore the competition. It may be interesting for future research to test this idea using experimental design.

Achievement goals models. For the achievement goals model (Table 24, Figure 19), higher mastery-approach goals predicted more constructive-epistemic regulation, which is consistent with the prior finding (Darnon et al., 2006). Also, higher mastery-approach goals predicted less concurrence-seeking epistemic regulation, which was a new finding that contributes to literature and consistent with the hypothesis. Higher performance-approach goals predicted more competitive-relational regulation, and higher performance-avoidance goals predicted more protective-relational regulation, which are consistent with the prior finding (Darnon et al., 2006; Sommet et al., 2014, 2015) and the hypotheses in the current study. There are two important meanings of the current results where prior findings about positive relations between mastery goals and epistemic regulation, between performance-approach goals and competitive-relational regulation, and performance-avoidance goals and protective-relational regulation were replicated. First, although the conceptual and operational definition of protective-relational regulation was refined in this dissertation to disentangle regulation from motivation, its positive relation with performance-avoidance goals was replicated. Second, the relations among achievement goals and different conflict regulation types were replicated even after (a) correcting measurement errors by using latent factors and (b) controlling for other possible influential relations by including all covariates in the same model.

Consequence models. For the behavioral engagement and disengagement model (Table 25, Figure 20), higher constructive-epistemic regulation predicted higher behavioral engagement, whereas higher concurrence-seeking epistemic regulation predicted lower behavioral engagement. There were no statistically significant paths to behavioral disengagement.

For the critical reasoning model (Table 25, Figure 21), higher constructive-epistemic regulation predicted higher critical reasoning, whereas higher protective-relational regulation predicted lower critical reasoning. As expected, constructive-epistemic regulation showed the most adaptive patterns in terms of behavioral and cognitive (i.e., critical reasoning) engagement, which was consistent with the hypotheses. Interestingly, concurrence-seeking epistemic regulation was maladaptive for behavioral engagement, but protective-relational regulation was maladaptive for cognitive engagement (i.e., critical reasoning). One of the possible reasons why concurrence-seeking epistemic regulation did not negatively predict critical reasoning is that this type of regulation still involves epistemic concerns about not understanding learning materials (e.g., mastery-avoidance goals), rather than demonstrating or protecting competence. However, it is unclear why protective-relational regulation did not negatively predict behavioral engagement. Since examining this relation was the first attempt in this study, future research needs to clarify it.

Summary

In sum, the results of Study 2 confirmed utility of the new measures of socio-cognitive conflict regulation in an actual undergraduate classroom. The most important finding is that the new type of regulation—concurrence-seeking epistemic regulation—was operative and differentiated from the other three types of conflict regulation in the real classroom. I also replicated the Study 1's findings about the correlations between different types of conflict regulation and their antecedent and consequent variables and measurement invariance across

students' prior course experience as well as gender and ethnicity. Furthermore, I examined structural relations among different types of students' socio-cognitive conflict regulations and their antecedents and consequences, and tested interactive effects of perceived competence and social interdependence using LMS approach, which advances literature on socio-cognitive conflict regulation both conceptually and methodologically.

I should note that there were also some mixed findings between Study 1 and Study 2. These findings should be further investigated with a larger sample size of students in real classroom settings. Specifically, the following results should be replicated or clarified in future field studies: (a) the four-factor model of socio-cognitive conflict regulation with full items (24 items) and reduced items (15 items); (b) the correlation between concurrence-seeking epistemic and competitive-relational regulations (positive or negative?); (c) correlations between social-interdependence variables and submissive types of conflict regulation (i.e., concurrence-seeking epistemic and protective-relational regulations) and; (d) measurement invariance of the four-factor model over ethnicity.

CHAPTER 7:

General Discussion

In this dissertation study, I conducted one pilot study and two main studies to investigate the 2 × 2 socio-cognitive conflict regulation framework, with a particular focus on a new construct of concurrence-seeking epistemic regulation. I also examined the effects of perceived competence as a personal factor and social interdependence as a contextual factor on socio-cognitive conflict regulation, and structural relations among different types of socio-cognitive conflict regulation and their antecedents and consequences. Results from all studies provided support for the new framework and the new construct, along with its convergent and divergent validity based on the key antecedents and consequences of socio-cognitive conflict regulation. In this chapter, I shed light on the value of conflict in peer learning with an emphasis on a desirable type of socio-cognitive conflict regulation, and reconsider the construct of socio-cognitive conflict regulation from both conceptual and measurement perspectives. I end this chapter with limitations, future directions, and implications.

Revaluing Conflict in Peer Learning in Individual Learning

It is common that different individuals have different opinions on the same topic. In classrooms, it is also not surprising that students cope with disagreements unproductively or are even off topic when they are faced with different thoughts of other students. In this dissertation, I have provided evidence that such unproductive peer learning may be from different kinds of concerns, especially concerns about looking stupid to others or thinking of incorrect answers so misinforming others. These concerns may lead students to engage in less productive regulation types when they are faced with disagreements, such as relational conflict regulations or concurrence-seeking epistemic regulation. However, when students focus more on the task and

on seeking a more valid answer among different answers from different individuals, they engage in a more productive regulation, which is constructive-epistemic regulation. I have also provided evidence that constructive-epistemic regulation is more associated with better outcomes than the other types of conflict regulation, such as behavioral engagement and critical reasoning. Then, how does this particular type of conflict regulation lead to more adaptive learning outcomes? Mercer (2013) proposes three possible mechanisms behind how collective reasoning affects individual reasoning—*appropriation*, *co-construction*, and *transformation*—which provides critical insights on understanding the roles of constructive-epistemic regulation in individual learning processes.

First, when students are working together, they can gain relevant, useful information and knowledge for solving problems from each other. Other students' explanations and cognitive strategies can be useful resources for individual understanding. Thus, working together plays an important role in sharing appropriate information, which may help individual learning. Mercer (2013) identifies such function of collaborative learning as *appropriation*.

Second, when students are working together, they can not only share ideas but also argue constructively about them. They can gain new levels of understanding by constructing more valid approaches to solving problems, and the approaches are better than any of them that would have been developed by one individual. These better approaches or performance by group members are called the "assembly bonus effect," meaning group performance is better than that of its best member (Laughlin, Hatch, Silver, & Bot, 2006; Mercer, 2013). Thus, working together plays a key role in generating new, effective solutions through different explanations provided by different individuals. Mercer (2013) identifies such function of collaborative learning as *co-construction*.

Third, when students are working together, the group discussion can promote individuals' critical thinking. The processes of discussion or argumentation in a *group* can be transformed into metacognitive and critical awareness of reasoning processes in an *individual*. Individuals are more able to think of possible solutions critically and monitor and regulate their own problem solving processes on their own. Thus, social experience influences individuals' psychological development as well. Mercer (2013) identifies such function of collaborative learning as *transformation*, and highlights this function the most among the three functions.

In this dissertation, the role of constructive-epistemic regulation in the third function, "transformation," was empirically supported by the positive relation of constructive-epistemic regulation to critical reasoning (see Model 40 in Table 25, Figure 21). As mentioned in the literature review earlier, supporting students to become a critical thinker is one of the long-lasting essential themes for educational psychologists (Frijters et al., 2008; Nussbaum, 2005). Both the current study and Mercer (2013) suggest that productive peer learning may be an essential step to facilitate students to think critically, and more importantly, it is necessary for them to constructively seek agreements while dealing with contrasting opinions. The next question is then how to help students engage in the most desirable conflict regulation during peer learning, which is constructive-epistemic regulation.

The Effects of Perceived Competence and Social Context

Borrowing an evolutionary psychological perspective, human beings inherently have social-cognitive capabilities that they can engage *together* in goal-oriented, knowledge-building, and problem-solving activities (Mercer, 2013). Constructive-epistemic regulation may emerge from those socio-cognitive capabilities innate in human beings when they experience conflicts during peer learning. Although people naturally have such capacity to think socially and

cognitively, the skills for more constructive discussion and conflict regulation need to be learned and practiced. For this reason, as introduced earlier, researchers have designed a variety of instructional interventions or models to promote students' critical thinking and more productive argumentation (e.g., Chan et al., 1997; Kienhues et al., 2008). In these interventions, researchers focused on teaching specific cognitive strategies or argumentation skills that are directly related with individuals' conceptual change and cognitive development. Before teaching students these specific skills, I suggest that it is important to establish appropriate learning conditions first where students can focus on understanding the problem during peer learning. The current findings suggest that both personal and contextual factors are crucial. Specifically, high level of both perceived competence and cooperative contexts are necessary for individuals to engage in more productive conflict regulation. Therefore, in the followings, I suggest how to support students' perceived competence and establish more cooperative learning settings based on prior literature on some intervention studies for students' competence-related motivation and basic elements for cooperative learning.

To improve students' perceived competence, self-efficacy, or self-concept, researchers have designed different interventions including different components such as performance feedback, attributional retraining, or confidence strategy. Craven and colleagues (Craven, Marsh, & Debus, 1991) developed an intervention for self-concept by providing performance feedback confirming children's strengths in reading or mathematics as evidence of their competence (e.g., "Look at all the skills you have in mathematics. You can do lots of things well in mathematics," p. 21). They also provide feedback on successful performance by modeling an internal attribution to self-concept in the domain (e.g., "You must feel good about your abilities in mathematics," p. 21). There have been more interventions for attributional retraining for failure

in academic performance (Hall, Hladkyj, Perry, & Ruthig, 2004; Hall, Perry, Chipperfield, Clifton, & Haynes, 2006; Hall et al., 2007). According to attribution theory, attributions for failure experiences which are stable and uncontrollable are detrimental to one's motivation including competence. Therefore, the interventions for attributional training were designed to encourage individuals to attribute failure experiences to unstable and controllable factors, such as a lack of effort, which result in increased effort and performance, which in turn improve perceived competence.

Other researchers also developed a new model for secondary students' motivation and achievement, which includes confidence strategy to help students develop a positive expectation for successful achievement (Feng & Tuan, 2005). They provided an appropriate level of tasks with appropriate expectations for students, and the meaning of "appropriate" is that teachers' standards are high enough to motivate students to do the tasks but not too high so that they are not frustrated about them. They also provide students with opportunities to practice new skills under low-risk conditions such as a cooperative learning environment. Indeed, their approach was also closely related to the intervention strategies for improving students' cooperative perceptions, because they argued that cooperative perceptions can decrease anxiety about competition or relative competence to others, which is in line with the idea in this dissertation study.

Not only for individuals' promoted competence, but also for cooperative contexts themselves, establishing cooperative environments are critical. Social interdependence theory (Johnson & Johnson, 1989) suggests that there are five basic elements for cooperative groups which should be supported in cooperative contexts (Johnson & Johnson, 2013). First, *positive interdependence* must be established. Group members need to perceive that they need each other

to complete the group work. Teachers can support positive interdependence by setting mutual goals, providing joint rewards (e.g., if all group members do the task well, each will receive bonus point), or assigning different roles to each group member. Second, *individual accountability* is necessary, which means teachers need to evaluate each member's performance and contributions to the group work so that every group member is responsible for their work. Third, teachers should emphasize face-to-face *promotive interaction*, such as helping, sharing, and teaching other group members, throughout group work. Fourth, teachers need to teach necessary *interpersonal and small group skills* so that groups can function more effectively. Johnson and Johnson (2013) suggest that there are different collaborative skills to be taught, including decision-making, trust-building, communication, and conflict-management skills. Lastly, teachers should monitor the groups to make sure they are working together. Teachers can also give every group some time to discuss how well they are reaching their goals and maintaining effective working relationships among group members to facilitate *group processing*. Through these five basic rules, teachers can encourage students to work more collaboratively and have more cooperative perceptions in the classroom.

"Do people solve problems more effectively when working together than alone?" To this question, Mercer (2013) answered, "In the right circumstances, yes. (p. 163)" "Do people regulate conflicts more effectively when they are faced with disagreements?" To this question, my answer is the same as Mercer's (2013): "In the right circumstances, yes." And, the right circumstances mean those where students' competence is consistently supported and cooperative goal structures are established.

Rethinking Socio-cognitive Conflict Regulation

Conceptual Considerations

In the socio-cognitive conflict regulation literature, one of the big milestones may be Sommet and his colleagues' (2014, 2015) proposal of protective-relational regulation that is distinct from relational conflict regulation. From their proposal of the new regulation type, relational conflict regulation has been divided into competitive-relational and protective-relational regulations. The refining process of epistemic conflict regulation in the current study may also be similar to the distinction of two relational conflict regulation types. I have provided both theoretical and empirical evidence of the existence of concurrence-seeking epistemic regulation by identifying this type of conflict regulation differentiated from the other types of conflict regulation (i.e., structural validity) and providing its unique associations with different antecedents and consequences (i.e., convergent and discriminant validity).

Re-consideration of protective-relational conflict regulation: Why it needs to be separated from concurrence-seeking epistemic regulation? The argumentation literature and socio-cognitive conflict theory has not clearly differentiated protective-relational regulation from concurrence-seeking epistemic regulation. Argumentation researchers' "cumulative talk" (Mercer, 1996; Wegerif et al., 1999), "(position-driven) consensus dialogues" (Keefer et al., 2000), and "consensual discourse" (Asterhan, 2013) may represent the concepts of some combination of protective-relational regulation and concurrence-seeking epistemic regulation. In contrast, researchers of controversy and conflict resolution show a possibility that the conflict-regulating style with submissive tendency may be divided into protective-relational regulation and concurrence-seeking epistemic regulation based on how important social relationships are to individuals.

Specifically, under cooperative contexts, social relationships are important because my goal can be achieved when others' goal is also achieved. When individuals' goals are positively interdependent and their perceived competence is low, they may tend to align their thinking with others' because this quick alignment is expected to help better understand the problem and eventually reach their shared goals. In contrast, under competitive contexts, social relationships are not much important because my goal can be achieved when other's goal is not achieved. When individuals' goals are negatively interdependent and their perceived competence is low, they may tend to give up and withdraw from the conflict because they expect that their own goal is less likely to be achieved. Prior models of conflict management in social psychology (Blake & Mouton, 1964; Johnson & Johnson, 2005b; Kilmann & Thomas, 1977) have differentiated the avoiding or withdrawing management style—which is similar to protective-relational regulation—from the obliging or accommodating style—which is similar to concurrence-seeking epistemic regulation. Therefore, the similar low level of competence may lead to different styles of conflict regulation depending on an individual's perceptions of goal structure in the context (i.e., cooperative vs. competitive), which was supported by not only factor structure of these different styles but also their differentiated relations with different antecedents and consequences.

Across both Study 1 and 2, the antecedent results for concurrence-seeking epistemic regulation indicated that this regulation was grounded in low perceived competence, low mastery-approach goals, high mastery-avoidance goals, low performance-approach goals, and high performance-avoidance goals, whereas protective-relational regulation was grounded in low perceived competence, high competence threat, low cooperative perceptions, high mastery-avoidance goals, and high performance-avoidance goals. Although these two types of regulation

evidenced similar antecedent profiles in terms of low competence and high avoidance-valenced motivation, unlike concurrence-seeking epistemic regulation, protective-relational regulation emerged from high competence threat and low cooperative perceptions. This suggests that protective-relational regulation may be grounded in the least optimal motivational dispositions, which was also supported by the consequence profiles. Specifically, concurrence-seeking epistemic regulation was positively (Study 1) or non-significantly (Study 2) associated with critical reasoning, whereas protective-relational regulation was negatively associated with critical reasoning in both studies. But both regulation types were negatively associated with behavioral engagement and positively associated with behavioral disengagement, suggesting concurrence-seeking epistemic regulation represents a combination of optimal and nonoptimal components. Taken together, protective-relational regulation needs to be separated from concurrence-seeking epistemic regulation based on the theoretical models of conflict management and empirical evidence of antecedent and consequence profiles.

Re-consideration of epistemic conflict regulation: Why it needs to be separated from concurrence-seeking epistemic regulation? Socio-cognitive conflict theory posits that individuals engage in epistemic conflict regulation when individuals do not perceive their partner threatening, such as within cooperative contexts. But students with low perceived competence under cooperative contexts may still have some concerns, such as worries about misunderstanding, making others confused, or inhibiting others' goal achievement. These possible concerns suggest that it may not necessary that individuals under cooperative contexts always engage in epistemic conflict regulation. Prior models of conflict management in social psychology (Blake & Mouton, 1964; Johnson & Johnson, 2005b; Kilmann & Thomas, 1977) have also differentiated the integrating or collaborating management style—which is similar to

constructive-epistemic regulation—from the obliging or accommodating style—which is similar to concurrence-seeking epistemic regulation. Therefore, the same epistemic concern may lead to different styles of conflict regulation depending on an individual's perceived competence, which was supported by not only factor structure of these different styles but also their differentiated relations with different antecedents and consequences.

Across both Study 1 and 2, the antecedent results for concurrence-seeking epistemic regulation indicated that this regulation was grounded in low perceived competence, low mastery-approach goals, high mastery-avoidance goals, low performance-approach goals, and high performance-avoidance goals, whereas constructive-epistemic regulation was grounded in high perceived competence, high cooperative perceptions, low individualistic perceptions, high mastery-approach goals, low performance-approach goals, and high performance-avoidance goals. Although both types of regulation involve cognitive concerns (e.g., pursuit of better understanding or worries about misunderstanding), they evidenced very different antecedent profiles in terms of competence level, perceptions of social interdependence, and different types of achievement goals. Unlike concurrence-seeking epistemic regulation, constructive-epistemic regulation emerged from high competence, high cooperative perceptions, low individualistic perceptions, and high mastery-approach goals. This suggests that constructive-epistemic regulation may be grounded in the most optimal motivational dispositions, which was also supported by the consequence profiles. Specifically, constructive-epistemic regulation was most strongly positively associated with critical reasoning across both studies, and it was the only regulation type which was positively associated with behavioral engagement and negatively associated with behavioral disengagement. Taken together, constructive-epistemic regulation

needs to be separated from concurrence-seeking epistemic regulation based on the theoretical models of conflict management and empirical evidence of antecedent and consequence profiles.

Comprehensive coverage of the 2 × 2 model. Borrowing the approach to validating the 2 × 2 model of achievement goals (Elliot & McGregor, 2001), I also propose the new framework of socio-cognitive conflict regulation based on its two fundamental components: definition and valence, more specifically definition of individual concern and valence of motivation. With regard to the definition component of concern during peer learning, two basic ways to define concern may be identified—based on an *epistemic* way which is more cognitive concerns and a *relational* way which is more social concerns—and these two are considered to fully cover the conceptual space of definition of concerns when individuals working with others. With regard to the valence component of concern during peer learning, two basic ways to valence motivation may be identified—based on an *approach* way which is motivation to gain positive outcomes and an *avoidance* way which is motivation to prevent negative outcomes—and these two are considered to fully cover conceptual space of valence of motivation. These two components are crossed to generate the four different types of conflict regulation of the 2 × 2 model.

Further, I suggest key antecedents of these two components which are posited to be from a perceived competence in the personal dimension and social contexts in the contextual dimension, with empirical evidence of causality. With regard to the definition component of concern during peer learning, whether individuals focus more on epistemic or relational concerns may be determined by goal structures in the context or individuals' perceptions of goal structures, which are particularly related to cooperative or competitive goal structures. With regard to the valence component of concern during peer learning, whether individuals focus more on gaining positive outcomes or preventing negative outcomes may be determined by

individuals' perceived competence, which is particularly related to high or low level. This dissertation provides not just correlations between these key antecedents and definition and valence of conflict regulation, but cause-and-effect relations through experimental studies. Therefore, each of the four regulations have been clearly and precisely conceptualized and supported by both theoretical and empirical bases, along with the evidence of differentiated key antecedents in the current study. Figure 26 represents the full, comprehensive understanding of 2 × 2 model in definition and valence of socio-cognitive conflict regulation and its key antecedents from both personal and contextual dimensions.

I should note that it is still possible that protective-relational regulation may emerge from no interdependence (i.e., individualistic contexts) rather than negative interdependence (i.e., competitive contexts), based on the findings from Study 1 in which protective-relational regulation was positively associated with individualistic perceptions but negatively associated with competitive perceptions. That is, incompetent individuals may just check themselves out of the competitive dynamics and tend to work individually, when their goals are not shared and they are not working cooperatively. However, Study 2 showed that both competitive and individualistic perceptions were not significantly correlated with protective-relational regulation (see Table 21), and therefore the social contexts as an antecedent of protective-relational regulation should be clarified in future research.

Measurement Considerations

This dissertation study has also made some contributions to the measures of socio-cognitive conflict regulation, on the basis of theoretical refinement of each type of regulation. The first noteworthy contribution is that all of the socio-cognitive conflict regulation items focused explicitly on the regulating behavior per se, which is separated from the underlying

reason or aim for the regulating behavior. This separation of motivation and regulation brings precision and clarity for both definition and measurement, allowing more accurate examination of the relations among the 2 × 2 regulating behavior patterns and their associated motivation such as achievement goals, competence threat, or interpersonal goals (although interpersonal goals were not eventually investigated in the current study).

Cleaner assessment of the regulating behaviors may also help consistently maintain the definition component of conflict regulation in measures. For instance, for the epistemic conflict regulation, there can be different regulating behavior types, even though their basic concerns identically come from epistemic questions. Looking one of the constructive-epistemic conflict regulation items, "I tried to understand each point of view" IN ORDER TO understand the problem better. Also, looking one of the concurrence-seeking epistemic conflict regulation items, "I took up other students' view as if it was my own" IN ORDER TO understand the problem better. Their behavior patterns are differentiated from each other, but the underlying aim or reason for the behavior can be the same, which is solving epistemic question in this case. Likewise, for the relational conflict regulation, there can also be different regulating behavior types, even though their basic concerns are identically from relational (i.e., social) questions. Looking one of the competitive-relational conflict regulation items, "I showed other students I was right" IN ORDER TO protect my self-image. Also, looking one of the protective-relational conflict regulation items, "I reluctantly withdrew my approach" IN ORDER TO protect my self-image. Again, their behavior patterns are differentiated from each other, but the underlying aim or reason for the behavior can be the same, which is solving relational (social) concern in this case. In the meantime, each item also reflects on approach-based (e.g., integrating different perspectives, trying to win the argument) or avoidance-based (e.g., accepting other students'

idea, giving up and withdrawing from any confrontation) action appropriately to regulate intellectual conflicts with others. Hence, the revised measures proposed in this study reflect on both the definition and valence well, while focusing only on behavior—differentiated from motivation—clearly.

Moreover, I addressed the generalizability of different types of socio-cognitive conflict regulation across gender, ethnicity, and students' experience with the same course by testing measurement invariance of the four-factor model. One of the measurement questions often raised is whether the same psychological constructs are measured in different characteristics of population. This dissertation has shown the evidence that the structure of conflict regulations was invariant across students' characteristics considered to be closely related to their regulation styles, which means any mean differences in conflict regulation types among different groups of gender, ethnicity, and course experience can be interpreted as their actual mean differences. In this study, I did not address latent mean differences in different types of socio-cognitive conflict regulation because they are beyond the focused research questions. However, examining gender, ethnicity, and course-experience differences in different types of socio-cognitive conflict are an important research question in that we can consider more targeted and effective interventions towards particular populations, based on their specific tendencies of conflict regulating styles.

Limitations and Future Directions

There were at least a few limitations due to a relatively small sample size (for Study 2), research design, and the nature of participants and contexts. First, I had to exclude many of the created items of socio-cognitive conflict regulation measures to increase their model fit in Study 2, although the same model was well supported in Study 1. One reason for this different result may be from different research designs (vignette-based experimental vs. field observational), so

the measures established in Study 2 may be more appropriate to be used since they are empirically supported by the data from the actual students who were really working in their small groups in the classrooms. Another reason, however, may be due to the small sample size (N = 230) in Study 2, considering that the model has four latent factors. For the same reason, structural relations among different types of socio-cognitive conflict regulation and their antecedent *and* consequence variables within the same models could not be investigated. For example, it would be interesting to examine how perceived competence and cooperative/competitive perceptions predict different types of socio-cognitive conflict regulation, which in turn predict behavioral engagement and critical reasoning in the same model. In this model, it is also possible to examine indirect effects of antecedents of regulation types on their consequences through different regulation types. Future research should re-validate the developed measures and examine the structural relations including both antecedents and consequences of socio-cognitive conflict regulation with a larger sample size.

Second, Pilot Study and Study 1 provided some explanations for causal relations between antecedents and socio-cognitive conflict regulation. However, the inherent nature of experimental vignette method introduces inevitable limitations of the applicability of the findings to people's actual behavior. In order to clarify the underlying social-psychological processes of socio-cognitive conflict regulation, this study needs further evidence of a causal mechanism behind what personal and social factors predict different types of socio-cognitive conflict regulation, which in turn influence various outcomes. Examining individuals' actual perceptions or behavior in laboratory-randomized experimental settings—by manipulating antecedents and controlling for other confounding predictors—may facilitate the prediction of their socio-cognitive conflict regulation in the real situations based on causal evidence. It could also extend

to the investigation of different consequences of different types of socio-cognitive conflict regulation. Yet artificial manipulations for laboratory studies also suffer from a lack of external validity. By the same token, the structural relations in Study 2 may facilitate external validity, but they cannot infer causal (internal validity) or sequential relations associated with socio-cognitive conflict regulation, although I designed the models with the idea of the relations between different conflict regulation types and their antecedents or consequences.

Thus, based on the current findings, future research needs to additionally support both the internal and external validity of this study through an additional randomized experimental design study and the current research design with longitudinal data of students' conflict regulation behavior in the real classrooms for causality evidence and generalizability to the natural classroom settings.

Another limitation is the nature of the sample data and study context in Study 2. The participants in Study 2 were undergraduates in a human anatomy course required of all pre-medicine and pre-health students, meaning they generally perceive high values in this course, such as attainment and utility values. The findings among these highly motivated students may be hard to be generalized to the population of undergraduate students who have an average level of academic motivation. For example, students with high academic motivation or task value would be more likely to engage more in constructive-epistemic regulation in particular. In fact, the current data showed that the mean level of constructive-epistemic regulation was especially higher (M = 3.89, SD = 0.48) than the other mean levels (Ms = 2.53 to 2.68, SDs = 0.73 to 0.78). In addition, the current data included higher portions of female (62%) and White (84%) students, which may not be representative of all undergraduate student populations. Especially, the subject area could differently influence students' feelings or behavior in the classroom depending on

their gender and ethnicity. For example, female or minority students may be susceptible to being passive during group work with male or majority students in a STEM-subject (science, technology, engineering, and math) course. To minimize this concern, in this study, I controlled for students' gender and ethnicity in the analyses where they was significantly associated with variables of interest. However, it may need to replicate the findings with more representative samples of average-level of undergraduate students.

In addition, the subject matter could also influence the nature or degree of conflicts in learning settings, which eventually affect students' conflict regulating styles. Specifically, this study was conducted in anatomy labs, and the small-group activities in the labs were highly likely to be discussion on the factual-based questions (e.g., anatomical structures) due to the nature of subject matter. There might also be less conflicts among students than those that would occur in other subject courses such as social science. In fact, the mean of the degree of perceived conflicts in this course was lower than a mean level (M = 2.79, SD = 0.69, possible range from 1 to 5). Therefore, the nature of the participants and context may limit the generalizability of the findings to other populations of students or other subject areas, and thus the findings about socio-cognitive conflict regulation in this study should be interpreted considering these unique characteristics of sample and context.

Extending the generalizability issue in this study, the nature of a broader context also needs to be considered, such as the characteristics of society, country, and culture. For example, there are surely differences in the socio-cognitive conflict regulating styles between students in the United States and those in other Asian countries. Considering the literature on individualism vs. collectivism (e.g., Oyserman, Coon, & Kemmelmeier, 2002), it may be possible that Asian students are more likely to engage in concurrence-seeking epistemic regulation than American

students. Although such differences in behavioral patterns among different societies are expected, prior socio-cognitive conflict regulation studies have been conducted exclusively in Western cultures (e.g., France, Swiss, the United States). Therefore, it is necessary to examine whether and how students' socio-cognitive conflict regulation differs according to society, country, or culture.

Implications

Implications for Theory

The primary contribution of this study for theory and research is to provide an alternative model that explains different types of socio-cognitive conflict regulation, by incorporating social interdependence theory into the model. This alternative approach allows the new integrative model of socio-cognitive conflict regulation to do two things. First, it aligns with prior literature about different interpersonal conflict resolution models, and extends these models in social psychology to the academic settings. In social psychology, interpersonal conflict resolution strategies have been discussed for a long time, through different models such as models of controversy and decision making (Johnson & Johnson, 2007, 2009b) and conflict management (Blake & Mouton, 1964; Kilmann & Thomas, 1977; Johnson & Johnson, 2005b). In this study, I showed how this literature can be integrated with research on socio-cognitive conflict regulation which has more been addressed in educational psychology. One of the benefits of this integration is that the new 2 × 2 model aligns with the interpersonal conflict resolution models in social psychology well. Thus, the new model proposed in this study may help better understand *learners'* conflict regulation patterns in *academic* settings in particular, which can be

differentiated from the previous models of interpersonal conflict resolution addressed in social psychology.

Second, the proposed model shed light on both socio-cognitive conflict theory and social interdependent theory by examining how these two theories can play complementary roles in understanding peer learning. Specifically, socio-cognitive conflict theory helps understand how students' personal competence or goal orientations may lead to different behaviors to regulate conflicts, and social interdependence theory helps understand how students' perceptions of social context—whether cooperative or competitive—may lead to different outcomes, particularly their behaviors to regulate conflicts in this study. Combination of these two theories eventually contribute to the idea of interactions of personal factor (competence) and contextual factor (social contexts: cooperative or competitive) impacting students' different behavioral patterns of conflict regulation. Ultimately, the fundamental idea of this research is in line with Lewin's conceptualization of human behavior, more broadly, as a function of Person × Environment interactions (Ross & Nisbett, 2011). Hence, the new 2 × 2 model of socio-cognitive conflict regulation may more systematically explain how personal (i.e., competence) and contextual (i.e., social interdependence) factors induce individuals' cognitive and social concerns.

Implications for Research

The present study not only established the first profile of antecedents and consequences for the new construct, concurrence-seeking epistemic regulation, but also further validated and extended the profiles of the other three types of conflict regulation. I specified how different antecedents differentially lead to socio-cognitive conflict regulation, which in turn results in different outcomes. Prior socio-cognitive conflict regulation research has focused on a few variables as antecedents (e.g., competence threat, achievement goals) or consequences (e.g., test

scores) of socio-cognitive conflict regulation. This study, in contrast, investigated its diverse antecedents and consequences and, further, structural relations among these related variables. Examining a full model including both antecedents and consequences of socio-cognitive conflict model in future research will provide a more fruitful understanding of the underlying psychological processes of socio-cognitive conflict regulation and the processes' effects on students' different outcomes, such as behavioral, cognitive, and emotional engagement. Moreover, the research design for Study 1, a randomized-experimental vignette method, presented causal evidence of the relations between personal (i.e., perceived competence) and contextual (i.e., social interdependence) antecedents and socio-cognitive conflict regulation. This evidence is expected to hold practical implications for how to encourage students to engage in more adaptive types of socio-cognitive conflict regulation at both the personal and contextual levels.

I also expect researchers as well as teachers and other practitioners to appreciate the usefulness of the revised measurement instrument of socio-cognitive conflict regulation as a means to better understand learners' different conflict-regulating styles for research and practice. So, researchers can provide more important implications for research and practice regarding proper instructions for their cognitive development and various social-psychological outcomes.

Implications for Practice

Practically, this study may provide more direct and specific guidance for peer-learning instruction. Educational researchers are increasingly encouraging peer learning for students' learning outcomes, but these outcomes may vary depending on students' interaction quality in groups. This study contributes to practice by clarifying what kind of socio-cognitive conflict regulation is particularly beneficial for student outcomes. Teachers often do not have a clear

notion of what discussing, regulating way they should encourage for peer collaborative learning and for what reason. This study's findings may be able to show teachers more precise ways of how to help students' peer learning, such as supporting students' personal perception of competence and establishing cooperative goal structures. Numerous studies in educational psychology emphasize supporting students' cognitive engagement for more adaptive learning outcomes. Nonetheless, it may be equally important to make safe learning environments where students are not threatened by social comparison or of high risk of failure (lowering perceived competence), so they are free to focus on the task itself. This study's findings support this argument with empirical evidence not only from a controlled experimental setting with the possibility of causal inference but also from a natural setting that is more ready to bring about practical implications.

This study's findings can also provide some implications for grouping strategies in classrooms. The current findings have relatively clear implications for the importance of cooperative contexts, which increase epistemic conflict regulations. In terms of perceived competence level, it is important to help students promote their perceived competence (as discussed earlier in the section of The Effects of Perceived Competence and Social Context). However, promoting every student's perceived competence can be very complicated in real classrooms, because competence may always be perceived relative to others. That is, as long as different students are working together, it may be inevitable that some students perceive that their competence differs from others. And thus, to the extent that a student perceive themselves as being relatively less competent than a peer, the possibility of competence threat also exists. This begs the question: Should teachers group students who have similar abilities to each other so that students are less likely to feel lower competence relative to others'?

To answer this question, researchers have debated over how to group students in terms of their different ability levels for a long time (Johnson & Johnson, 1989). Some researchers claim that grouping students with similar ability level may be the best. For instance, one argument is that, in cooperative group work, medium- and low-ability individuals may hinder high-ability individuals' performance. Slavin and Karweit (1985) maintained that low-ability individuals may not gain benefits from medium- and high-ability individuals because the low-ability individuals simply follow higher-ability individuals' answers. However, researchers who maintain the importance of heterogeneous grouping strategy have found that all students with different ability-levels showed higher achievement (Armstrong, Johnson, & Balow, 1982; Smith et al., 1982; Yager, Johnson, & Johnson, 1985). The mechanism explained was that high-ability students working with lower-ability students tended to develop higher-level reasoning strategies than do those working alone or do those working with others with the similar ability level. Applying this mechanism to the current study, high-ability students' constructive-epistemic regulation, as a higher-level reasoning strategy for peer learning, may help low-ability students to be more able to learn how to think critically and how to approach the problem from higher-ability students than do those working with similarly low-ability students.

At the same time, however, comparing one's competence to that of others may be human nature (Allport, 1920; Johnson & Johnson, 1989; Johnson, Johnson, & Roseth, 2012) and social comparison may be more induced when students are working together on the same material (i.e., resource *in*dependence) than when they are working together on different material (i.e., resource *inter*dependence; Buchs & Butera, 2009; Buchs, Butera, & Mugny, 2004). Thus, one of the ways to buffer such relative competence threats may be working together based on resource interdependence, so that each member has only a portion of the resources or materials necessary

for the task to be completed and all members' resources should be combined to achieve their group goal. Similarly, teachers can also use task interdependence or role interdependence, which are all considered as *positive means interdependence* with resource interdependence (Johnson & Johnson, 1989). Similar to resource interdependence, task interdependence can be supported when a task can be divided into subtasks, and one group member must complete his responsibilities before the next member completes his own. Likewise, role interdependence can be supported when all group members have complementary and interconnected roles specifying responsibilities for the achievement of group goal.

Such positive means interdependence can buffer students' competence threats because every members' resources, tasks, and roles are necessary to attain their group goals, meaning there is a clear reason why all members' efforts are needed and appreciated regardless of their competence levels. For example, although one group member is less competent about his group task relative to other group members, it may not be necessary for him to be threated by other members, as long as there is a clear part that he can contribute to his group work and all group members know that their group goal cannot be achieved without his resource, responsible task, or role. Thus, it is important for teachers to support all group members' efforts by designing group work based on positive means interdependence, so every member can be focused on their responsibility without the concerns about social comparison of their competence. In conclusion, supports for positive means interdependence for students' competence are equally important to the supports for positive goal interdependence for students' perceptions of cooperative contexts.

Conclusion

Students learn and develop while they are working with other students in a classroom. Although numerous researchers have emphasized on the importance of dynamic learning

systems in students' cognitive development, research in educational psychology has little focused on how students can more constructively participate in peer learning in social contexts. This dissertation study suggests not only personal competence level but also contextual characteristics are critical for students' productive interactions that enhance their cognitive development and learning. The conceptual model of socio-cognitive conflict regulation may help enable teachers and practitioners to make informed how to support the type of peer interactions or intellectual conflicts that they aim to lead students to engage in (i.e., constructive-epistemic regulation). I hope this dissertation study can contribute to this end by clarifying essential antecedents of different types of socio-cognitive conflict regulation based on the evidence of both internal and external validity.

APPENDICES

APPENDIX A.

Tables

Table 1

Socio-cognitive Conflict Regulation and Associated Models of Interpersonal Conflict Resolution

Socio-cognitive conflict regulation	Argumentative discourse			Controversy and decision making	Conflict management		
	Mercer (1996), Wegerif et al. (1999)	Keefer (2000)	Asterhan (2013)	Johnson & Jonson (1995)	Blake & Mouton (1964)	Kilmann & Thomas (1977)	Johnson & Johnson (2005b)
Constructive-epistemic	Exploratory talk	Critical discussions	Co-constructive critical argumentation	Constructive controversy (deliberate discourse)	Integrating	Collaborating	Confronting
Competitive-relational	Disputational talk	Eristic discussions	Adversarial argumentation	Debate	Dominating	Competing	Forcing
Concurrence-seeking epistemic	Cumulative talk	Consensus dialogues	Consensual discourse	Concurrence seeking	Obliging	Accommodating	Smoothing
Protective-relational				N/A	Avoiding	Avoiding	Withdrawing

Table 2

Characteristics of Different Socio-cognitive Conflict Regulation Types

	Personal dimension				Social dimension	
	Perceived competence	Critical reasoning	Consensual construction and validation of explanations	Quick consensus seeking	Positive inter-dependence (cooperative perceptions)	Negative inter-Dependence (competitive perceptions)
Constructive-epistemic	High	High	High	Low	High	Low
Concurrence-seeking epistemic	Low	Low	Low	High	High	Low
Competitive-relational	High	High	Low	Low	Low	High
Protective-relational	Low	Low	Low	High	Low	High

Table 3

Summary of Revisions of Socio-cognitive Conflict Regulation Items

Item	Pilot	Study 1	Study 2
Concurrence-seeking 2	I would support the other employee's opinion.	I would accept the other employee's opinion without worrying about my original idea.	I easily substituted other students' ideas for my own.
Problems	The phrase, "supporting" others, can overlap with the concept of constructive-epistemic regulation.	The phrase, "without worrying about my original idea," can be understood as "not caring about the discussion/debate" which overlaps with the concept of protective-relational regulation.	N/A
Concurrence-seeking 3	Same as Study 1	I would go along with the other employee's idea without hesitation.	I freely replaced my opinion with other students'.
Problems	N/A	There is not so much about epistemic concerns. There could be different reasons for going along with others' idea. The reason should be from concerns about the ideas, not from those about position.	N/A
Concurrence-seeking 4	I would easily align my thinking with the other employee's point of view without experiencing any contradiction.	I would align my thinking with the other employee's as if I reached the same conclusions myself.	Same as Study 1
Problems	Epistemic concerns may need to be more emphasized.	N/A	N/A
Protective 2	I would withhold my idea despite thinking it still has merit.	I would withdraw my ideas and wait for the conflict to end.	Same as Study 1
Problems	The phrase, "despite thinking it still has merit," is unnecessary for this type of regulation.	N/A	N/A
Protective 3	I would disengage from any discussion of our ideas.	I would disengage from any confrontation and avoid the conflict.	Same as Study 1
Problems	The phrase, "our ideas," can trigger cooperative perceptions which overlap with concurrence-seeking epistemic regulation that is passive and cooperative.	N/A	N/A

Table 4

Demographic Information by Condition: Pilot Study

	Total	Condition 1	Condition 2	Condition 3	Condition 4
Gender					
Male	116 (58%)	23 (49%)	26 (51%)	30 (57%)	37 (74%)
Female	85 (42%)	24 (51%)	25 (49%)	23 (43%)	13 (26%)
Transgender	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Prefer not to respond	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Ethnicity					
African American or Black	19 (10%)	6 (13%)	3 (5%)	5 (9%)	5 (10%)
Asian, Pacific Islander, or Asian-American	16 (8%)	2 (4%)	7 (>1%)	5 (9%)	2 (4%)
European American or White (not Hispanic)	139 (69%)	29 (62%)	35 (>1%)	37 (70%)	38 (76%)
Hispanic or Latino/a	15 (8%)	4 (9%)	3 (>1%)	4 (8%)	4 (8%)
Native American/American Indian	4 (2%)	2 (4%)	1 (84%)	1 (2%)	0 (0%)
Others (not listed)	7 (4%)	4 (9%)	1 (7%)	1 (2%)	1 (2%)
Prefer not to respond	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Native language					
English	199 (99%)	47 (100%)	51 (100%)	53 (100%)	48 (96%)
Non-English	2 (1%)	0 (0%)	0 (0%)	0 (0%)	2 (4%)
Age: *M* (*SD*)	21.60 (1.81)	21.49 (1.65)	21.59 (1.93)	21.72 (1.78)	21.60 (1.92)
GPA: *M* (*SD*)	3.43 (0.38)	3.45 (0.36)	3.47 (0.33)	3.42 (0.43)	3.45 (0.42)

Note. Condition 1: high competence—positive interdependence; Condition 2: low competence—positive interdependence; Condition 3: high competence—negative interdependence; Condition 4: low competence—negative interdependence.

Table 5

Item Revisions from the Original Scales of Socio-cognitive Conflict Regulation

Item	Original Scales: Darnon et al. (2006), Sommet et al. (2015)	The Present Study (Study 2)
	When reacting to your partner's answer, to what extent did you…	***Sometimes disagreements occur when working with others in lab. When this occurred…***
Epistemic 1	try to think about the text again in order to understand better?	I thought about what I would learn from other students' ideas.
Epistemic 2	try to examine the conditions under which each point of view could help you understand?	I tried to understand each point of view.
Epistemic 3	try to think of a solution that could integrate both points of view?	I thought of a solution that could integrate multiple points of view.
Competitive 1	try to show you were right?	I showed other students I was right.
Competitive 2	resist and maintain your initial position?	I resisted other students' view by maintaining my initial position.
Competitive 3	try to show he (she) was wrong?	I showed that other students were wrong.
Protective 1	think his (her) answer was more correct than yours?	N/A
Protective 2	try to comply with his (her) opinion?	N/A
Protective 3	agree with his (her) own way of viewing things?	N/A

Note. The revised items of protective-relational regulation are not available in this table, because they were considerably changed. All revised items are presented in Appendix C and D.

Table 6

EFA with All 24 Items: Pilot Study

	Factor 1	Factor 2	Factor 3	Factor 4
readily accept the other employee's idea as if I had thought of it myself	**.77**	.05	.15	-.01
take up the other employee's view as if it was my own	**.73**	-.03	-.07	-.09
go along with the other employee's idea without hesitation	**.63**	-.09	-.14	-.13
readily endorse the other employee's point of view without feeling like it contradicts my own thinking	**.57**	.07	-.17	-.04
easily align my thinking with the other employee's point of view without experiencing any contradiction	**.34**	.20	-.14	-.23
integrate the different perspectives	.03	**.88**	.05	.06
consider the different points of view	-.12	**.82**	.02	-.09
figure out how to incorporate the different points of view	-.05	**.82**	.02	-.11
think of a solution that could integrate multiple points of view	-.07	**.68**	.05	-.03
try to understand each point of view	.15	**.53**	.03	.22
think about what I would learn from the other employee's idea	.20	**.53**	-.20	.14
support the other employee's opinion	**.30**	**.47**	-.27	-.04
resist by showing my perspective is better than the other employee's	-.02	.10	**.76**	-.14
show the other employee I am right	-.10	.08	**.76**	.11
resist by showing my perspective is right	.12	-.06	**.76**	.10
show the other employee is wrong	-.07	-.06	**.74**	.06
try to win the argument	-.08	.06	**.73**	.02
resist the other employee's view by maintaining my initial position	.04	-.12	**.73**	-.001
back out and ignore the conflict	-.01	-.01	-.05	**-.80**
give up and withdraw from any confrontation	.06	.01	-.12	**-.78**
reluctantly withdraw my approach	.02	.003	-.14	**-.65**
want to leave and think about something else	.04	.04	.15	**-.64**
withhold my idea despite thinking it still has merit	.21	-.07	-.12	**-.43**
disengage from any discussion of our ideas	**.36**	-.18	.21	**-.41**
% of explained variance	27.45	17.87	11.19	5.31
Eigenvalue	6.59	4.29	2.69	1.28

Note. Factor loadings > |.30| are in boldface. Four items in boldface were excluded in the final EFA in Pilot Study (see Table 7). Factor 1 = Concurrence-seeking epistemic regulation; Factor 2 = Constructive-epistemic regulation; Factor 3 = Competitive-relational regulation; Factor 4 = Protective-relational regulation.

Table 7

Final EFA with 20 Items: Pilot Study

	Factor 1	Factor 2	Factor 3	Factor 4
resist by showing my perspective is better than the other employee's	**-.77**	.09	.14	.002
resist by showing my perspective is right	**-.76**	-.07	-.09	.11
show the other employee I am right	**-.76**	.07	-.09	-.11
show the other employee is wrong	**-.74**	-.06	-.05	-.06
resist the other employee's view by maintaining my initial position	**-.73**	-.13	-.01	.04
try to win the argument	**-.72**	.06	-.02	-.09
integrate the different perspectives	-.01	**.88**	-.04	.02
figure out how to incorporate the different points of view	.01	**.82**	.11	-.05
consider the different points of view	< .001	**.81**	.09	-.09
think of a solution that could integrate multiple points of view	-.02	**.68**	.03	-.07
try to understand each point of view	-.03	**.53**	-.20	.17
think about what I would learn from the other employee's idea	.21	**.53**	-.13	.20
back out and ignore the conflict	.04	-.03	**.81**	.01
give up and withdraw from any confrontation	.11	-.01	**.76**	.10
want to leave and think about something else	-.15	.03	**.72**	.07
reluctantly withdraw my approach	.12	-.01	**.72**	.08
take up the other employee's view as if it was my own	.05	-.04	.11	**.78**
readily accept the other employee's idea as if I had thought of it myself	-.16	.04	.04	**.76**
go along with the other employee's idea without hesitation	.13	-.09	.13	**.62**
readily endorse the other employee's point of view without feeling like it contradicts my own thinking	.18	.07	.05	**.53**
% of explained variance	27.68	18.91	12.34	6.30
Eigenvalue	5.54	3.78	2.47	1.26

Note. Factor loadings > |.53| are in boldface. Factor 1 = Competitive-relational regulation; Factor 2 = Constructive-epistemic regulation; Factor 3 = Protective-relational regulation; Factor 4 = Concurrence-seeking epistemic regulation.

Table 8

CFAs: Standardized Factor Loadings and Residual Variances

Variable	Item	Factor loadings Pilot/Study 1/Study 2	Residual variances Pilot/Study 1/Study 2
Constructive	Constructive1	.58/.67/.60	.66/.56/.64
	Constructive2	.57/.76/.59	.68/.42/.65
	Constructive3	.65/.78/.51	.58/.39/.75
	Constructive4	.74/.80/.64	.45/.37/.60
	Constructive5	.90/.78/.57	.20/.40/.67
	Constructive6	.80/.78/.74	.36/.40/.46
Concurrence-seeking	Concurrence1	.67/.67/–	.55/.55/–
	Concurrence2	–/–/–	–/–/–
	Concurrence3	.73/.73/.68	.46/.46/.54
	Concurrence4	–/.73/–	–/.47/–
	Concurrence5	.83/.69/.75	.30/.52/.43
	Concurrence6	.69/.70/.59	.53/.51/.65
Competitive	Competitive1	.82/.74/.64	.33/.46/.60
	Competitive2	.74/.65/–	.45/.58/–
	Competitive3	.78/.75/.82	.40/.44/.33
	Competitive4	.70/.71/–	.51/.49/–
	Competitive5	.77/.74/.59	.41/.45/.65
	Competitive6	.74/.71/–	.46/.50/–
Protective	Protective1	.72/.70/–	.48/.51/–
	Protective2	–/.76/–	–/.43/–
	Protective3	–/.73/.67	–/.48/.55
	Protective4	.85/.79/.62	.28/.38/.62
	Protective5	.57/.64/–	.68/.59/–
	Protective6	.79/.75/.80	.37/.43/.37

Note: CFA = Confirmatory factor analysis; Constructive = Constructive-epistemic regulation; Concurrence-seeking = Concurrence-seeking epistemic regulation; Competitive = Competitive-relational regulation; Protective = Protective-relational regulation.

Table 9

Comparison of the Hypothesized Model and Alternative Models

Model	χ^2	*df*	CFI	TLI	RMSEA	SRMR	$\Delta\chi^2$	AIC	Adjusted BIC
Pilot Study									
Hypothesized model	320.25***	164	.92	.91	.07	.07		10554.09	10563.01
3-factor model A	660.66***	167	.74	.70	.12	.16	340.41***	10888.50	10897.02
3-factor model B	477.08***	167	.84	.81	.10	.09	156.83***	10704.92	10713.44
Epistemic-Relational	925.61***	169	.60	.55	.15	.17	605.36***	11149.45	11157.69
Agentic-Submissive	1085.48***	169	.52	.46	.16	.19	765.23***	11309.33	11317.57
Study 1									
Hypothesized model	748.23***	224	.91	.90	.07	.07		29629.85	29708.49
3-factor model A	1736.03***	227	.73	.70	.12	.15	987.80***	30611.65	30687.14
3-factor model B	1173.01***	227	.83	.81	.09	.10	424.78***	30048.63	30124.12
Epistemic-Relational	2933.47***	229	.51	.46	.16	.19	2185.24***	31865.09	31938.49
Agentic-Submissive	1917.19***	229	.70	.67	.12	.12	1168.96***	30788.81	30862.20
Study 2									
Hypothesized model	151.33***	84	.92	.90	.06	.06		9081.47	9256.81
3-factor model A	295.10***	87	.74	.69	.10	.10	143.77***	9219.24	9384.27
3-factor model B	282.26***	87	.76	.71	.10	.09	130.93***	9206.41	9371.43
Epistemic-Relational	441.13***	89	.56	.48	.13	.12	289.80***	9361.27	9519.42
Agentic-Submissive	415.33***	89	.59	.52	.13	.11	264.00***	9335.48	9493.63

Note. 3-factor model A: The constructive-epistemic and concurrence-seeking epistemic items load together on a latent variable; 3-factor model B: The concurrence-seeking epistemic and protective-relational items on a latent variable; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root-mean-square error of approximation; SRMR = standardized root mean square residual; AIC = Akaike information criterion; BIC = Bayesian information criterion.

***$p < .001$.

Table 10

Descriptive Statistics by Condition: Pilot Study

	Total		Condition 1		Condition 2		Condition 3		Condition 4	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
1. Constructive	3.79	0.74	3.98	0.69	3.80	0.61	3.51	0.84	3.91	0.74
2. Concurrence	2.70	0.92	2.52	0.72	3.30	0.90	2.24	0.87	2.75	0.82
3. Competitive	3.13	0.96	2.93	0.83	2.65	0.98	3.87	0.65	3.04	0.91
4. Protective	2.57	0.96	2.25	0.93	3.00	0.80	2.11	0.83	2.93	0.97
5. Competence	3.53	1.14	4.17	0.68	2.86	1.00	4.30	0.62	2.78	1.16
6. Competence threat	3.17	1.03	2.71	1.01	3.41	0.92	3.13	1.04	3.43	1.02
7. Cooperative	3.53	0.75	3.80	0.69	3.50	0.70	3.38	0.82	3.46	0.74
8. Competitive	3.27	0.94	2.83	0.81	3.00	0.91	4.00	0.70	3.22	0.87
9. Individualistic	2.85	0.83	2.57	0.90	2.70	0.85	3.17	0.68	2.92	0.79

Note. Condition 1: high competence—positive interdependence; Condition 2: low competence—positive interdependence; Condition 3: high competence—negative interdependence; Condition 4: low competence—negative interdependence; Constructive = constructive-epistemic regulation; Concurrence = concurrence-seeking epistemic regulation; Competitive = competitive-relational regulation; protective = Protective-relational regulation; Cooperative = cooperative perceptions; Competitive = competitive perceptions; Individualistic = individualistic perceptions.

Table 11

Intercorrelations: Pilot Study

	1	2	3	4	5	6	7	8	9
1. Constructive	–								
2. Concurrence	.14*	–							
3. Competitive	-.14†	-.36***	–						
4. Protective	-.13†	.47***	-.24***	–					
5. Competence	.14†	-.38***	.47***	-.57***	–				
6. Competence threat	-.10	.17*	.10	.45***	-.37***	–			
7. Cooperative	.60***	.14*	-.19**	-.21**	.24**	-.31***	–		
8. Competitive	-.16*	-.15*	.78***	-.18**	.39**	.18*	-.15*	–	
9. Individualistic	-.33***	-.06	.42***	.22**	.05	.37***	-.69***	.44*	–
M	3.79	2.70	3.13	2.57	3.53	3.17	3.53	3.27	2.85
SD	0.74	0.92	0.96	0.96	1.14	1.03	0.75	0.94	0.83
Observed range	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5
Cronbach's α	.86	.82	.89	.82	.89	.76	.75	.84	.79

Note. Constructive = constructive-epistemic regulation; Concurrence = concurrence-seeking epistemic regulation; Competitive = competitive-relational regulation; protective = Protective-relational regulation; Cooperative = cooperative perceptions; Competitive = competitive perceptions; Individualistic = individualistic perceptions.

$^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Table 12

Summary of the MAN(C)OVA Results

	Pilot		Study 1		
	Competence	Social interdependence	Competence	Social interdependence	Replication
Competence					
Perceived competence	High > Low	*ns*	High > Low	*ns*	Yes
Competence threat	Low > High	*ns*		Positive (larger difference): Low > High†	Interaction
				Negative: Low > High†	added
Social interdependence					
Cooperative		Positive: High > Low†		Positive: High > Low	Yes
		Negative: Low > High†		Negative: Low > High	
Competitive		Positive: Low > High		Positive: High > Low	Yes
		Negative: High > Low		Negative (larger difference): High > Low	
Individualistic	*ns*	Negative > Positive		Positive: High > Low	Interaction
				Negative (larger difference): High > Low	added
Conflict regulation					
Constructive-epistemic		Positive: High > Low		Positive: High > Low	Yes
		Negative: Low > High		Negative: Low > High	
Concurrence-seeking	Low > High	Positive > Negative	Low > High	Positive > Negative	Yes
Competitive-relational		Positive: High > Low		Positive: High > Low	Yes
		Negative (larger difference): High > Low		Negative (larger difference): High > Low	
Protective-relational	Low > High	*ns*	Low > High	*ns*	Yes
Achievement goals	N/A	N/A			N/A
Mastery approach			High > Low	Positive > Negative	
Mastery avoidance			Low > High	Negative > Positive†	
Performance approach				Positive: High > Low	
				Negative (larger difference): High > Low	
Performance avoidance				Positive (larger difference): Low > High†	
				Negative: Low > High†	
Work avoidance			Low > High	*ns*	
Critical reasoning	N/A	N/A		Positive: High > Low	N/A
				Negative: Low > High	

Note. $^{\dagger}p < .10$.

Table 13

Demographic Information by Condition: Study 1

	Total	Condition 1	Condition 2	Condition 3	Condition 4
Gender					
Male	301 (60%)	66 (58%)	79 (63%)	83 (61%)	73 (57%)
Female	195 (39%)	47 (42%)	44 (35%)	49 (36%)	55 (43%)
Transgender	4 (1%)	0 (0%)	2 (2%)	3 (2%)	1 (1%)
Prefer not to respond	4 (1%)	0 (0%)	0 (0%)	2 (2%)	0 (0%)
Ethnicity					
African American or Black	61 (12%)	16 (14%)	9 (7%)	18 (13%)	18 (14%)
Asian, Pacific Islander, or Asian-American	47 (9%)	10 (9%)	14 (11%)	11 (8%)	12 (9%)
European American or White (not Hispanic)	320 (64%)	67 (59%)	86 (69%)	90 (66%)	77 (60%)
Hispanic or Latino/a	30 (6%)	8 (7%)	5 (4%)	6 (4%)	11 (9%)
Native American/American Indian	6 (1%)	2 (2%)	1 (1%)	3 (2%)	0 (0%)
Others (not listed)	33 (7%)	8 (7%)	7 (6%)	8 (6%)	10 (8%)
Prefer not to respond	6 (1%)	2 (2%)	3 (2%)	1 (1%)	0 (0%)
Native language					
English	495 (98%)	111 (98%)	122 (98%)	135 (99%)	127 (98%)
Non-English	8 (2%)	2 (2%)	2 (2%)	2 (2%)	2 (2%)
Age: *M* (*SD*)	21.66 (1.96)	21.66 (1.93)	21.93 (1.79)	21.58 (2.00)	21.50 (2.09)
GPA: *M* (*SD*)	3.44 (0.38)	3.43 (0.37)	3.43 (0.39)	3.43 (0.37)	3.45 (0.42)

Note. Condition 1: high competence—positive interdependence; Condition 2: low competence—positive interdependence; Condition 3: high competence—negative interdependence; Condition 4: low competence—negative interdependence.

Table 14

EFA with All 24 Items: Study 1

	Factor 1	Factor 2	Factor 3	Factor 4
align my thinking with the other employee's as if I reached the same conclusions myself	**.81**	-.06	-.003	-.03
readily accept the other employee's idea as if I had thought of it myself	**.78**	-.04	.04	-.06
take up the other employee's view as if it was my own	**.65**	.07	.06	.09
readily endorse the other employee's point of view without feeling like it contradicts my own thinking	**.57**	.10	-.14	.12
go along with the other employee's idea without hesitation	**.53**	**.31**	-.08	-.02
give up and withdraw from any confrontation	-.03	**.81**	-.01	.002
back out and ignore the conflict	-.01	**.75**	-.04	-.07
withdraw my ideas and wait for the conflict to end	.05	**.73**	.03	-.01
want to leave and think about something else	-.08	**.69**	.05	.001
reluctantly withdraw my approach	.09	**.65**	.004	-.01
disengage from any confrontation and avoid the conflict	.10	**.65**	-.03	.03
accept the other employee's opinion without worrying about my original idea	**.31**	**.41**	-.10	.09
show the other employee I am right	-.01	-.16	**.79**	.09
show the other employee is wrong	.06	.02	**.76**	-.01
try to win the argument	-.03	-.11	**.76**	.05
resist by showing my perspective is right	.10	.09	**.72**	-.06
resist by showing my perspective is better than the other employee's	-.05	.09	**.68**	-.07
resist the other employee's view by maintaining my initial position	-.08	.12	**.59**	-.11
think of a solution that could integrate multiple points of view	-.03	.03	.02	**.82**
figure out how to incorporate the different points of view	-.01	.08	.05	**.82**
integrate the different perspectives	-.02	.08	-.03	**.79**
consider the different points of view	-.02	-.09	-.02	**.78**
try to understand each point of view	.04	-.14	-.01	**.74**
think about what I would learn from the other employee's idea	.05	-.01	-.08	**.62**
% of explained variance	26.57	21.84	8.74	5.46
Eigenvalue	6.38	5.24	2.10	1.31

Note. Factor loadings > |.30| are in boldface. One item in boldface was excluded in the final EFA in Study 1 (see Table 15). Factor 1 = Concurrence-seeking epistemic regulation; Factor 2 = Protective-relational regulation; Factor 3 = Competitive-relational regulation; Factor 4 = Constructive-epistemic regulation.

Table 15

Final EFA with 23 Items: Study 1

	Factor 1	Factor 2	Factor 3	Factor 4
think of a solution that could integrate multiple points of view	**.82**	.03	.02	.02
figure out how to incorporate the different points of view	**.82**	.08	.05	.01
integrate the different perspectives	**.79**	.08	-.03	.02
consider the different points of view	**.78**	-.09	-.02	.02
try to understand each point of view	**.74**	-.14	-.02	-.04
think about what I would learn from the other employee's idea	**.62**	-.01	-.08	-.05
give up and withdraw from any confrontation	.01	**.80**	-.02	.02
back out and ignore the conflict	-.07	**.75**	-.04	< .001
withdraw my ideas and wait for the conflict to end	-.003	**.73**	.02	-.06
want to leave and think about something else	.01	**.70**	.05	.07
reluctantly withdraw my approach	-.001	**.65**	-.001	-.10
disengage from any confrontation and avoid the conflict	.04	**.65**	-.03	-.11
show the other employee I am right	.09	-.16	**.79**	.02
show the other employee is wrong	-.01	.02	**.76**	-.06
try to win the argument	.05	-.11	**.76**	.04
resist by showing my perspective is right	-.06	.09	**.72**	-.10
resist by showing my perspective is better than the other employee's	-.07	.09	**.67**	.06
resist the other employee's view by maintaining my initial position	-.11	.11	**.59**	.08
align my thinking with the other employee's as if I reached the same conclusions myself	-.03	-.06	-.01	**-.81**
readily accept the other employee's idea as if I had thought of it myself	-.06	-.04	.04	**-.80**
take up the other employee's view as if it was my own	.10	.08	.06	**-.65**
readily endorse the other employee's point of view without feeling like it contradicts my own thinking	.12	.10	-.15	**-.54**
go along with the other employee's idea without hesitation	-.01	.31	-.09	**-.51**
% of explained variance	26.39	22.14	9.11	5.70
Eigenvalue	6.07	5.09	2.10	1.31

Note. Factor loadings > |.51| are in boldface. Factor 1 = Constructive-epistemic regulation; Factor 2 = Protective-relational regulation; Factor 3 = Competitive-relational regulation; Factor 4 = Concurrence-seeking epistemic regulation.

Table 16

Descriptive Statistics by Condition: Study 1

	Total		Condition 1		Condition 2		Condition 3		Condition 4	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
1. Constructive	3.82	0.79	4.09	0.60	3.91	0.78	3.45	0.90	3.87	0.70
2. Concurrence-seeking	2.71	0.86	2.68	0.87	3.00	0.82	2.42	0.87	2.76	0.79
3. Competitive	3.04	0.88	2.97	0.71	2.52	0.83	3.68	0.77	2.91	0.75
4. Protective	2.33	0.86	2.08	0.82	2.56	0.76	2.02	0.76	2.65	0.93
5. Competence	3.66	1.03	4.26	0.67	2.99	0.91	4.35	0.61	3.03	0.94
6. Competence threat	3.09	1.03	2.61	0.87	3.27	1.03	3.05	0.99	3.36	1.05
7. Cooperative	3.65	0.72	3.85	0.62	3.66	0.72	3.46	0.78	3.68	0.69
8. Competitive	3.30	0.83	3.09	0.82	2.96	0.81	3.80	0.70	3.27	0.74
9. Individualistic	2.75	0.84	2.65	0.79	2.53	0.84	3.14	0.78	2.63	0.82
10. MAP	4.27	0.74	4.38	0.62	4.15	0.82	4.32	0.76	4.25	0.74
11. MAV	3.33	1.03	2.89	0.95	3.63	1.00	2.99	0.98	3.78	0.92
12. PAP	3.51	0.92	3.26	0.94	3.23	0.88	3.96	0.81	3.51	0.86
13. PAV	3.64	0.89	3.41	0.88	3.80	0.89	3.59	0.84	3.74	0.91
14. WAV	2.22	0.99	2.14	0.87	2.35	1.00	2.13	0.99	2.26	1.07
15. Critical reasoning	3.80	0.73	4.01	0.65	3.80	0.76	3.57	0.77	3.85	0.64

Note. Condition 1: high competence—positive interdependence; Condition 2: low competence—positive interdependence; Condition 3: high competence—negative interdependence; Condition 4: low competence—negative interdependence; Constructive = constructive-epistemic regulation; Concurrence = concurrence-seeking epistemic regulation; Competitive = competitive-relational regulation; protective = Protective-relational regulation; Cooperative = cooperative perceptions; Competitive = competitive perceptions; Individualistic = individualistic perceptions; MAP = mastery-approach goals; MAV = mastery-avoidance goals; PAP = performance-approach goals; PAV = performance-avoidance goals; WAV = work-avoidance goals.

Table 17

Intercorrelations: Study 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Constructive	–														
2. Concurrence	.21***	–													
3. Competitive	-.46***	-.23***	–												
4. Protective	-.14**	.54***	-.06	–											
5. Competence	.08†	-.24***	.38***	-.47***	–										
6. Competence threat	-.17***	.13**	.25***	.42***	-.37***	–									
7. Cooperative	.69***	.24***	-.33***	-.17***	.17***	-.25***	–								
8. Competitive	-.25***	-.11*	.69***	-.11*	.35***	.22***	-.12**	–							
9. Individualistic	-.50***	-.24***	.52***	.10*	.13**	.26***	-.71***	.34***	–						
10. MAP	.50***	-.14**	-.06	-.41***	.33***	-.13**	.44***	.08†	-.21***	–					
11. MAV	.25***	.20***	-.21***	.27***	-.47***	.49***	.16***	-.18***	-.16***	.21***	–				
12. PAP	-.21***	-.17***	.66***	-.10*	.23***	.37***	-.18***	.79***	.37***	.12**	-.030	–			
13. PAV	.12**	.14**	.13**	.16***	-.15***	.54***	.04	.16***	.01	.20***	.38***	.32***	–		
14. WAV	-.26***	.41***	.19***	.63***	-.17***	.31***	-.22***	.16***	.18***	-.47***	.01	.06	.04	–	
15. Critical reasoning	.80***	.14**	-.35***	-.20***	.16***	-.18***	.65***	-.15**	-.40***	.53***	.24***	-.14**	.11*	-.31***	–
M	3.82	2.71	3.04	2.33	3.66	3.09	3.65	3.30	2.75	4.27	3.33	3.51	3.64	2.22	3.80
SD	0.79	0.86	0.88	0.86	1.03	1.03	0.72	0.83	0.84	0.74	1.03	0.92	0.89	0.99	0.73
Observed range	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5
Cronbach's α	.89	.83	.86	.87	.79	.79	.77	.81	.83	.80	.84	.82	.68	.78	.74

Note. Constructive = constructive-epistemic regulation; Concurrence = concurrence-seeking epistemic regulation; Competitive = competitive-relational regulation; protective = protective-relational regulation; Cooperative = cooperative perceptions; Competitive = competitive perceptions; Individualistic = individualistic perceptions; MAP = mastery-approach goals; MAV = mastery-avoidance goals; PAP = performance-approach goals; PAV = performance-avoidance goals; WAV = work-avoidance goals.
$^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Table 18

Fit Statistics for Multi-group Confirmatory Factor Analysis of Socio-cognitive Conflict Regulation

Model	Description	χ^2	*df*	CFI	ΔCFI	RMSEA	ΔRMSEA
Study 1							
Gender							
1	Null model	6029.63***	506	—	—	—	—
2	Configural	1029.63***	448	.895	—	.072	—
3	Weak	1050.57***	467	.894	.001	.075	.003
4	Strong	1063.79***	486	.895	+.001	.075	<.001
5	Strict	1084.94***	509	.896	+.001	.075	<.001
6	Factor variances/covariances	1104.32***	519	.894	.002	.083	.008
Ethnicity							
7	Null model	6240.03***	506	—	—	—	—
8	Configural	1027.86***	448	.899	—	.072	—
9	Weak	1048.26***	467	.899	<.001	.075	<.001
10	Strong	1055.21***	486	.901	+.002	.075	<.001
11	Strict	1105.39***	509	.896	.005	.075	<.001
12	Factor variances/covariances	1125.20***	519	.894	.002	.068	-.007
Study 2							
Gender							
13	Null model	1031.57***	210	—	—	—	—
14	Configural	251.78***	168	.898	—	.066	—
15	Weak	280.69***	179	.876	.022	.070	.004
16	Weak partial[1]	267.80***	178	.891	.007	.066	<.001
17	Strong	282.47***	189	.886	.005	.066	<.001
18	Strict	301.99***	204	.881	.005	.065	-.001
19	Factor variances/covariances	308.54***	214	.885	+.004	.062	-.003
Ethnicity[2]							
20	Null model	1057.10***	210				
21	Configural	250.47***	170	.905		.064	
22	Weak	279.73***	181	.883	.022	.069	.005
23	Weak partial[3]	264.27***	179	.899	.006	.064	<.001
24	Strong	275.54***	190	.899	<.001	.063	.001
25	Strict	310.82***	204	.874	.025	.067	.004
26	Strict partial[4]	293.85***	202	.892	.007	.063	<.001
27	Factor variances/covariances	306.82***	212	.888	.004	.062	.001
Prior course experience							
28	Null model	1046.11***	210	—	—	—	—
29	Configural	256.84***	168	.894	—	.068	—
30	Weak	268.21***	179	.893	.001	.066	-.002
31	Strong	273.70***	190	.900	+.007	.062	-.004
32	Strict	298.94***	205	.888	.012	.063	.001
33	Strict partial	291.74***	204	.895	.005	.061	-.001
34	Factor variances/covariances	311.12***	214	.884	.011	.063	.002
35	Factor variances/covariances partial[5]	308.07***	213	.886	.009	.062	-.001

Table 18 (cont'd)

Note. CFI = comparative fit index; RMSEA = root-mean-square error of approximation. [1]The factor loading for one of the constructive-epistemic items ("I thought of a solution that could integrate multiple points of view.") was allowed to vary. [2]Observed variable error term matrix (theta) was not positive definite, and the issue was originated from the residual variance for one of the competitive-relational items ("I showed that other students were wrong."). So, its residual variance was fixed as zero. [3]The factor loadings for two of the concurrence-seeking epistemic items ("I took up other students' view as if it was my own.", "I readily accepted other students' idea as if I had thought of it myself.") were allowed to vary. [4]The residual variances for two of the protective-relational items ("I gave up and withdrew from any confrontation.", "I backed out and ignored the conflict.") were allowed to vary. [5]The variance of latent variable for the competitive-relational regulation was allowed to vary.

Table 19

Demographic Information: Study 2

	Frequency
Gender	
Male	87 (38%)
Female	142 (62%)
Transgender	1 (< 1%)
Prefer not to respond	0 (0%)
Ethnicity	
African American or Black	13 (6%)
Asian, Pacific Islander, or Asian-American	3 (1%)
European American or White (not Hispanic)	193 (84%)
Hispanic or Latino/a	4 (2%)
Native American/American Indian	2 (1%)
Others (not listed)	14 (6%)
Prefer not to respond	1 (< 1%)
Native language	
English	224 (97%)
Non-English	5 (2%)
Age	
18 to 19	84 (37%)
20 to 21	110 (48%)
22 to 24	27 (12%)
25 and above	9 (4%)
School year	
First	24 (10%)
Second	85 (37%)
Third	70 (30%)
Fourth	35 (15%)
5+	11 (5%)
Transfer	5 (2%)
Prior course experience	
Any high school anatomy and/or physiology	125 (54%)
Prerequisite undergraduate course	59 (26%)
The same course (re-taking)	40 (17%)
Consideration of pre-health professional	174 (76%)
GPA: *M* (*SD*)	3.25 (0.46)

Table 20

EFA with All 24 Items: Study 2

	Factor 1	Factor 2	Factor 3	Factor 4
I backed out and ignored the conflict.	**.79**	.04	.05	.15
I disengaged from any confrontation and avoided the conflict.	**.71**	.13	-.07	.05
I gave up and withdrew from any confrontation.	**.57**	-.16	.02	-.17
I withdrew my ideas and waited for the conflict to end.[1]	**.54**	-.10	< .001	**-.26**
I reluctantly withdrew my approach.[1]	**.37**	-.19	.06	**-.25**
I wanted to leave and thought about something else.[1]	**.21**	-.18	.12	**-.21**
I figured out how to incorporate the different points of view.	-.08	**.71**	-.10	-.10
I considered the different points of view.	.06	**.67**	-.07	.13
I tried to understand each point of view.	-.002	**.66**	.06	.20
I thought about what I would learn from other students' ideas.	.08	**.66**	-.01	-.02
I integrated the different perspectives.	-.05	**.60**	.06	-.15
I thought of a solution that could integrate multiple points of view.	.01	**.52**	.06	-.08
I showed other students I was right.	-.06	.17	**.74**	-.04
I showed that other students were wrong.	-.01	-.04	**.72**	.04
I tried to win the argument.	**-.24**	-.07	**.65**	-.08
I resisted by showing my perspective is right.[1]	**.23**	.02	**.59**	.01
I resisted by showing my perspective was better than other students'.[1]	**.35**	-.09	**.42**	.01
I resisted other students' view by maintaining my initial position.[1]	.16	**-.26**	**.35**	-.003
I readily accepted other students' idea as if I had thought of it myself.	-.12	-.09	-.03	**-.70**
I took up other students' view as if it was my own.	.07	.08	.10	**-.69**
I freely replaced my opinion with other students'.	.06	.09	.09	**-.57**
I easily substituted other students' ideas for my own.[1]	.11	-.05	**.24**	**-.47**
I aligned my thinking with other students' as if I reached the same conclusions myself.[1]	**.33**	.09	-.10	**-.44**
I readily endorsed other students' point of view without feeling like it contradicted my own thinking.[1]	-.06	**.34**	-.17	**-.38**
% of explained variance	21.42	13.89	8.74	7.37
Eigenvalue	5.14	3.33	2.10	1.77

Note. The scores standardized by the survey version were used. Factor loadings > |.20| are in boldface.
[1]These nine items were excluded for the final analyses. Factor 1 = Protective-relational regulation; Factor 2 = Constructive-epistemic regulation; Factor 3 = Competitive-relational regulation; Factor 4 = Concurrence-seeking epistemic regulation.

Table 21

Intercorrelations: Study 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	—																
2	.04	—															
3	-.17*	.17**	—														
4	-.10	.19**	.03	—													
5	.10	.00	.17*	-.19**	—												
6	.22***	-.17**	.13*	-.25***	.06	—											
7	-.11†	.11	.16*	.18**	.05	-.34***	—										
8	.46***	-.01	-.23***	-.10	.04	.34***	-.19**	—									
9	-.03	-.02	.44***	-.05	.10	.19**	.24***	-.07	—								
10	-.36***	-.06	.25***	.11	.01	-.25***	.24***	-.84***	.13†	—							
11	.24***	-.21**	.04	-.08	.10	.39***	-.07	.39***	.13†	-.21**	—						
12	.02	.12†	.10	.17*	.03	-.37***	.50***	-.06	-.01	.16*	-.02	—					
13	-.03	-.06	.39***	-.01	.10	.20**	.24***	-.03	.66***	.16*	.17**	.01	—				
14	.13*	.13†	.00	.29***	.07	-.07	.28***	.10	.06	.03	.15*	.25***	.07	—			
15	.33***	-.22***	-.07	-.18**	.03	.39***	-.16*	.42***	-.02	-.25***	.63***	-.06	.03	.14*	—		
16	-.16*	.11†	.13†	.05	-.02	-.35***	.14*	-.29***	.08	.26***	-.29***	.31***	.03	.00	-.35***	—	
17	.58***	-.02	.06	-.21**	.29***	.39***	-.13†	.53***	.15*	-.43***	.34***	.004	.12†	-.01	.33***	-.10	—
M	3.89	2.68	2.53	2.54	2.79	3.71	2.81	4.15	2.79	2.08	4.44	3.37	3.17	4.05	4.26	2.60	3.50
SD	0.48	0.78	0.73	0.76	0.69	0.67	1.00	0.67	0.84	0.89	0.52	1.01	0.90	0.77	0.47	1.03	0.50
α	.79	.71	.72	.72	.50	.76	.79	.82	.79	.93	.68	.85	.87	.73	.79	.83	.65
□□*n*□	1.83	1.00	1.00	1.00	1.00	1.67	1.00	1.25	1.00	1.00	2.00	1.00	1.00	1.00	2.40	1.00	1.40
□□*x*□	5.00	4.67	4.33	4.33	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

Note. 1 = constructive-epistemic regulation; 2 = concurrence-seeking epistemic regulation; 3 = competitive-relational regulation; 4 = protective-relational regulation; 5 = perceived conflicts; 6 = perceived competence; 7 = competence threat; 8 = cooperative perceptions; 9 = competitive perceptions; 10 = individualistic perceptions; 11 = mastery-approach goals; 12 = mastery-avoidance goals; 13 = performance-approach goals; 14 = performance-avoidance goals; 15 = behavioral engagement; 16 = behavioral disengagement; 17 = critical reasoning; α = Cronbach's α.
$^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Table 22

Perceived Competence and Cooperative Perceptions Predicting Socio-cognitive Conflict Regulation Types: Results from Structural Equation Modeling

Model 36 *B* (*SE*)	Constructive	Concurrence	Competitive	Protective
Competence	.10 (.09)	-.24* (.10)	.25* (.10)	-.26* (.12)
Cooperative	.41*** (.13)	-.03 (.11)	-.49** (.16)	-.17 (.12)
Competence × Cooperative	.04 (.22)	-.36* (.15)	-.13 (.14)	-.27† (.15)
Control variables				
Version	.15*** (.05)	—	—	.06 (.06)
Gender (1 = Female)	—	—	-.01 (.05)	.17** (.06)
GPA	—	-.05 (.06)	.05 (.05)	—
Health (1 = Yes)	—	—	.07*** (.02)	-.08*** (.02)

Note. All indicators were standardized before conducting the analysis. All constructs were modeled as latent variables except for the control variables. Traditional fit indices are not available for models with latent product terms. Constructive = constructive-epistemic regulation; Concurrence = concurrence-seeking epistemic regulation; Competitive = competitive-relational regulation; Protective = protective-relational regulation; Health = Consideration of pre-health professional.
$^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Table 23

Perceived Competence and Competitive Perceptions Predicting Socio-cognitive Conflict Regulation Types: Results from Structural Equation Modeling

Model 37 *B* (*SE*)	Constructive	Concurrence	Competitive	Protective
Competence	.25** (.09)	-.17† (.10)	.05 (.09)	-.29** (.11)
Competitive	-.07 (.14)	.03 (.12)	.45** (.14)	.22† (.12)
Competence × Competitive	-.25 (.23)	-.07 (.20)	.26 (.20)	-.31* (.13)
Control variables				
Version	.13** (.05)	—	—	.07 (.06)
Gender (1 = Female)	—	—	.03 (.05)	.18** (.07)
GPA	—	-.09 (.06)	.07 (.05)	—
Health (1 = Yes)	—	—	.07* (.03)	-.14*** (.03)

Note. All indicators were standardized before conducting the analysis. All constructs were modeled as latent variables except for the control variables. Traditional fit indices are not available for models with latent product terms. Constructive = constructive-epistemic regulation; Concurrence = concurrence-seeking epistemic regulation; Competitive = competitive-relational regulation; Protective = protective-relational regulation; Health = Consideration of pre-health professional.
†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$.

Table 24

Achievement Goals Predicting Socio-cognitive Conflict Regulation Types: Results from Structural Equation Modeling

Model 38 β (*SE*)	Constructive	Concurrence	Competitive	Protective
Mastery approach	.29** (.09)	-.26** (.10)	-.07 (.10)	-.16 (.10)
Mastery avoidance	.02 (.08)	.13 (.09)	.11 (.09)	.11 (.09)
Performance approach	-.09 (.08)	-.01 (.09)	.47*** (.08)	.05 (.08)
Performance avoidance	.08 (.10)	.15 (.11)	-.02 (.10)	.31*** (.10)
Control variables				
Version	.23*** (.07)	—	—	.11 (.08)
Gender (1 = Female)	—	—	-.08 (.07)	.21** (.07)
GPA	—	-.15† (.08)	.06 (.08)	—
Health (1 = Yes)	—	—	.17* (.08)	-.20** (.08)

Note. All estimates are standardized coefficients. All constructs were modeled as latent variables except for the control variables. Constructive = constructive-epistemic regulation; Concurrence = concurrence-seeking epistemic regulation; Competitive = competitive-relational regulation; Protective = protective-relational regulation; Health = consideration of pre-health professional.
†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$.

Table 25

Socio-cognitive Conflict Regulation Types Predicting Behavioral Engagement/Disengagement and Critical Reasoning: Results from Structural Equation Modeling

	Model 39		Model 40
β (*SE*)	Engagement	Disengagement	Critical Reasoning
Constructive	.37*** (.08)	-.13 (.09)	.92*** (.06)
Concurrence	-.20* (.10)	.11 (.09)	-.13 (.09)
Competitive	.04 (.10)	.12 (.10)	.13 (.09)
Protective	-.10 (.09)	.09 (.09)	-.14† (.08)
Control variables			
Gender (1 = Female)	.18* (.08)	-.08 (.08)	—
GPA	.09 (.07)	—	—
First language (1 = English)	—	—	.15* (.07)
Health (1 = Yes)	—	—	.02 (.07)

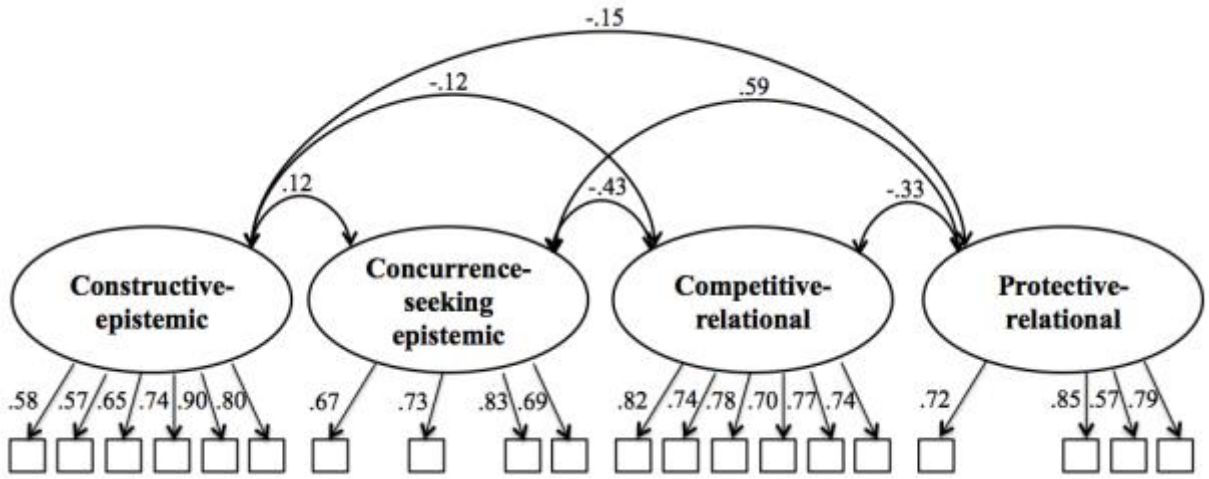
Note. All estimates are standardized coefficients. All constructs were modeled as latent variables except for the control variables. Constructive = constructive-epistemic regulation; Concurrence = concurrence-seeking epistemic regulation; Competitive = competitive-relational regulation; Protective = protective-relational regulation. Health = consideration of pre-health professional.
†$p < .10$; *$p < .05$; ***$p < .001$.

APPENDIX B.

Figures

Figure 2

Confirmatory factor analysis of the socio-cognitive conflict regulation items in Pilot Study



Note. The values in the figure are standardized coefficients. For clarity, means and residual variances are omitted.

Figure 3

The interactive effect of competence and social interdependence on cooperative perceptions in Pilot Study

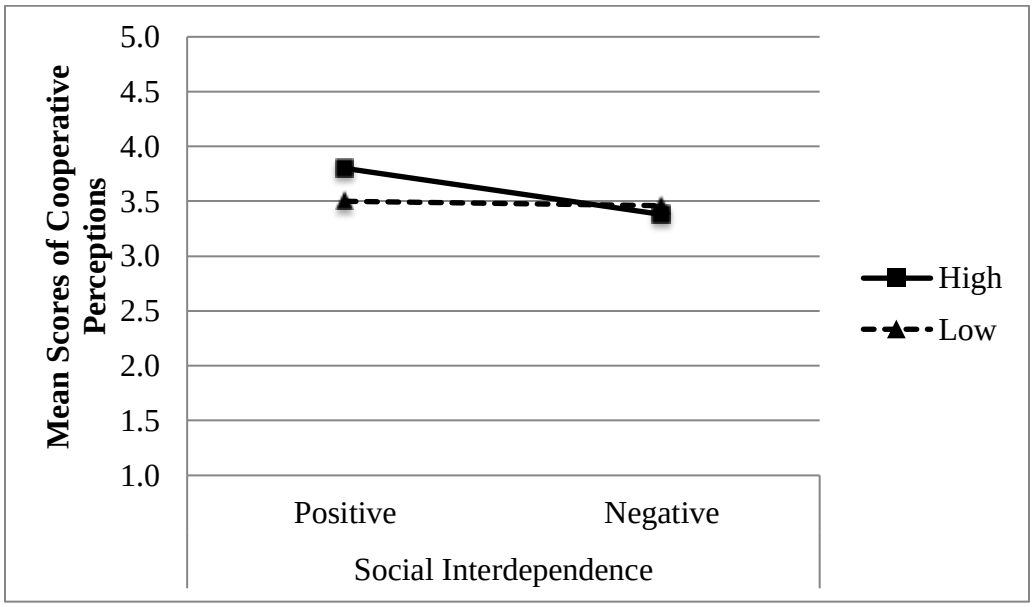


Figure 4

The interactive effect of competence and social interdependence on competitive perceptions in Pilot Study

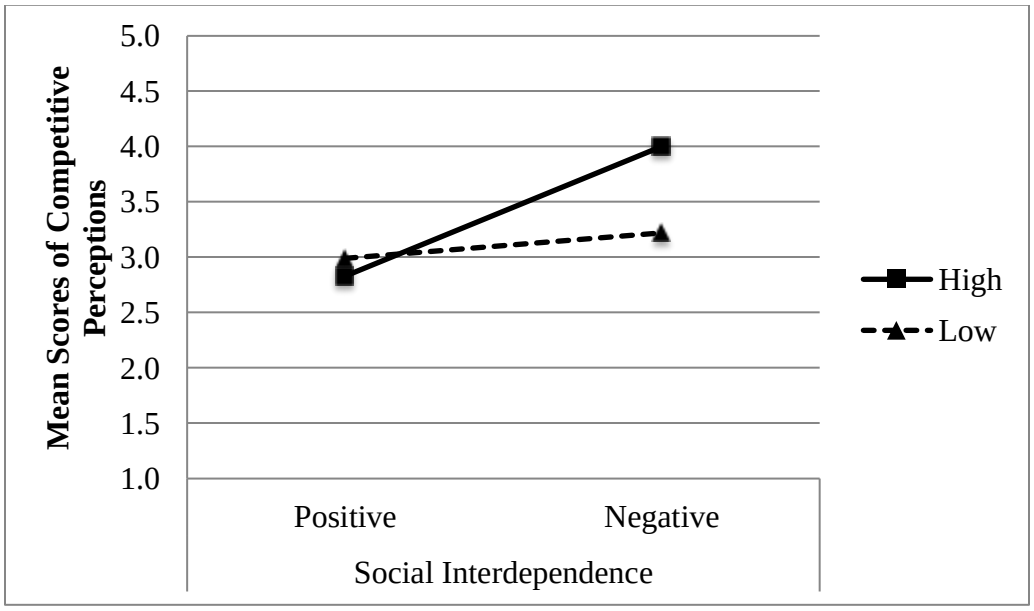


Figure 5

The interactive effect of competence and social interdependence on constructive-epistemic regulation in Pilot Study

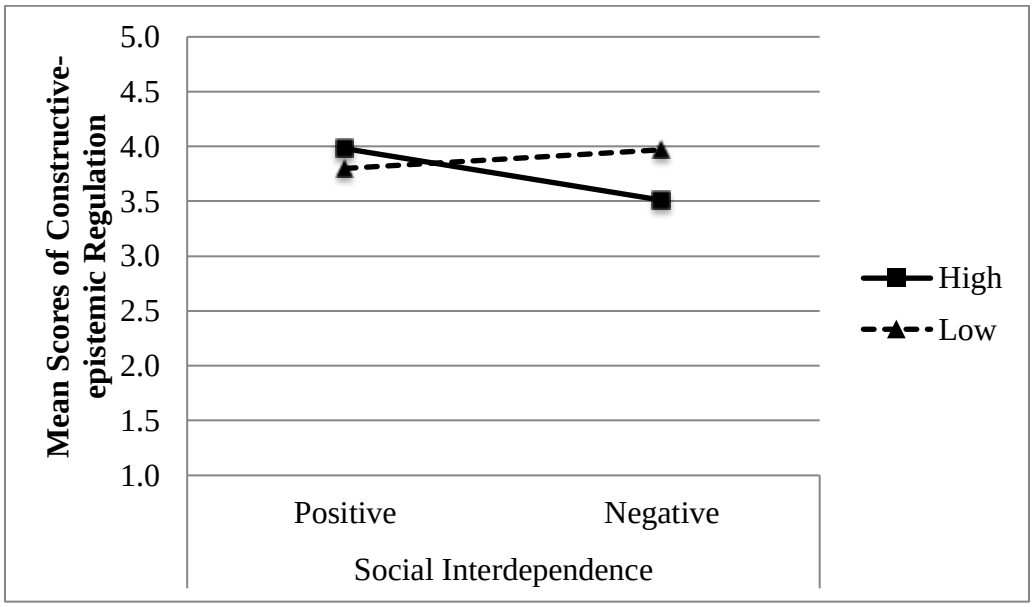


Figure 6

The interactive effect of competence and social interdependence on competitive-relational regulation in Pilot Study.

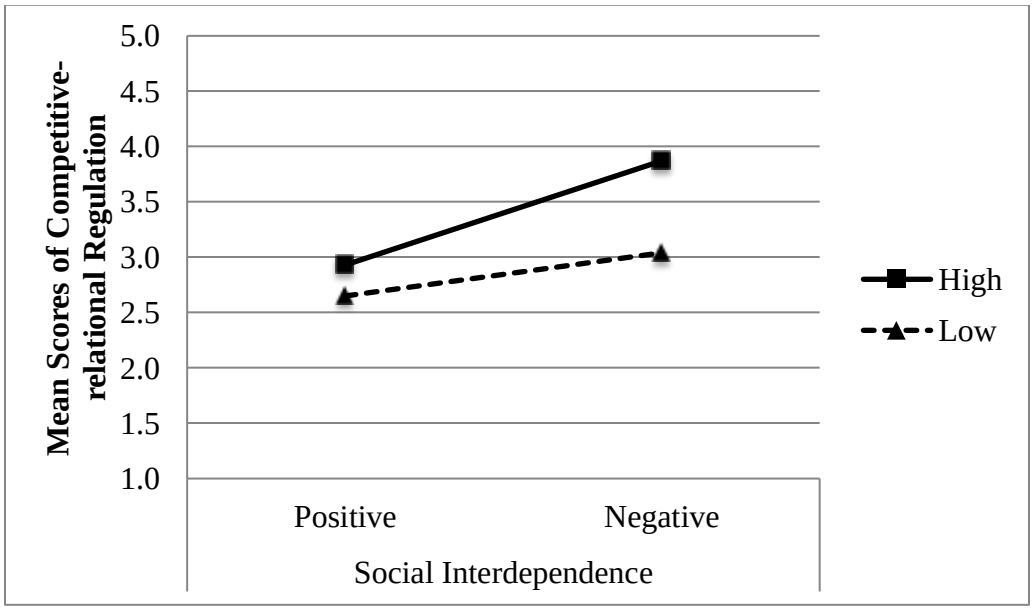
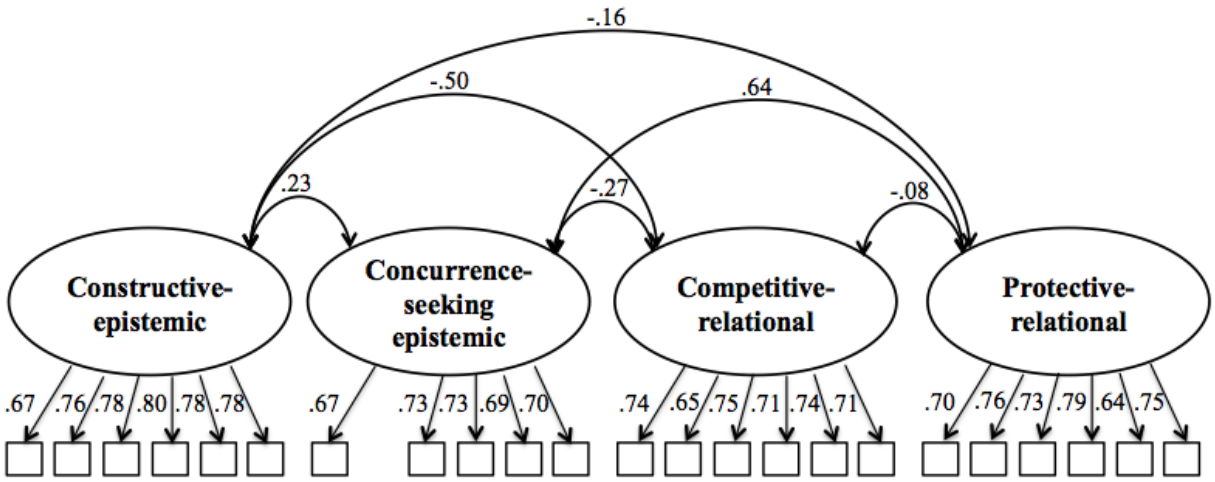


Figure 7

Confirmatory factor analysis of the socio-cognitive conflict regulation items in Study 1



Note. The values in the figure are standardized coefficients. For clarity, means and residual variances are omitted.

Figure 8

The interactive effect of competence and social interdependence on competence threat in Study 1

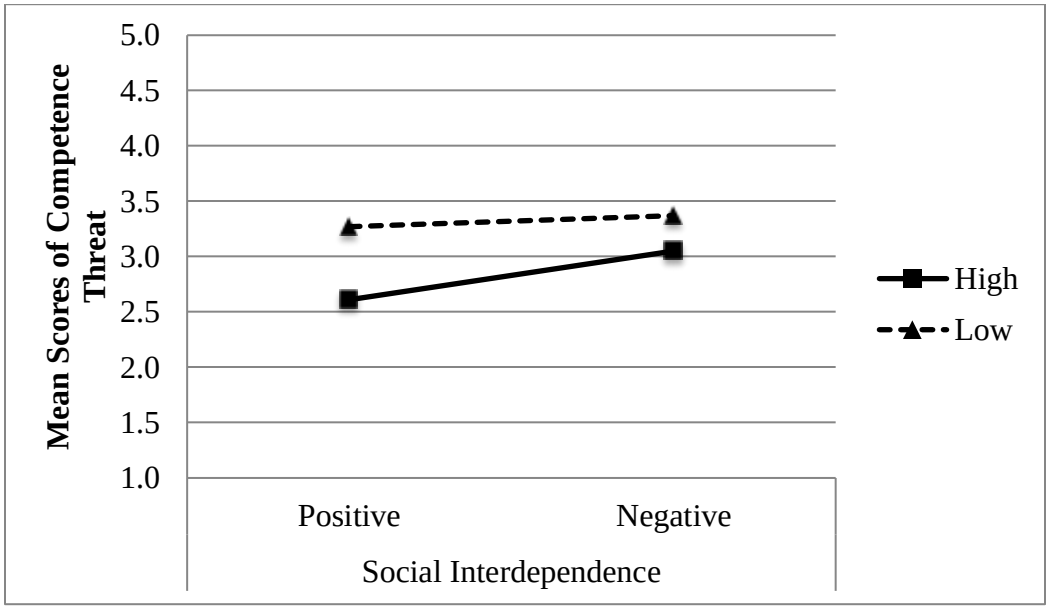


Figure 9

The interactive effect of competence and social interdependence on cooperative perceptions in Study 1

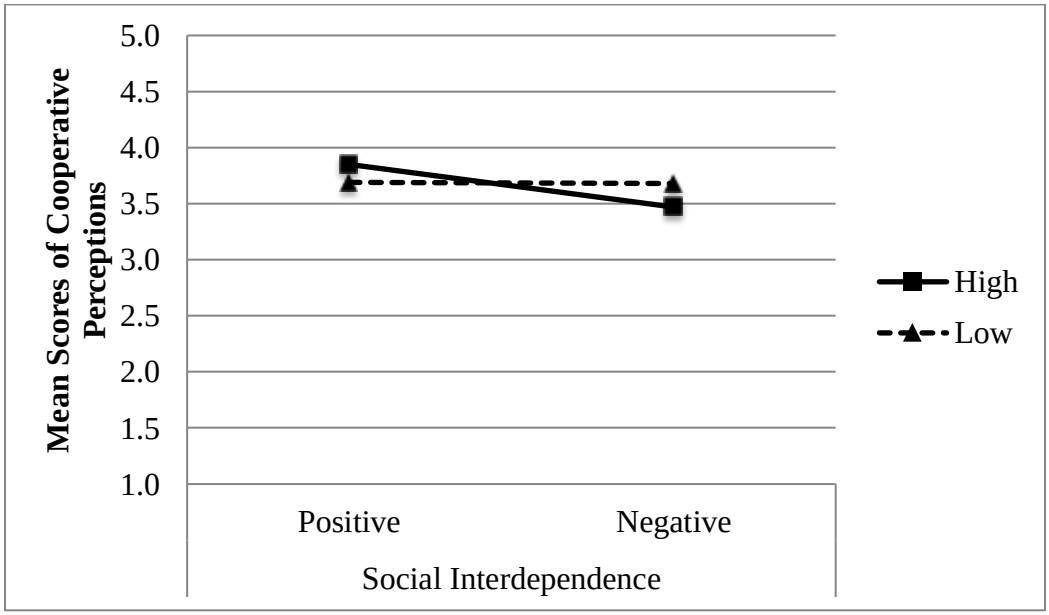


Figure 10

The interactive effect of competence and social interdependence on competitive perceptions in Study 1

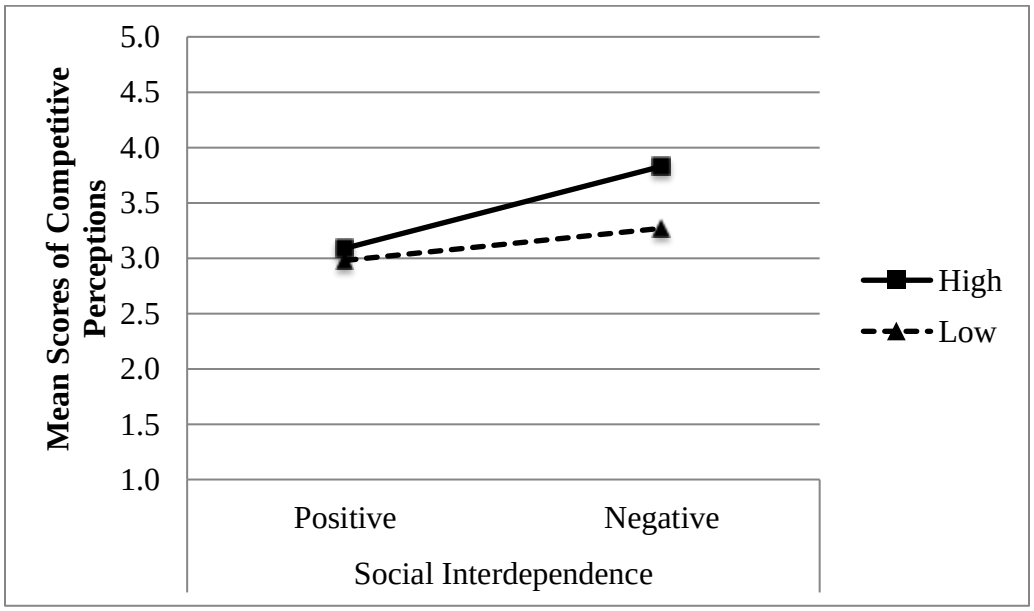


Figure 11

The interactive effect of competence and social interdependence on individualistic perceptions in Study 1

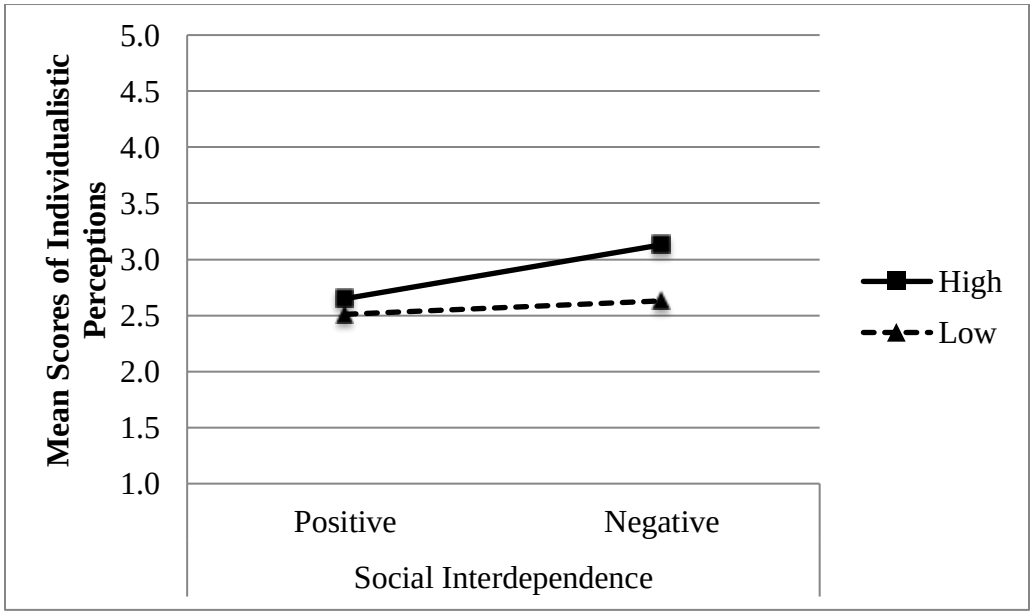


Figure 12

The interactive effect of competence and social interdependence on constructive-epistemic regulation in Study 1

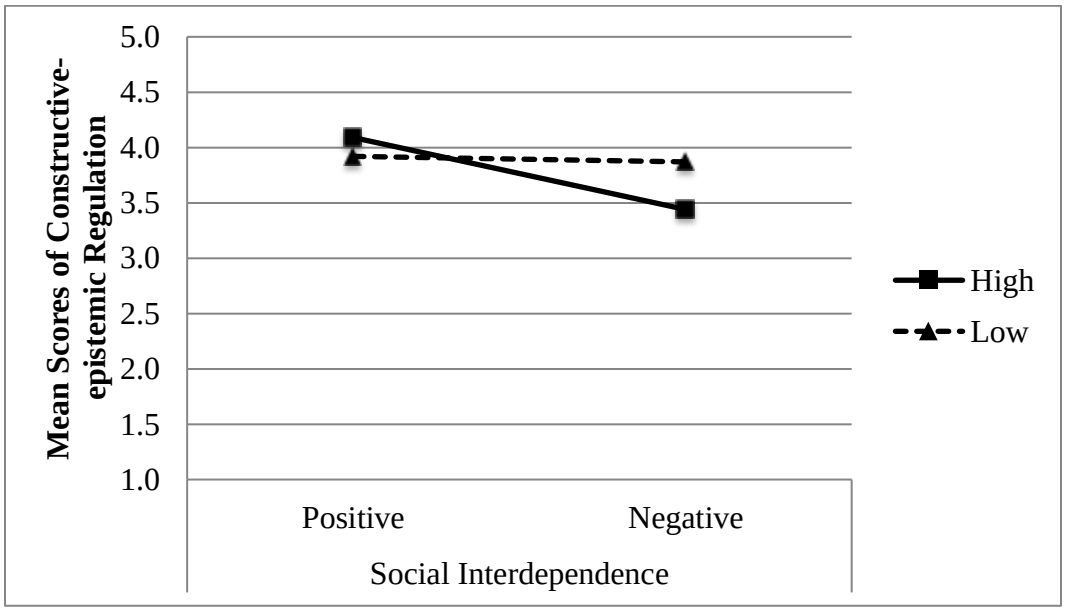


Figure 13

The interactive effect of competence and social interdependence on competitive-relational regulation in Study 1

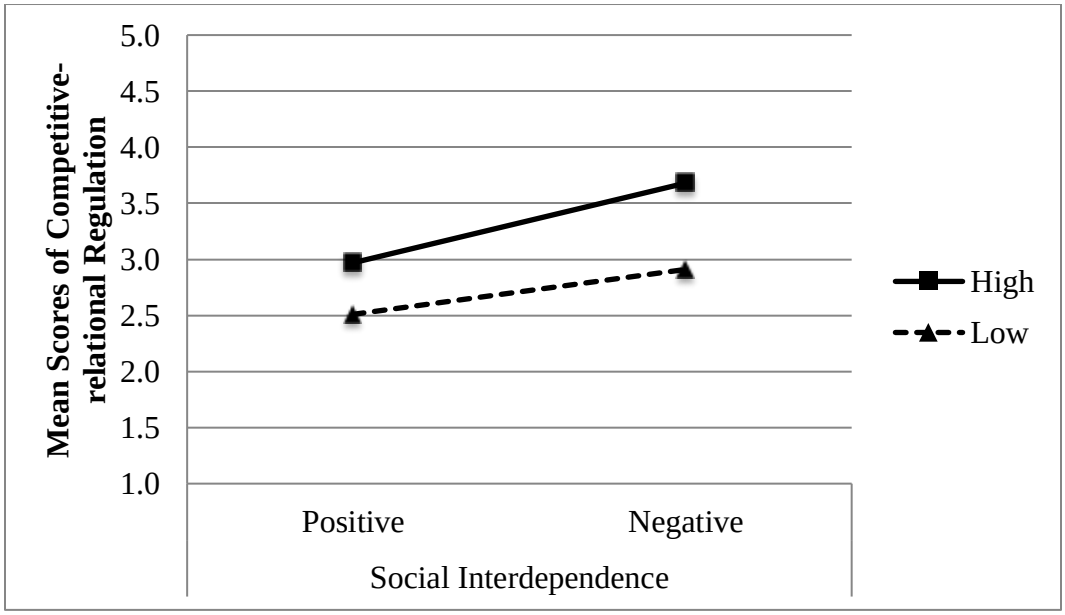


Figure 14

The interactive effect of competence and social interdependence on performance-approach goals in Study 1

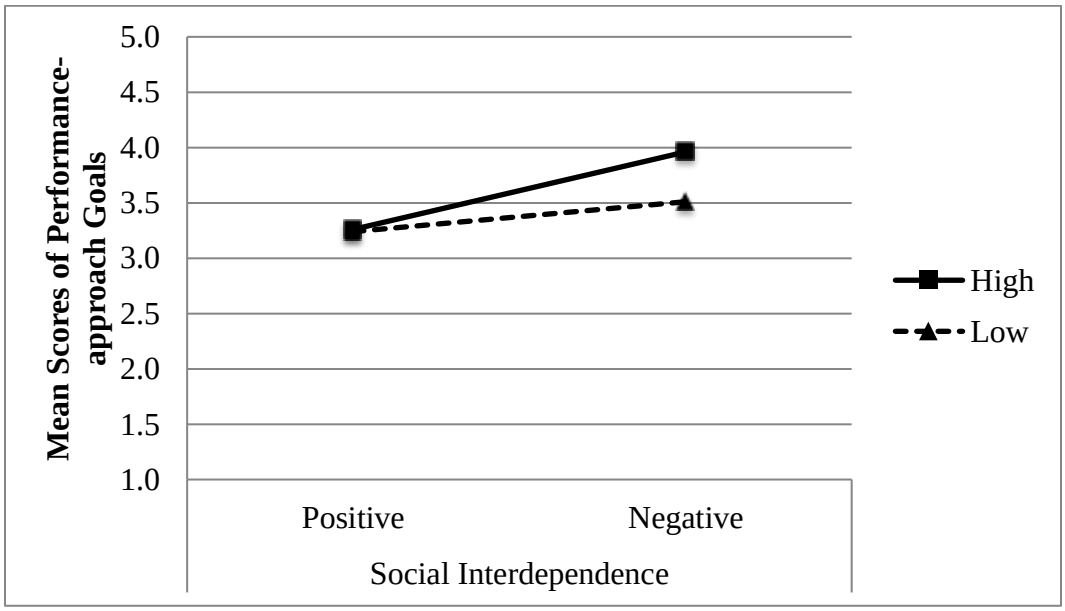


Figure 15

The interactive effect of competence and social interdependence on performance-avoidance goals in Study 1

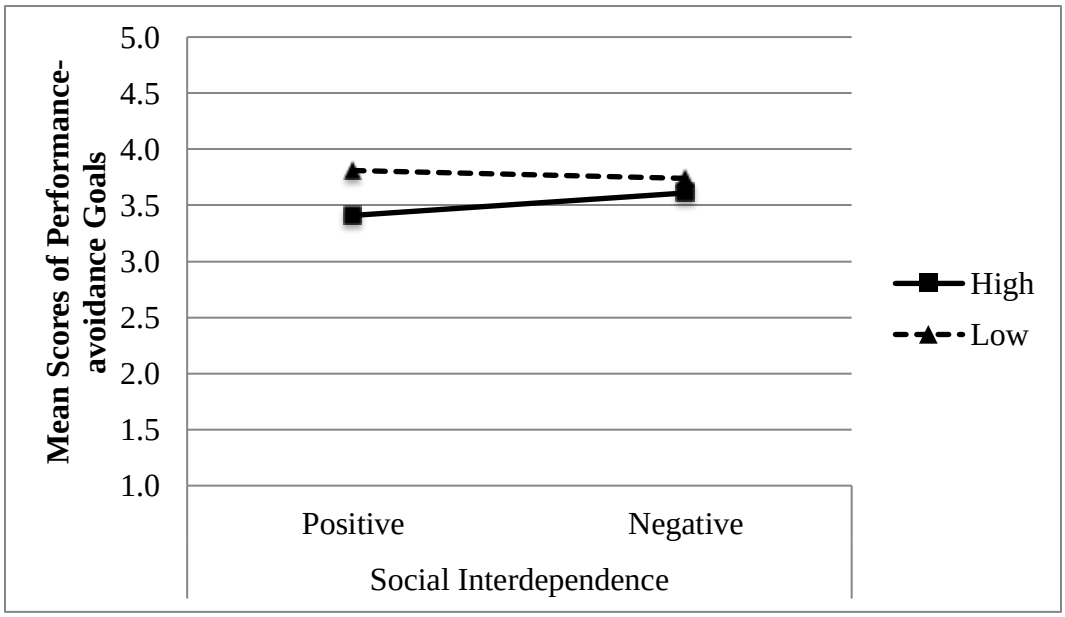


Figure 16

The interactive effect of competence and social interdependence on critical reasoning in Study 1

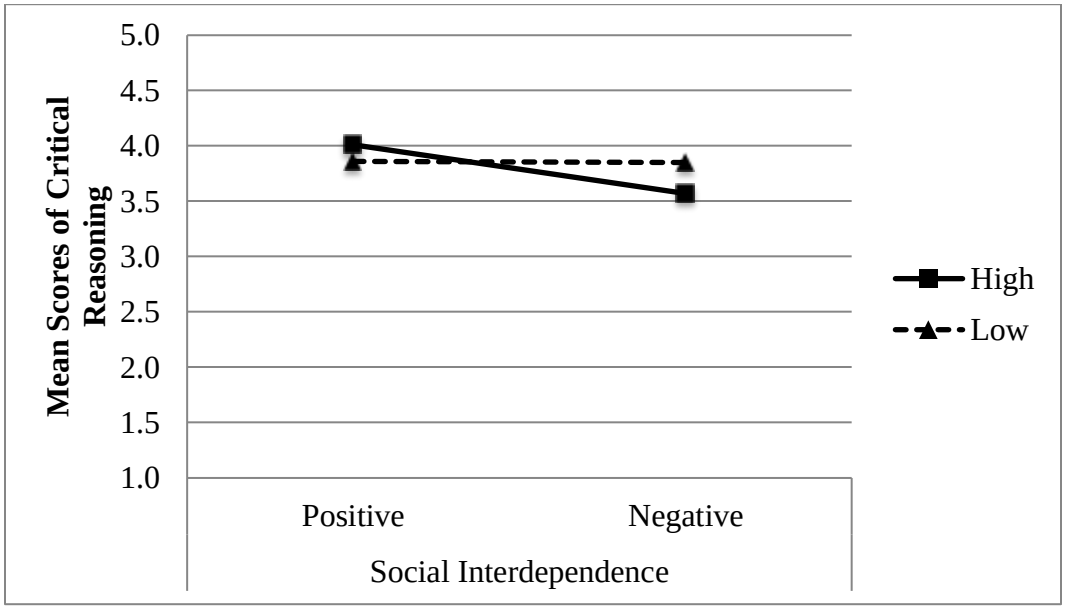
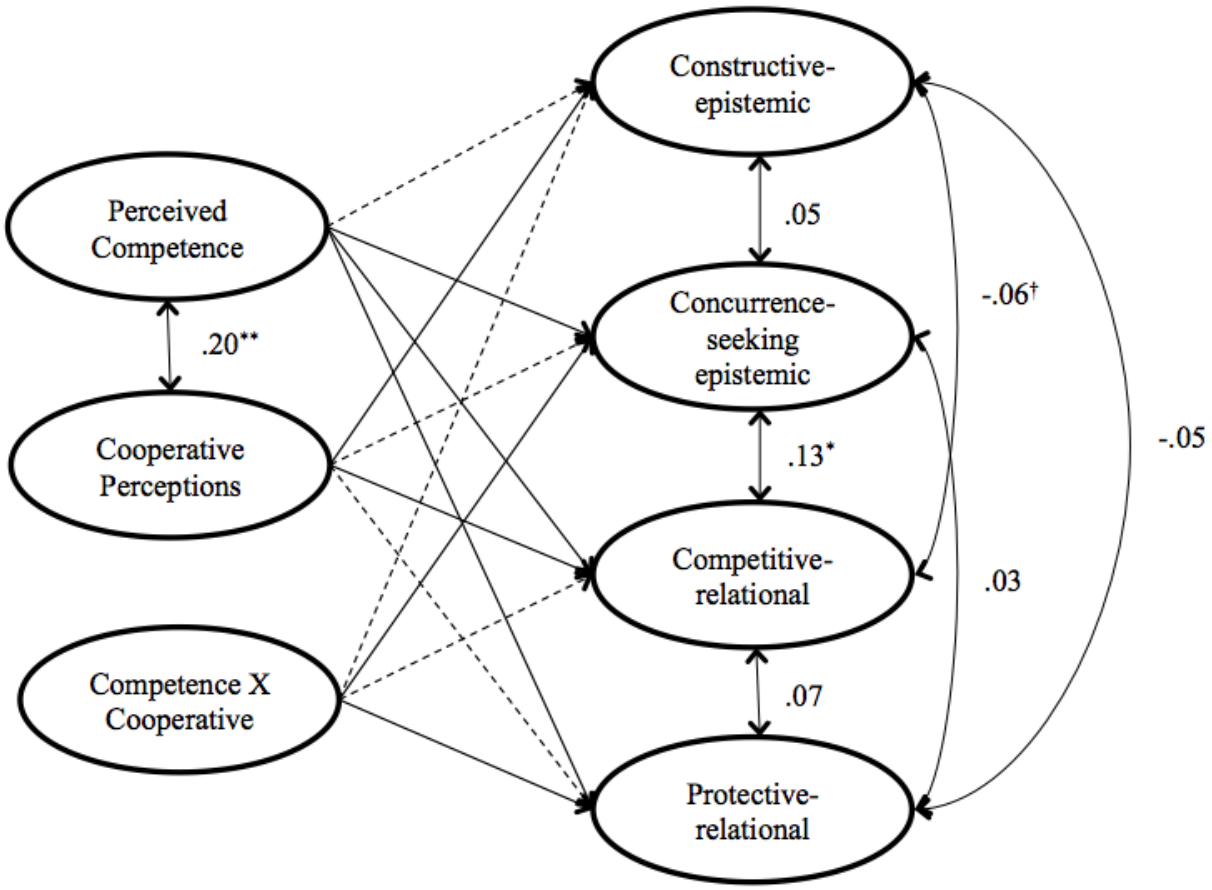


Figure 17

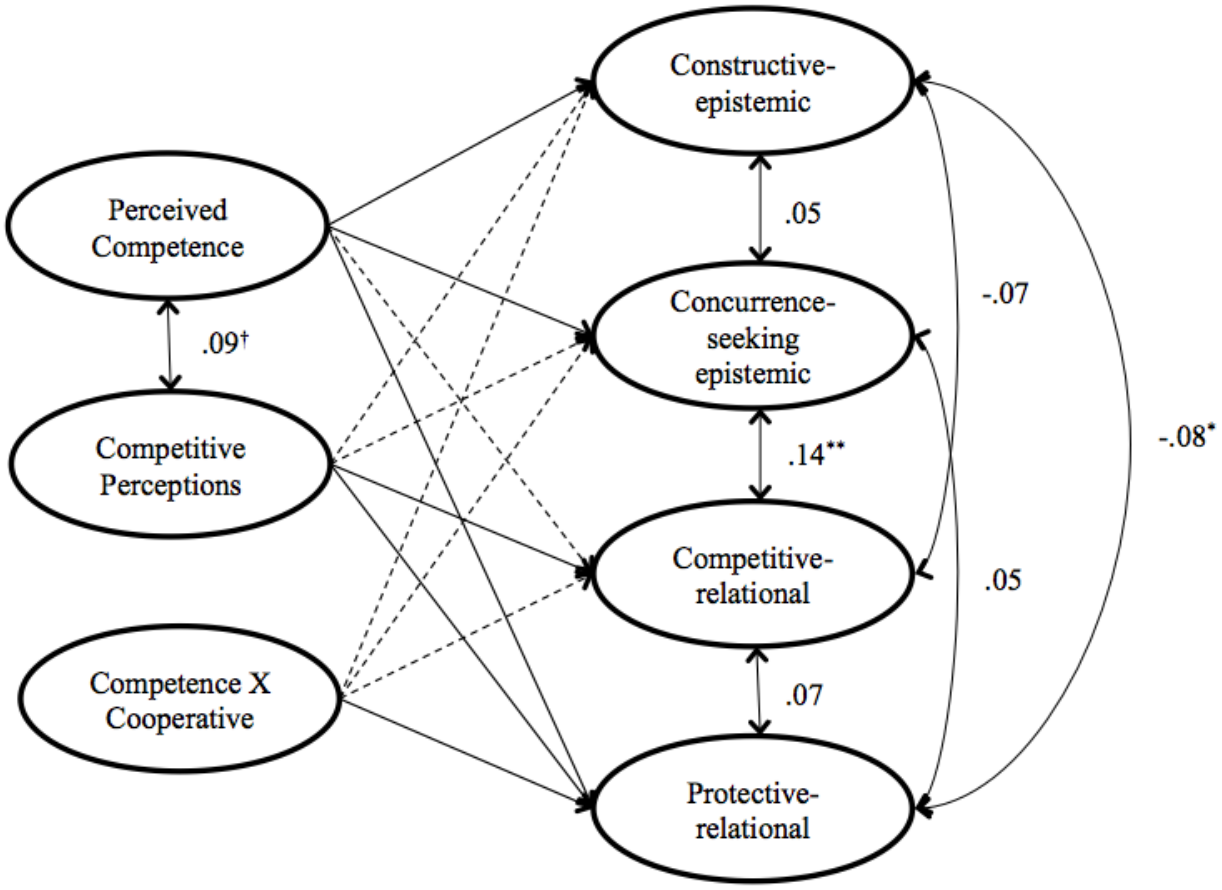
Factor correlation coefficients of theoretical model for perceived competence and cooperative perceptions predicting socio-cognitive conflict regulation types (Model 36)



Note. For the sake of brevity, measurement models, path coefficients, and results related to the controlled variables are not presented. Ovals represent latent factors. Full bidirectional arrows represent factor correlations/covariances; full unidirectional arrows represent the significant paths (see Table 22); dotted unidirectional arrows represent the non-significant paths.
$^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$.

Figure 18

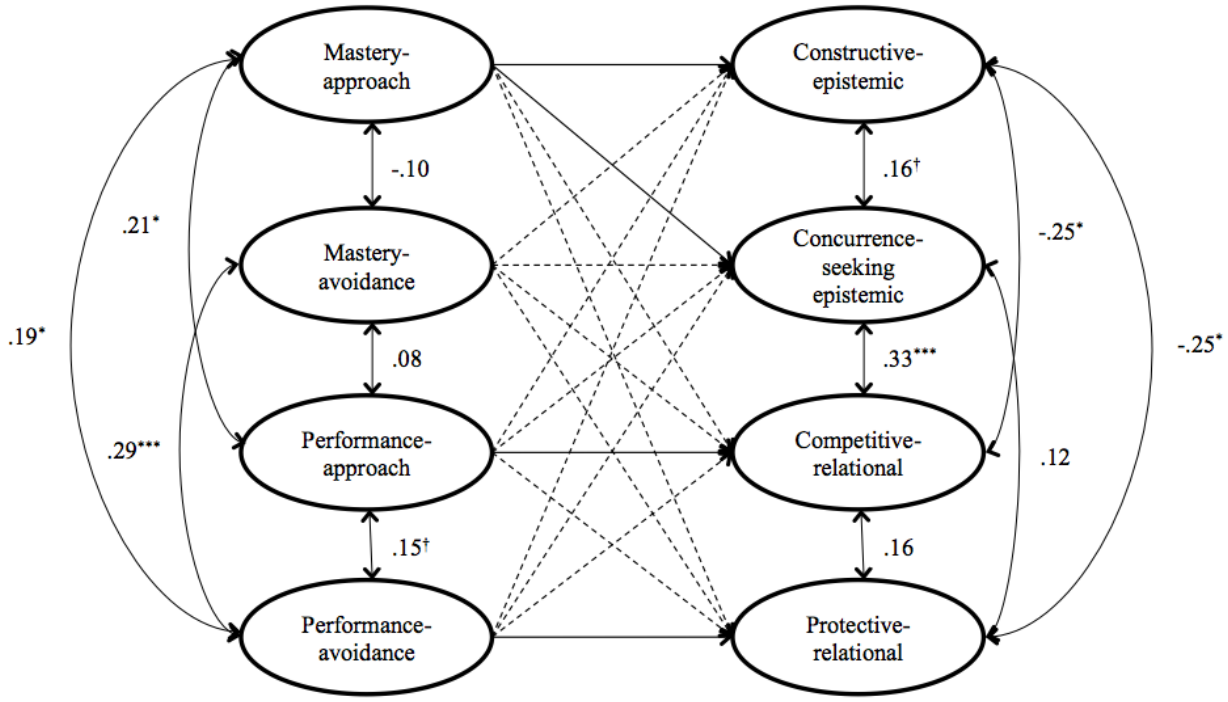
Factor correlation coefficients of theoretical model for perceived competence and competitive perceptions predicting socio-cognitive conflict regulation types (Model 37)



Note. For clarity, measurement models, path coefficients, and results related to the controlled variables are not presented. Ovals represent latent factors. Full bidirectional arrows represent factor correlations/covariances; full unidirectional arrows represent the significant paths (see Table 23); dotted unidirectional arrows represent the non-significant paths.
$^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$.

Figure 19

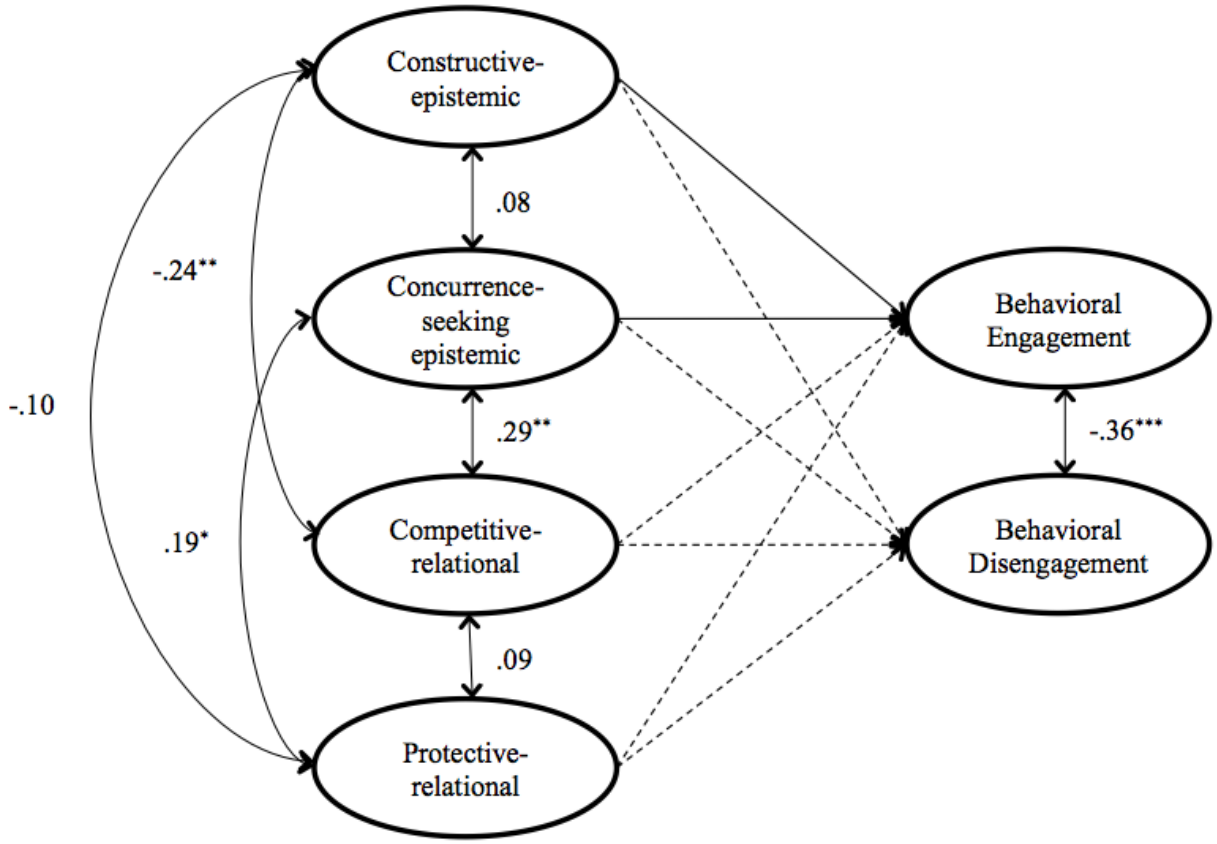
Factor correlation coefficients of theoretical model for achievement goals predicting socio-cognitive conflict regulation types (Model 38)



Note. For clarity, measurement models, path coefficients, and results related to the controlled variables are not presented. Ovals represent latent factors. Full bidirectional arrows represent factor correlations/covariances; full unidirectional arrows represent the significant paths (see Table 24); dotted unidirectional arrows represent the non-significant paths.
$^{\dagger}p < .10$; $^{*}p < .05$; $^{***}p < .001$.

Figure 20

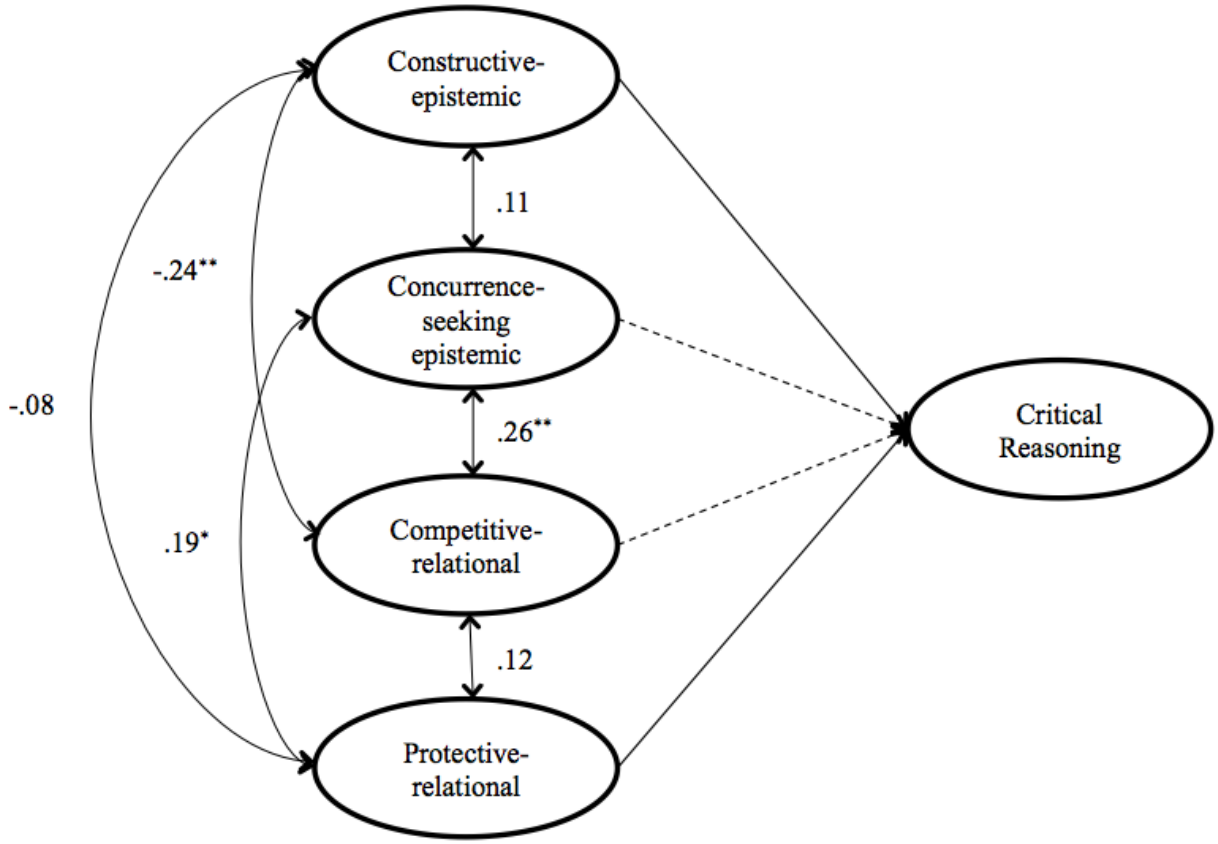
Factor correlation coefficients of theoretical model for socio-cognitive conflict regulation types predicting behavioral engagement and disengagement (Model 39)



Note. For clarity, measurement models, path coefficients, and results related to the controlled variables are not presented. Ovals represent latent factors. Full bidirectional arrows represent factor correlations/covariances; full unidirectional arrows represent the significant paths (see Table 25); dotted unidirectional arrows represent the non-significant paths.
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Figure 21

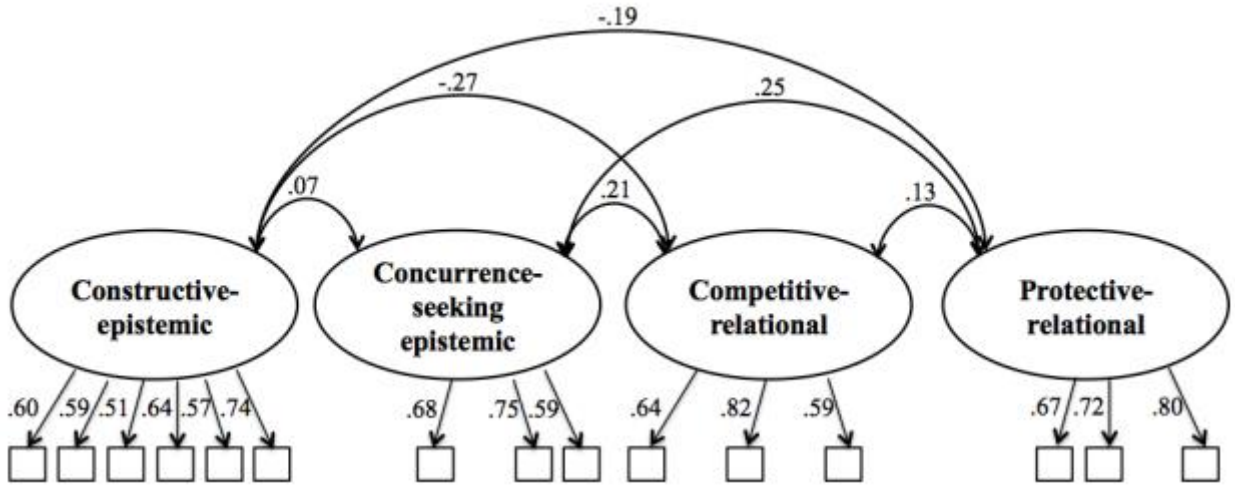
Factor correlation coefficients of theoretical model for socio-cognitive conflict regulation types predicting critical reasoning (Model 40)



Note. For clarity, measurement models, path coefficients, and results related to the controlled variables are not presented. Ovals represent latent factors. Full bidirectional arrows represent factor correlations/covariances; full unidirectional arrows represent the significant paths (see Table 25); dotted unidirectional arrows represent the non-significant paths.
$^{*}p < .05$; $^{**}p < .01$.

Figure 22

Confirmatory factor analysis of the socio-cognitive conflict regulation items in Study 2



Note. The values in the figure are standardized coefficients. For clarity, means and residual variances are omitted.

Figure 23

Predicting concurrence-seeking epistemic regulation: a graphical illustration of Model 36

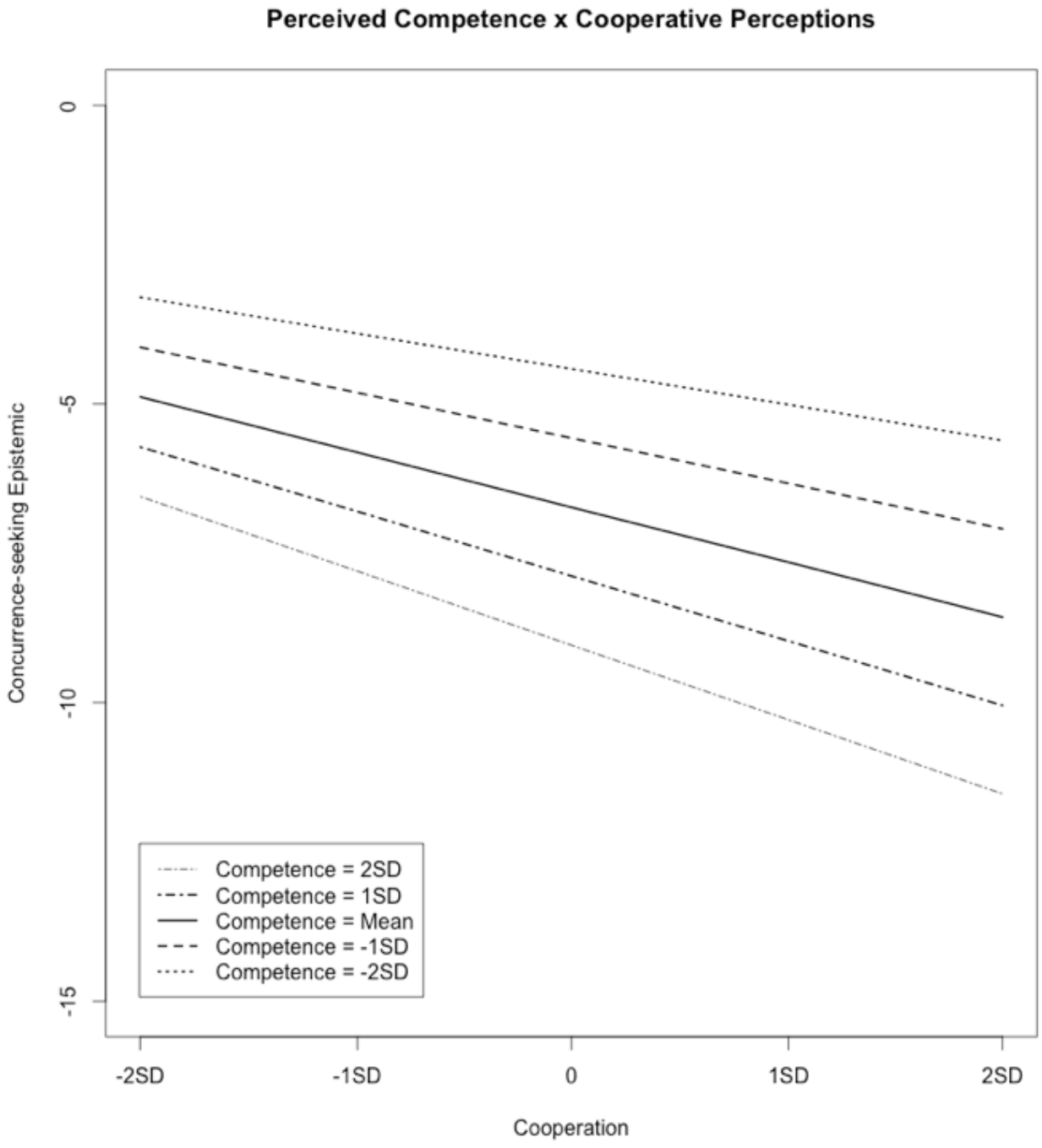


Figure 24

Predicting protective-relational regulation: a graphical illustration of Model 36

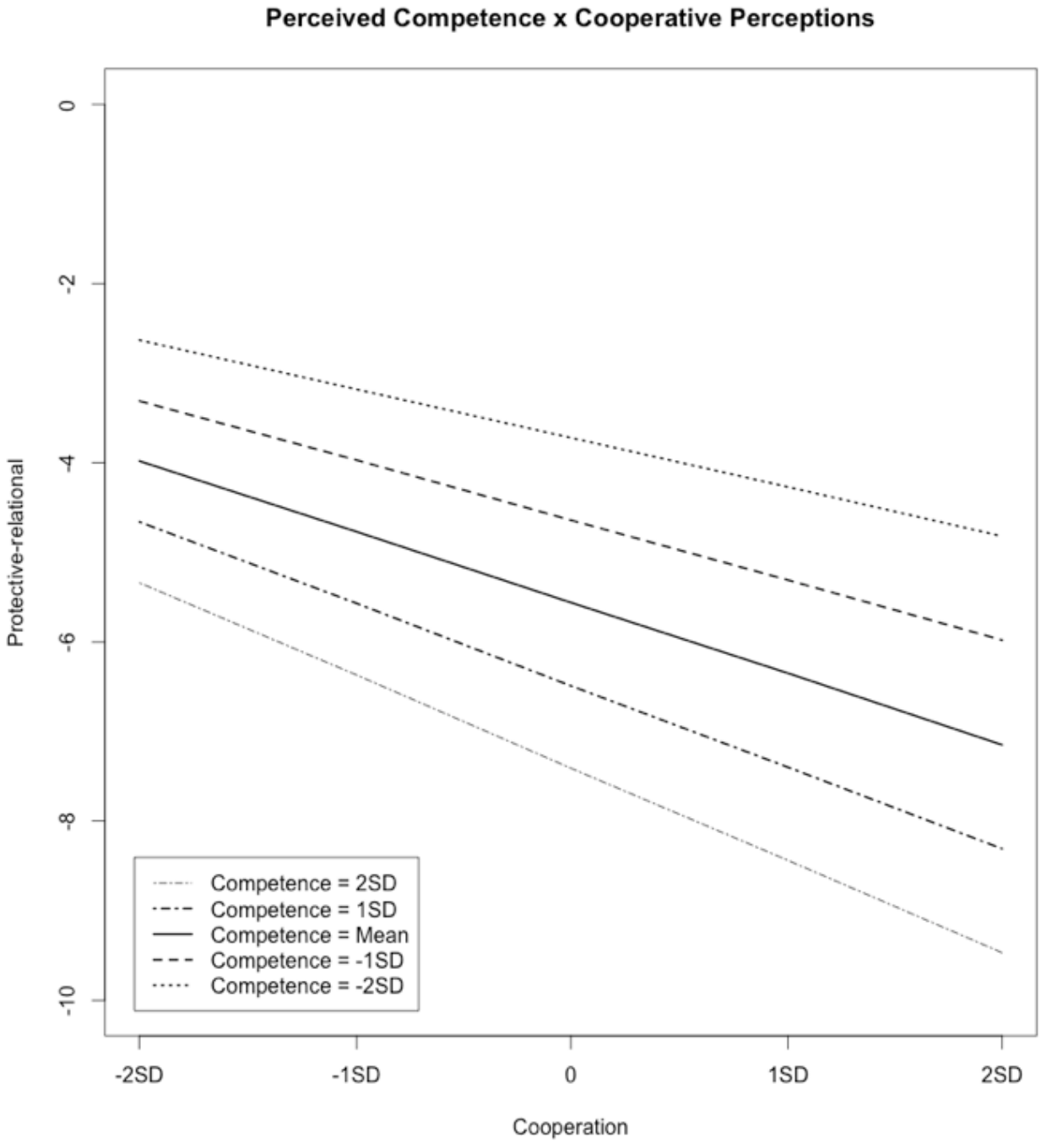


Figure 25

Predicting protective-relational regulation: a graphical illustration of Model 37

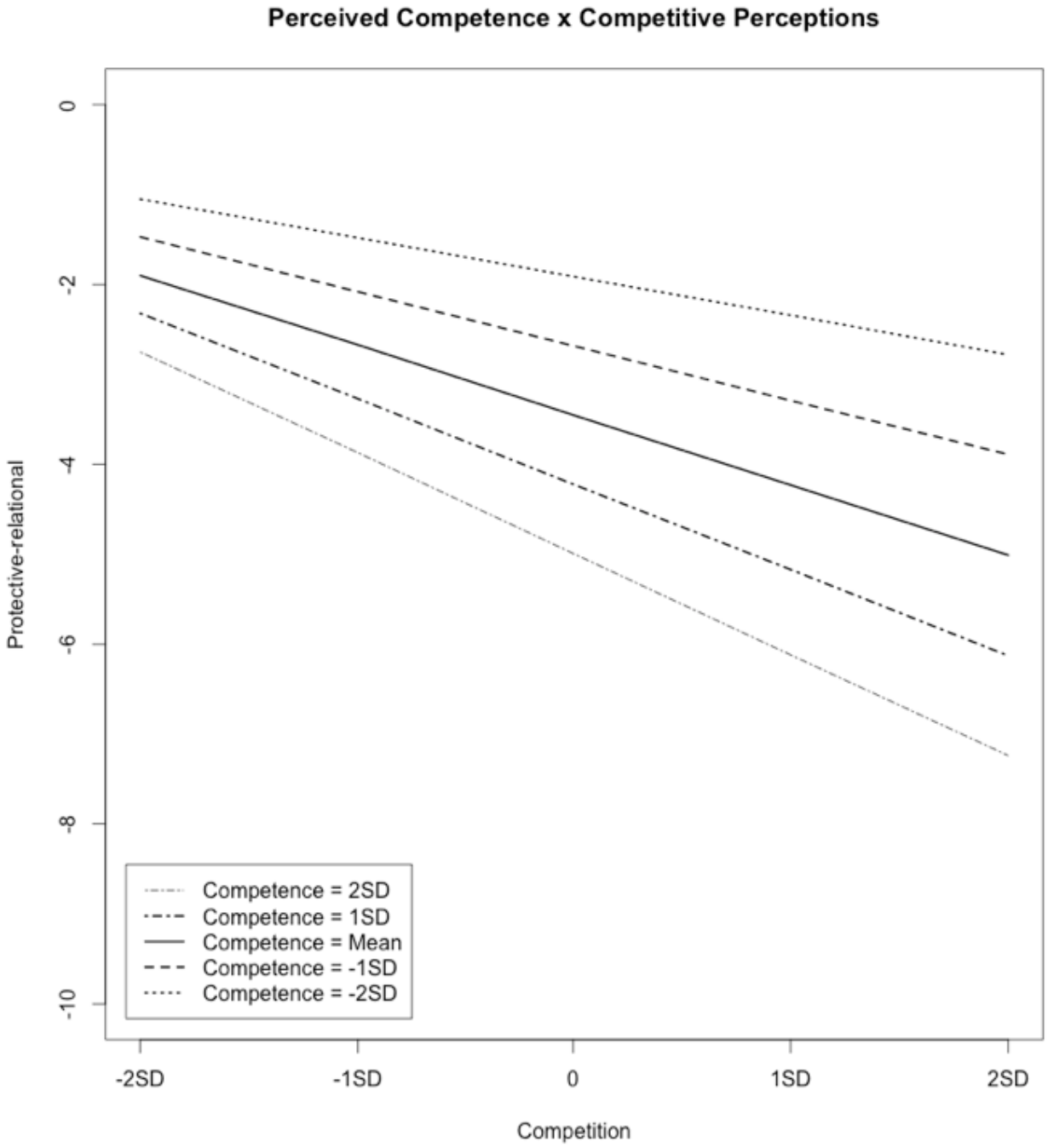


Figure 26

The 2 × 2 socio-cognitive conflict regulation framework

			Social interdependence	
			Negative (competitive)	Positive (cooperative)
		Definition/ Valence	Relational	Epistemic
Personal competence	High	Approach	Competitive-relational	Constructive-epistemic
	Low	Avoidance	Protective-relational	Concurrence-seeking epistemic

Note. Definition and valence are determined by personal and contextual dimensions representing competence and social interdependence. Positive (cooperative) and negative (competitive) represent two ways that social interdependence can be defined, and high and low represent different levels of personal competence. Epistemic and relational represent the two ways that socio-cognitive conflict regulation can be defined, and approach and avoidance represent the two ways that socio-cognitive conflict regulation can be valenced.

APPENDIX C.

Survey Items: Pilot Study and Study 1

Eligibility-checking questions

1. Are you from the United States?
    1. Yes
    2. No

To be eligible, participants must choose "1. Yes."

2. What is the highest level of education you **completed**?
    1. High school or a GED
    2. College
    3. Master's degree
    4. Doctorate or professional degree (e.g., PhD, MD, JD)

To be eligible, participants must choose "1. High school or a GED."

3. Are you currently pursuing a post-secondary degree (e.g., BA, BS, etc.)?
    1. Yes
    2. No

To be eligible, participants must choose "1. Yes."

4. Are you taking courses towards your degree this semester?
    1. Yes
    2. No
    3. Not applicable

To be eligible, participants must choose "1. Yes."

5. What is your year of birth? Please enter a **four-digit number only** (e.g., **1985**).

To be eligible, participants must answer 1991 or more.

Manipulation-checking questions

Now, keep thinking about the story. As you answer the following questions, please think about the way that Alex will think, feel, and behave in this situation. Please respond as truthfully as possible.

1. Did Alex feel competent?

A. Yes
B. No

To continue participating in this study, participants in high-competence conditions (Condition 1, 3) must answer "A. Yes," whereas those in low-competence conditions (Condition 2, 4) must answer "B. No."

2. What was the goal of Alex's work with the other employee?

A. To integrate positions and come to consensus about why the phones caught fire.
B. To debate positions in order to identify the best explanation of why the phones caught fire.

To continue participating in this study, participants in positive-interdependence conditions (Condition 1, 2) must answer "A. To integrate positions and come to consensus about why the phones caught fire," whereas those in negative-interdependence conditions (Condition 3, 4) must answer "B. To debate positions in order to identify the best explanation of why the phones caught fire."

3. In the story, did the other employee agree with Alex about why the phones were catching fire?

A. Yes
B. No

To continue participating in this study, all must answer "B. No."

Main questions

Now, describe how you would feel about the situation described in the story, if you were Alex Star[Alex New].

[Positive-interdependence conditions: Condition 1, 2] In the story, the group leader asked Alex and the other employee to **integrate** their positions and come to **consensus** about why the phones caught fire. Fortunately[Unfortunately], Alex was **certain[uncertain]** about how to **cooperate** with the other employee because he/she **knew[didn't know]** a lot about smartphones.

[Negative-interdependence conditions: Condition 3, 4] In the story, the group leader asked Alex and the other employee to **debate** their positions in order to identify the **best** explanation of why the phones caught fire. Fortunately[Unfortunately], Alex was **certain[uncertain]** about how to **compete** with the other employee because he/she **knew[didn't know]** a lot about smartphones.

I would…

Perceived competence

1. understand the problem well.
2. be able to answer questions about the problem well.
3. feel competent about the problem.

Competence threat

1. be concerned about appearing less competent than the other employee.
2. worry how the other employee is doing compared to me.
3. feel anxious if the other employee is doing better than me.

Social interdependence

Cooperative perceptions
1. like sharing my ideas with the other employee.
2. learn important things from the other employee.
3. like to help the other employee.
4. believe working with the other employee is better than working alone. (*reversed* for Individualistic)
5. like working with the other employee. (*reversed* for Individualistic)

Individualistic perceptions
1. want to spend a lot more time working on my own.
2. want to work by myself.
3. rather work alone than with the other employee.

Competitive perceptions
1. work to do better than the other employee.
2. compete with the other employee to see who could do the best.
3. be happiest when I feel like I am competing with the other employee.
4. want to do better than the other employee.
5. believe competing with the other employee is a good way to work.

Socio-cognitive conflict regulation

Constructive-epistemic regulation
1. think about what I would learn from the other employee's idea.
2. try to understand each point of view.
3. think of a solution that could integrate multiple points of view.
4. consider the different points of view.
5. integrate the different perspectives.
6. figure out how to incorporate the different points of view.

Concurrence-seeking epistemic regulation

1. readily endorse the other employee's point of view without feeling like it contradicts my own thinking.
2. accept the other employee's opinion without worrying about my original idea.
    a. Pilot: support the other employee's opinion.
3. go along with the other employee's idea without hesitation.
4. align my thinking with the other employee's as if I reached the same conclusions myself.
    a. Pilot: easily align my thinking with the other employee's point of view without experiencing any contradiction.
5. take up the other employee's view as if it was my own.
6. readily accept the other employee's idea as if I had thought of it myself.

Competitive-relational regulation

1. show the other employee I am right.
2. resist the other employee's view by maintaining my initial position.
3. show the other employee is wrong.
4. resist by showing my perspective is better than the other employee's.
5. try to win the argument.
6. resist by showing my perspective is right.

Protective-relational regulation

1. reluctantly withdraw my approach.
2. withdraw my ideas and wait for the conflict to end.
    a. Pilot: withhold my idea despite thinking it still has merit.
3. disengage from any confrontation and avoid the conflict.
    a. Pilot: disengage from any discussion of our ideas.
4. give up and withdraw from any confrontation.
5. want to leave and think about something else.
6. back out and ignore the conflict.

<u>Achievement goals (only Study 1)</u>

Mastery-approach goals

1. want to learn as much as possible about the smartphone problem.
2. think it is important for me to understand the smartphone problem as thoroughly as possible.
3. desire to completely understand the smartphone problem.

Mastery-avoidance goals

1. worry that I may not understand all that I possibly could.
2. be afraid that I may not understand the problem as thoroughly as I'd like.
3. be concerned that I may not learn all that there is to learn.

Performance-approach goals

1. think it is important for me to do better than the other employee.
2. think it is important for me to do well compared to the other employee.
3. aim to do better than the other employee.

Performance-avoidance goals
1. just want to avoid doing poorly.
2. aim to avoid performing poorly.
3. be motivated by my fear of performing poorly.

Work-avoidance goals
1. aim to get through this consensus assignment[debate] by doing the least amount of work possible.
2. think it is important to me to do as little work as possible in this consensus assignment[debate].
3. aim to not work hard in this consensus assignment[debate].

Critical Reasoning (only Study 1)

1. evaluate the evidence for the different opinions.
2. use logic to challenge the other employee's thinking.
3. think carefully about our different views before reaching a conclusion.
4. combine and build on the idea of the other employee.
5. offer new ways of looking at our disagreement.

Demographic questions

You're almost done! We just have a few more questions for you about your background.

1. Your gender:*
   Male
   Female
   Transgender
   Prefer not to respond

2. Your race/ethnicity (please mark all that apply):*
   African American or Black
   Asian, Pacific Islander, or Asian-American
   European American or White (not Hispanic)
   Hispanic or Latino/a
   Native American/American Indian
   Not listed: Go to the next question
   Prefer not to respond

3. If "Not listed" in the previous question, what is your race/ethnicity?

4. Is English your native language?*
   Yes
   No

5. What is your current GPA?*

*Items were also used in Study 2.

APPENDIX D.

Survey Items: Study 2

The order of two parts in surveys:

Version 1: Part 1 – Part 2 – Demographic questions
Version 2: Part 2 – Part 1 – Demographic questions

Part 1

When answering the questions below, please think about your typical behaviors and feelings **during the recent labs focusing on Muscles & Actions.** Indicate your agreement with each statement from "strongly disagree" to "strongly agree" that best describes how you feel.

When I was working with others in lab…

Perceived conflicts
1. I confronted different points of view.
2. I was faced with alternative perspectives in lab.
3. Disagreements occurred in lab.

Perceived competence
1. I understood anatomy well.
2. I was able to answer questions about anatomy well.
3. I felt competent about anatomy in lab.

Competence threat
1. I was concerned about appearing less competent than other students.
2. I worried how other students were doing compared to me.
3. I felt anxious if other students were doing better than me.

Social interdependence

Cooperative perceptions
1. I liked sharing my ideas with other students in lab.
2. I learned important things from other students in lab.
3. I liked to help other students in lab.
4. I believed that working with other students in lab was better than working alone. (reversed for individualistic perceptions)
5. I liked working with other students in lab. (reversed for individualistic perceptions)

Competitive perceptions
1. I worked to do better than other students in lab.
2. I competed with other students to see who could do the best in lab.
3. I was happiest when I felt like I was competing with other students in lab.
4. I wanted to do better than other students in lab.

5. I believed competing with other students was a good way to work in lab.

Individualistic perceptions
1. I wanted to spend a lot more time working on my own in lab.
2. I wanted to work by myself in lab.
3. I would rather have worked alone in lab than with other students.

Achievement goals

Mastery-approach goals
1. I wanted to learn as much as possible.
2. It was important for me to understand the material in lab as thoroughly as possible.
3. I desired to completely master the material in lab.

Mastery-avoidance goals
1. I worried that I might not learn all that I possibly could in lab.
2. Sometimes I was afraid that I might not understand the material in lab as thoroughly as I'd like.
3. I was often concerned that I might not learn all that there was to learn in lab.

Performance-approach goals
1. It was important for me to do better than other students in lab.
2. It was important for me to do well compared to other students in lab.
3. My goal in lab was to get a better grade than most of the other students.

Performance-avoidance goals
1. I just wanted to avoid doing poorly in lab.
2. My goal in lab was to avoid performing poorly.
3. My fear of performing poorly in lab was often what motivates me.

Interpersonal goals

Friendly goals
1. It was important to me to openly share my thoughts and ideas in lab.
2. It was important to me to not keep other students at a distance in lab.
3. It was important to me to be supportive of other students' goals in lab.
4. It was important to me to not be too cold toward other students in lab.

Friendly submissive goals
1. It was important to me to put other students' needs before my own in lab.
2. It was important to me to not be too independent in lab.
3. It was important to me to not be too suspicious of other students in lab.
4. It was important to me to work with other students in a way that protected or supported other students' interests in lab.

Dominant goals
1. It was important to me to be self-confident in lab.
2. It was important to me to be firm when I needed to be in lab.
3. When appropriate, it was important to me to say "no" to other students in lab.
4. It was important to me to be aggressive when the situation called for it.

Hostile submissive goals
1. It was important to me to not be noticed too much in lab.
2. It was important to me to keep some things private from other students in lab.
3. It was important to me to not open up to other students too much in lab.
4. It was important to me to not tell personal things to other students in lab.

Behavioral engagement
1. I tried hard to focus during lab. (Engage1)
2. I worked as hard as I could to concentrate in lab. (Engage2)
3. I took advantage of opportunities to participate during lab. (Engage3)
4. I paid attention in lab. (Engage4)
5. I listened very carefully in lab. (Engage5)

Behavioral disengagement
1. I just acted like I was concentrating in lab.
2. I didn't try very hard in lab.
3. I did just enough to get by in lab.
4. I thought about other thing during lab.
5. My mind wandered during lab.

Critical reasoning
1. I evaluated the evidence for the different opinions. (Critical1)
2. I challenged other students' thinking. (Critical2)
3. I thought carefully about different views before reaching a conclusion. (Critical3)
4. I combined and built on the idea of other students. (Critical4)
5. I offered new ways of looking at the disagreement. (Critical5)

Part 2

Sometimes disagreements occur when working with others in lab. When answering these questions, please think about your typical behaviors **during the recent anatomy labs**.

Socio-cognitive conflict regulation
Sometimes disagreements occur when working with others in lab. When this occurred…

Constructive-epistemic regulation
1. I thought about what I would learn from other students' ideas. (Constructive1)
2. I tried to understand each point of view. (Constructive2)
3. I thought of a solution that could integrate multiple points of view. (Constructive3)
4. I considered the different points of view. (Constructive4)

5. I integrated the different perspectives. (Constructive5)
6. I figured out how to incorporate the different points of view. (Constructive6)

Concurrence-seeking epistemic regulation
1. I readily endorsed other students' point of view without feeling like it contradicted my own thinking.*
2. I easily substituted other students' ideas for my own.*
3. I freely replaced my opinion with other students'.
4. I aligned my thinking with other students' as if I reached the same conclusions myself.*
5. I took up other students' view as if it was my own.
6. I readily accepted other students' idea as if I had thought of it myself.

Competitive-relational regulation
1. I showed other students I was right. (Competitive1)
2. I resisted other students' view by maintaining my initial position.* (Competitive2)
3. I showed that other students were wrong. (Competitive3)
4. I resisted by showing my perspective was better than other students'.* (Competitive4)
5. I tried to win the argument. (Competitive5)
6. I resisted by showing my perspective was right.* (Competitive6)

Protective-relational regulation
1. I reluctantly withdrew my approach.* (Protective1)
2. I withdrew my ideas and waited for the conflict to end.* (Protective2)
3. I disengaged from any confrontation and avoided the conflict. (Protective3)
4. I gave up and withdrew from any confrontation. (Protective4)
5. I wanted to leave and thought about something else.* (Protective5)
6. I backed out and ignored the conflict. (Protective6)

*Items were excluded for the final analyses.
Parentheses for some of the items are used to explain the results about the behavioral engagement and disengagement model and the critical reasoning model as part of RQ 2-3.

Demographic questions

1. **Your age on December 31 of 2016?**
   Under 18
   18-19
   20-21
   22-24
   25 and above

2. **Your year in school?**
   First
   Second
   Third
   Fourth
   5+
   Transfer (Please explain: _____)

3. **What is your current overall GPA at CMU? _____**

4. **Anatomy courses taken** (check all that apply)
   Any high school anatomy and/or physiology
   HSC 211
   HSC 214 (re-taking)

5. **Do you consider yourself to be pre-health professional (e.g. pre-med, PT, PA, nursing)?**
   Yes
   No

APPENDIX E.

Annotated Syntax for Mplus

```
! Name a title
TITLE: Interaction;

! Read the data
DATA: File is LMS.dat;

!Label the variables in the datafile
Variable: NAMES are
Coop2 Coop3 Coop4 Coop5 ! Items for cooperative perceptions
Percom1 Percom2 Percom3 ! Items for perceived competence
Const1 Const2 Const3 Const4 Const5 Const6 ! Items for constructive-epistemic regulation
Consk3 Consk5 Consk6 ! Items for concurrence-seeking epistemic regulation
Rel1 Rel3 Rel5 ! Items for competitive-relational regulation
Prot3 Prot4 Prot6 ! Items for protective-relational regulation
Version Gender Health GPA; ! Covariates

! Missing values are identified by 99
Missing are all (          99);

ANALYSIS:
! Type = Missing indicates that FIML is to be used to
! handle missing values (This is the Mplus default).
! Type = Random is necessary for the latent interaction effects
! modeled with latent moderated structural equations approach
Type   missing random;

! For LMS analysis of latent interactions,
! Algorithm = integration is required,
! as the model is estimated by numerical integration.
Algorithm = integration;

MODEL:
! Definition of the measurement models for
! cooperative perceptions and perceived competence
Coop by Coop2 Coop3 Coop4 Coop5;
Percom by Percom1 Percom2 Percom3;

! Definition of the measurement models for
! each socio-cognitive conflict regulation type
Const by Const1 Const2 Const3 Const4 Const5 Const6;
Consk by Consk3 Consk5 Consk6;
Rel by Rel1 Rel3 Rel5;
```

```
Prot by Prot3 Prot4 Prot6;

! Definition of the latent product variable
! using the XWITH-statement.
IntCoop | Coop xwith Percom;

! Outcomes (socio-cognitive conflict regulation types)
! are regressed on control variables.
Const on Version;
Consk on GPA;
Rel on Health GPA Gender;
Prot on Version Gender Health;

! Predictors are regressed on control variables.
Coop on Gender;
Percom on Health GPA;

! Outcomes are regressed on latent predictors
! and their latent interaction.
Const on Percom Coop IntCoop ;
Consk on Percom Coop IntCoop ;
Rel on Percom Coop IntCoop ;
Prot on Percom Coop IntCoop ;

! Set a correlation between exogenous variables;
! The latent product variable is not allowed to be
! correlated with other exogenous variables in Mplus;
Percome with Coop;

! Sample statistics are requested.
Output: sampstat ;
```

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