EFFECTS OF BELONGINGNESS AND SYNCHRONICITY ON FACE-TO-FACE AND COMPUTER-MEDIATED ONLINE COOPERATIVE PEDAGOGY

By

Andrew John Saltarelli

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Educational Psychology and Educational Technology

2012

ABSTRACT

EFFECTS OF BELONGINGNESS AND SYNCHRONICITY ON FACE-TO-FACE AND COMPUTER-MEDIATED ONLINE COOPERATIVE PEDAGOGY

By

Andrew John Saltarelli

Previous research suggests asynchronous online computer-mediated communication (CMC) has deleterious effects on certain cooperative learning pedagogies (e.g., constructive controversy), but the processes underlying this effect and how it may be ameliorated remain unclear. This study tests whether asynchronous CMC thwarts belongingness needs necessary for promotive social interactions and motivation underlying cooperative learning pedagogies by randomly assigning 171 students to a 3 (initial belongingness: acceptance, mild rejection, control) x 3 (synchronicity: face-to-face, synchronous CMC, asynchronous CMC) experimental-control design. As predicted, under acceptance, cooperative perceptions, epistemic regulation, and motivation (post-controversy belongingness, interest-value, perceptions of technology) increased. Also as expected, under asynchronous CMC, competitive and individualistic perceptions and relational regulation increased, while epistemic regulation, motivation (post-controversy belongingness, interest-value, perceptions of technology), and achievement (completion rate, integrative statements) decreased. Overall, findings suggest that synchronicity and belongingness have additive effects on constructive controversy, and that acceptance buffers but does not offset the effects of asynchronous CMC.

ACKNOWLEDGEMENTS

I wish to thank Matthew Koehler, Punya Mishra, and Steven Weiland for their invaluable guidance and editorial assistance. I will forever be indebted to Cary Roseth for his mentorship, brilliant contributions, kindness, patience, and diligent support. I promise to "pay it forward." Above all else, I cherish your friendship most of all.

I wish to thank Patty for sacrificing every day so that I could do the work I love. Finally, I want to thank Madeline, Phineas, and Timothy for reminding me every April of what is most important.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Effects of Belongingness and Synchronicity on Face-to-Face and Computer-mediated Online Cooperative Pedagogy.

To ensure the effective integration of pedagogy and online technologies, research is needed that examines whether instructional procedures rooted in face-to-face (FTF) theory and research also generalize to online learning that is facilitated by computer-mediated communication (CMC). Recent research (i.e., Roseth, Saltarelli, & Glass, 2011) suggests that problems arise in asynchronous CMC conditions with one explanation being that belongingness needs essential to cooperative learning are thwarted in these learning environments. Accordingly, this study compares face-to-face and computer-mediated versions of *constructive controversy,* a theory-based cooperative learning procedure involving intellectual conflict among students (Johnson & Johnson, 2009). This study is guided by four different theories that may explain the processes by which belongingness and CMC synchronicity moderate cooperative learning and each is discussed in turn. First, however, it is necessary to define constructive controversy and introduce FTF and CMC versions of the procedure.

Constructive Controversy

Constructive controversy is a cooperative learning procedure in which individuals argue incompatible views and together seek an agreement integrating the best evidence and reasoning from both positions (Johnson & Johnson, 2007). Constructive controversy differs from concurrence seeking, debate, and individualistic approaches to controversy by emphasizing both (a) deliberate discourse (i.e., the discussion of relative strengths and weakness of different positions) and (b) the shared goal of reaching an agreement integrating the best information from different positions. As detailed below, constructive controversy is rooted in social interdependence theory's (Deutsch, 1949, 1973, 1985; Johnson & Johnson, 1989, 2005)

proposition that cooperative perceptions (e.g., sharing a common goal) tend to promote the constructive resolution of controversy by encouraging more open-minded inquiry, greater helpfulness and motivation, more accurate understanding of opposing positions, and higher-level reasoning (Johnson & Johnson, 2009).

FTF procedure. Briefly and as summarized in Table 1, the constructive controversy procedure includes 5 steps, with steps 1-4 involving deliberate discourse and step 5 the shared goal of reaching an integrative agreement. Before beginning the procedure, participants are first randomly assigned to pro- and con-sides of a controversial issue such as, in this study, "Should schools decrease class size to improve student outcomes? (see Issue 15, Abbeduto & Symons, 2008, pp. 318-338). In step one, same-side pairs jointly prepare the best case for their assigned position (e.g., one student pair jointly prepares the best case for why schools should decrease class sizes while the other pair jointly prepares the best case for why schools should not). In step two, new opposite-side pairs are created, and each student takes a turn presenting their best case to their opposite-side partner. In step 3, opposite-side pairs then engage in an open discussion of the controversy, arguing persuasively for their respective pro- and con-positions. In step 4, opposite-side pairs reverse positions and present the opposing side's argument as accurately as possible. Finally, in step 5, opposite-side pairs drop all advocacy of their pro- and con-positions and together develop a written statement integrating the best information from both sides of the controversy. For greater detail about the constructive controversy procedure, readers are referred to Johnson and Johnson (2007).

CMC procedure. To date, only one previous study (i.e., Roseth et al., 2011) has compared FTF, synchronous CMC, and asynchronous CMC versions of constructive controversy in different mediated (i.e., video, audio, text) contexts. In that study, the synchronous CMC

version of constructive controversy paralleled the FTF procedure in all but one respect: CMC partners were placed in separate rooms and could not see or hear each other save the communication facilitated by different synchronous CMC media. Similarly, the asynchronous version of constructive controversy paralleled the synchronous version, except that students completed the 5-step procedure asynchronously over seven consecutive days. Specifically, partners used different forms of asynchronous media to record and transmit one response to their partner each day of the activity.

As detailed below, Roseth et al. (2011) found that synchronicity but not medium moderated the effects of constructive controversy, providing initial evidence that problems arise – including decreased achievement and motivation – when integrating asynchronous CMC with constructive controversy pedagogy. What is not clear from Roseth et al.'s (2011) results is why asynchronous CMC had this effect or how it may be ameliorated. This is a problem for practitioners as it raises concerns about whether constructive controversy and related cooperative learning procedures may be used effectively in asynchronous online instruction. This is also a problem for theorists as it raises 'boundary questions' (Walther, 2009) about the online contextual conditions in which psychological theories rooted in FTF assumptions may not apply. This study addresses these issues by testing four different theories' accounts of how CMC may affect constructive controversy.

Belongingness Theories

Belongingness theories (i.e., self-determination theory and belongingness theory) offer one account of how CMC may affect constructive controversy. These theories posit that *belongingness,* or feelings of security and relatedness, represents a basic need that must be met in order for optimal motivation to occur.

Self-determination theory (Deci & Ryan, 2000; Ryan & Deci, 2000) posits that relatedness is one of three innate needs influencing motivational outcomes. Specifically, the theory argues that *relatedness* (feeling of belonging, social connection), *competence* (feeling of accomplishment that is derived from effective functioning), and *autonomy* (the perception of control over one's own actions) are innate psychological needs that must be satisfied to achieve self-regulation, intrinsic motivation, and personal well-being.

Similar to self-determination theory, *belongingness theory* (Baumeister & Leary, 1995) posits that humans have an innate need for, and drive to develop lasting, positive, and significant interpersonal relationships, and that thwarting this need leads to negative outcomes such as decreased motivation (for review, see Osterman, 2000; Wentzel, 1998) and achievement (Baumeister & DeWall, 2005; Baumeister, Twenge, & Nuss, 2002). To avoid confusion, from this point forward the term *belongingness* will be used to refer to both belongingness and relatedness needs, emphasizing similarities rather than differences among researchers' views of belongingness and relatedness (cf. Juvonon, 2006).

As a main effect explanation, belongingness theories suggest that CMC may affect students' sense of belongingness, with CMC associated with increased belongingness yielding positive outcomes, and CMC associated with decreased belongingness yielding negative outcomes. In support of belongingness theories, Roseth et al. (2011) found that, compared to FTF and synchronous CMC, belongingness decreased under asynchronous CMC, along with motivation (i.e., interest, value) and academic achievement (i.e., completion rate). This study adds to the literature by experimentally manipulating students' initial feelings of belongingness before the constructive controversy procedures begins. Thus, this study tests the extent to which FTF and CMC versions of constructive controversy either satisfy or thwart post-controversy

belongingness given different states of initial belongingness (i.e., acceptance, mild rejection, control).

Testing whether initial belongingness is a prerequisite condition, outcome, or both in constructive controversy is important to clarify how, exactly, synchronicity, social interdependence, conflict elaboration, and initial belongingness may affect CMC versions of the procedure. For example, an additive hypothesis suggests that initial belongingness and synchronicity may be complementary, with initial acceptance increasing the positive effects of synchronous CMC, and initial mild rejection exacerbating the negative effects of asynchronous CMC. Initial belongingness and synchronicity may also have additive effects on social interdependence and social-cognitive conflict, jointly promoting or undermining cooperative perceptions and, so doing, also indirectly increasing either epistemic or relational regulation.

It may also be the case that initial belongingness and synchronicity have buffering effects. For example, initial acceptance may ameliorate, or buffer the negative effects of asynchronous CMC on constructive controversy. This outcome would be especially important for practioners, as it would suggest that first satisfying students' belongingness needs may be an effective way of integrating constructive controversy in asynchronous online settings. Both initial acceptance and synchronicity may also buffer the negative effects of competitive and individualistic perceptions and relational regulation. This outcome would be important for theorists, as it would suggest that social interdependence theory and conflict elaboration theory may need to be modified to indicate that outcomes depend on initial belongingness.

Finally, constructive controversy itself may buffer the negative effects of initial mild rejection. As noted above, social interdependence theory makes no indication of initial belongingness or the effects initial mild rejection, arguing instead that cooperative perceptions

result in a benign spiral in which goal achievement enhances motivation, promotive interaction, and interpersonal relationships. This outcome would be important for practitioners, as it would suggest that even deficiencies in initial belongingnesss may be satisfied by cooperative instructional procedures like constructive controversy. For theorists, this outcome would also suggest that belongingness theories may need to be modified to indicate that belongingness satisfaction depends on cooperative contexts.

CMC Theories

The CMC literature offers opposing theories of how CMC may affect constructive controversy. On one side of the debate, the social information processing theory of CMC (Walther, 1992, 1996; Walther et al., 2005; see also Reicher, Spears, & Postmes, 1995) posits that, given sufficient time, communicators adapt their language, style, and other cues to whatever form of CMC they are using. Research by Walther (1992) and colleague's (Tidwell & Walther, 2002) supports this view, suggesting that asynchronous, text-based CMC (e.g., email, discussion forums) may actually enhance communicators' ability to select, manage, and transmit relational information compared to FTF contexts (Walther, 2007; Walther, Loh, & Granka, 2005). As a main effect explanation, the social information processing theory of CMC suggests that, given sufficient time for students to adapt their communication cues to CMC, there should be no differences between FTF and CMC versions of constructive controversy.

On the other side of the debate, other CMC theorists suggest that *media richness,* defined in terms of the ability of CMC "to clarify ambiguity and amplify understanding in a timely manner" (Maruping & Agarwal, 2004, p. 977), may affect constructive controversy. These views suggest that greater media richness produces higher quality communication and is more conducive to positive interpersonal relationships, while less media richness produces lower

quality communication by increasing ambiguity or by increasing the amount of time required for clear communication (e.g., Baltes, Dickson, Sherman, Bauer, & LaGanke, 2002; Daft & Lengel, 1984; Gunawardena, 1995; Short, Williams, & Christie, 1976). As a main effect explanation, media richness views suggest that FTF constructive controversy will yield more positive outcomes than less-rich CMC versions. And, because synchronous CMC versions of constructive controversy afford dynamic interaction and the immediate clarification of ambiguity, they will yield more positive outcomes than less-rich, asynchronous CMC versions.

Interestingly, Roseth et al.'s (2011) comparison of FTF and CMC versions of constructive controversy provided mixed support for both sides of the CMC debate. Supporting the social information processing theory of CMC but not media richness views, results showed no statistically significant differences between video, audio, or text versions of the procedure, suggesting that users adapted equally well to whatever medium they were using and that differences in media richness had no effect on constructive controversy outcomes. However, in support of media richness views but not social information processing theory of CMC, results also showed that synchronicity moderated constructive controversy outcomes, with asynchronous CMC resulting in decreased achievement (i.e., completion rate), motivation (i.e., relatedness, interest, value), and cooperative perceptions compared to FTF and synchronous CMC versions.

Of course, the social information processing theory of CMC offers an alternative explanation of synchronous and asynchronous differences, suggesting that students had insufficient time to adapt their communication to asynchronous CMC constraints. The present study adds to the literature by testing this possibility, examining how much time students spend and how much time they *would have preferred* to spend on the constructive controversy

procedure. Following the social information processing theory of CMC, if students spend the same amount of time on FTF and CMC versions of constructive controversy, then the negative effects of asynchronous CMC may be attributed to insufficient time for students to adapt their communication. However, if students already spend more time on asynchronous CMC but fail to report they would have preferred more time, then additional variables besides time may also explain how CMC affects constructive controversy. The next three sections consider theoretical perspectives on social, social-cognitive, and motivational variables thought to affect constructive controversy.

Social Interdependence Theory

Social interdependence theory (Deutsch, 1949, 1962; Johnson & Johnson, 1989, 2005) offers a third account of how CMC may affect constructive controversy. The basic premise of social interdependence theory is that the way in which social interdependence is structured determines how individuals interact which, in turn, determines outcomes. Specifically, *positive interdependence* (i.e., cooperative goal structures) results in promotive interactions (actions that foster the success of others and positive social relationships) which, in turn, facilitate goal achievement. In his *crude law of social relations,* Deutsch (1985) further suggests that successful goal achievement results in a *benign spiral,* or positive reciprocal effects enhancing promotive interaction, social relationships, and motivation. In contrast, *negative interdependence* (i.e., competitive goal structures), results in oppositional interaction patterns (actions that obstruct others' attempts to achieve goals) which reduce goal achievement and result in a destructive spiral involving increased oppositional interaction, more negative social relationships, and decreased motivation. Finally, *no interdependence* (i.e., individualistic goal structures) results in

incidental or no interaction, the result of which is that individuals tend to seek outcomes that are personally beneficial without concern for others' efforts to achieve their goals.

As a main effect explanation, social interdependence theory suggests that CMC may affect students' perceptions of social interdependence, with CMC associated with cooperative perceptions yielding positive outcomes, and CMC associated with competitive or individualistic perceptions yielding negative outcomes. In support of social interdependence theory, Roseth et al. (2011) found that, compared to FTF and synchronous CMC versions of constructive controversy, cooperative perceptions decreased and individualistic perceptions increased in asynchronous CMC, along with predicted declines in motivation (i.e., belongingness, interest, value) and academic achievement (i.e., completion rate). As detailed in the introduction's remaining sections, this study adds to the literature by replicating Roseth et al.'s (2011) comparison of FTF and CMC versions of constructive controversy while also testing social-cognitive and motivational accounts of how CMC may affect the procedure. Testing different theoretical accounts against each other is important as it clarifies whether one theory or some combination of theories are needed to understand how CMC affects constructive controversy.

Conflict Elaboration Theory

Finally, conflict elaboration theory (Doise & Mugny, 1984; Pérez & Mugny, 1996) offers a fourth account of how CMC may affect constructive controversy. Like social interdependence theory, conflict elaboration theory emphasizes the importance of cooperation in promoting controversy's constructive outcomes. However, rather than link cooperative perceptions to distinct social interaction patterns, conflict elaboration theory posits that cooperative perceptions first promote adaptive *social-cognitive* responses to the experience of arguing conflicting points of view (i.e., *socio-cognitive conflict*; cf. Piaget, 1975).

Conflict elaboration theory posits that arguing conflicting points of view promotes either epistemic or relational regulation. Under cooperative conditions, arguing conflicting points of view promotes *epistemic regulation* (i.e., regulating uncertainty about the correct response) and, as a result, tends to promote higher achievement, increased motivation, and more positive interpersonal relationships (Butera & Mugny, 2001; Darnon, Buch, Butera, 2002; Johnson & Johnson, 2009; Quiamzade & Mugny, 2001). Under individualistic or competitive conditions, in contrast, arguing conflicting points of view promotes *relational regulation* (i.e., regulating uncertainty about one's competence compared to the other person) and, as a result, tends to promote social comparison processes that lower achievement, decrease motivation, and result in more negative interpersonal relationships (Butera & Mugny, 2001; Darnon, Buch, Butera, 2002; Johnson & Johnson, 2009; Quiamzade & Mugny, 2001).

As a main effect explanation, conflict elaboration theory suggest that CMC may *indirectly* affect students' responses to social-cognitive conflict, with CMC associated with cooperative perceptions promoting epistemic regulation and, as a result, positive outcomes, and CMC associated with individualistic or competitive perceptions promoting relational regulation and, as a result, negative outcomes. It must be emphasized that social interdependence theory and conflict elaboration theory posit distinct mechanisms by which cooperative perceptions promote constructive controversy's positive outcomes. Social interdependence theory emphasizes the way cooperative perceptions (positive social interdependence) result in promotive interaction patterns which, in turn, increase achievement, motivation, and result in more positive interpersonal relationships. In contrast, conflict elaboration theory emphasizes the way cooperative perceptions promote epistemic over relational regulation and, so doing, avoid social comparison processes that result in lower achievement, decreased motivation, and more

negative interpersonal relationships. This study adds to the literature by simultaneously examining the effect of CMC on perceptions of social interdependence and epistemic and relational regulation, and so doing testing whether one or the other, or both of these processes are involved in CMC's moderation of constructive controversy outcomes.

Summary

To summarize, this study is guided by two research questions: (1) Why does asynchronous CMC moderate constructive controversy? and, (2) Can initial belongingness ameliorate the previously reported negative effects of asynchronous CMC? To answer these questions, this study tests four different theories against each other in order to clarify the processes by which belongingness and CMC – particularly asynchronous CMC – may moderate constructive controversy outcomes. First, belongingness theories suggest that CMC may thwart belongingness needs and, so doing, undermine student motivation. Second, CMC theories offer conflicting views of how media richness may or may not affect constructive controversy. Third, social interdependence theory suggests that CMC may undermine cooperative perceptions which, in turn, affect constructive controversy. And, fourth, conflict elaboration theory suggests that CMC may indirectly promote relational regulation which is deleterious to constructive controversy. Main, additive, and buffering effects are tested using a 3 (synchronicity: FTF, synchronous CMC, asynchronous CMC) x 3 (initial belongingness: acceptance, mild rejection, control) experimental-control design.

Method

Participants

This study was conducted in eleven introductory teacher education courses at a large, public Midwestern university. These courses are required of all teacher education students, the

majority of whom (> 80%) are female. Eligibility criteria included voluntary participation and signed consent of an undergraduate student between the age of 18 and 24. Exclusion criteria included the ability to read and write in English and willingness to follow procedural directions.

Participants were recruited by contacting course instructors and then, pending instructor approval, inviting students to participate by having the primary investigator describe the study in each of the course sections. Participants received course credit for participation. In all, 72% (N = 188) of recruited students agreed to participate in the study, with n = 66 absent on the day of the study and n = 6 choosing to complete an alternative class activity. Procedures associated with the study were reviewed and approved by the sponsoring university's institutional review board (IRB No. 11–204).

Procedures

A 3 (synchronicity: face-to-face, synchronous, asynchronous) x 3 (initial belongingness: acceptance, mild rejection, control) experimental-control design was used in this study. The eleven class sections were randomly assigned to the FTF (3 section), synchronous CMC (3 sections), and asynchronous text-based CMC conditions (5 sections) and, within each CMC condition, individual participants were randomly assigned to acceptance, mild rejection, or control conditions respectively. Individual students were also randomly paired as partners, each one being randomly assigned to the constructive controversy's pro or con position. All students in all conditions worked on the same controversy (Should schools decrease class size to improve student outcomes?) and, prior to starting the controversy, received the same bulleted review sheets pertaining to the pro or con sides respectively.

Next, students completed the belongingness manipulation before starting the constructive controversy procedure. Specifically, after providing written consent to participate in the study,

participants in all conditions individually completed the Eysenck Personality Questionnaire Brief Version (EPQ-BV; Eysenck & Eysenck, 1975; Sato, 2005), and were then told that their results were being sent electronically to potential partners who would use this information to select who they wanted to work with. As detailed below, the manipulation varied as a function of participants' randomly assigned initial belongingness condition. Research assistants interacting directly with participants during the experimental procedure were unaware of the participants' randomly assigned conditions.

After reading the manipulation text, participants were then matched with their randomly assigned partner and, save the FTF condition, given instructions how to use the online activity scaffold to communicate via text-based CMC with their partner. Participants in the FTF and synchronous CMC conditions then completed the learning activity with their partner. Participants in the asynchronous CMC conditions were dismissed early after being instructed to complete the learning activity with their partner during their free time but according to a specific asynchronous schedule. The asynchronous schedule is detailed below.

During the controversy procedure, all students in all conditions were shown the same video recordings explaining each of the constructive controversy's five steps. For all conditions save the FTF control, an online activity scaffold was used to guide the controversy procedure. Specifically, each dyad in the synchronous (see Appendix A for the synchronous scaffold) and asynchronous CMC conditions was assigned one unique online activity scaffold allowing the dyads to co-compose and co-edit the integrated essay in step 5 of the controversy procedure. For the asynchronous CMC condition, each dyad's unique online activity scaffold was also used to share their statements with their partners during steps 1 – 4 of the controversy procedure.

Finally, after completing the constructive controversy procedure, participants individually completed a web-based questionnaire including the study's dependent variables.

Materials

Materials in this study included paper-based resources and technologies used to facilitate synchronous and asynchronous CMC. Dependent measures were presented at the end of each controversy via a WWW-based survey. Table 2 summarizes materials for all conditions.

Paper-based resources. Participants in all conditions were randomly assigned to either the pro or con position of the controversy and, just prior to beginning the controversy activity, given one-page bullet sheets pertaining to the side of the argument that they were randomly assigned. Specifically, participants assigned to the pro side were given bullet points summarizing an article by Bruce J. Biddle and David C. Berliner entitled, "Small Class Size and Its Effects" (Abbeduto & Symons, 2008, pp. 320-330). Participants assigned to the con side were given bullet points summarizing an article by Kirk A. Johnson entitled, "The Downside to Small Class Policies" (Abbeduto & Symons, 2008, pp. 333-338).

Synchronous CMC. Each participant in the synchronous condition was given a laptop computer to use for the duration of the controversy procedure. Each dyad was assigned a unique co-editable online activity scaffold created specifically for this study. All synchronous dyads used the instant chat functionality built into the online activity scaffold to communicate. The activity scaffold allowed for near real-time co-editing of written text (i.e., < 3 second delay in updating recent edits).

Asynchronous communication. Participants in the asynchronous group were trained in class on how to complete the constructive controversy procedure with their partners. Participants

who did not own the necessary equipment to record their statement (e.g., laptop computer) were given these materials to use for the constructive controversy.

Independent Variables

Independent variables included initial belongingness and synchronicity.

Initial belongingness. The initial belongingness manipulation was administered using a choice procedure whereby participants are told that they are chosen or not chosen by others to complete a task (see e.g., Nezlek, Kowalski, Leary, Blevins, & Holgate, 1997; Twenge, Baumeister, Tice, & Stucke, 2001). Specifically, after completing and electronically submitting the initial personality questionnaire, all participants in all conditions were presented with the following on-screen instructions:

> Thank you for completing the personality questionnaire. The results of your personality test are being sent to potential partners who will evaluate the results and rank them on a scale ranging from "an almost perfect fit" to "probably not a fit." Their goal is to find a partner that will fit them best and provide the most agreeable working relationship. You will now also be presented with results from other students' questionnaires and will be asked to provide the same rankings for whom you would like to work with.

In actuality, researchers randomly assigned dyads while leading both participants to believe that their partner had either chosen or rejected them based on the personality test results.

In the *acceptance* condition, both participants in the dyad were told that they were their partner's first choice for the activity, indicating an "almost perfect fit". Both participants in this condition received the following message:

> You have been selected by another student to be their partner in this activity. After reviewing the results of your personality questionnaire, your partner rated you as their first choice to work with them on this activity. Thus, they believe you are "an almost perfect fit" to work with them on this activity and you would also probably get along well in other social situations. This person was also your first choice.

In the mild rejection condition, both participants in the dyad were told that they were their partner's last choice and rated as "probably not a fit" to work with them for the activity. They were told that this "not fit" choice was forced upon their partners based on the limited number of potential participants. In this condition, both participants received the following message:

> After reviewing the results of your personality test, your partner rated you as their last choice to work with them on this activity. However, due to all their higher rated individuals being chosen by other participants, your partner had no choice but to be paired with you. Thus, they believe you are "probably not a fit" to work with them on this activity and you would also probably not get along well in other social situations. This person was also your last choice.

In the *control* condition, both participants in the dyad received indicating that they had been paired, but no further information was given regarding whether they were or were not their partner's first choice. In this condition, both participants received the following message:

> You've been successfully paired with a partner for the study.

To check that feelings of rejection and acceptance varied as a result of the initial belongingness manipulation, participants were asked in the post-activity questionnaire whether or not they were their partner's first choice.

CMC Synchronicity. The *synchronous CMC* condition involved dynamic, real-time text-based chat between students in a dyad. The *asynchronous CMC* condition involved one text-based response per student in a dyad per day for 6 days. On day 1 and in class, students took the electronic personality questionnaire, were trained on how to use the asynchronous activity scaffold, were paired with a partner, and completed steps 1 and 2 of the controversy procedure. On days 2 and 3, students completed step 3 of the controversy procedure (i.e., open discussion). On day 4, students completed step 4 of the controversy procedure (i.e., reverse perspectives). On days 5 and 6, students completed step 5 of the controversy procedure (i.e., integrative agreement). For step 5, students produced an approximately 200-word essay integrating both readings and took the post-task questionnaire.

Debriefing. After completing the constructive controversy and the post-task questionnaire, participants were provided an extensive debriefing that outlined the aims of the study and explained that the researchers actually randomly assigned partners. Further, researchers explained that the mild rejection condition did not involve others' perceptions of the students, but was purposely manipulated to test how these two different groups interacted in online contexts. Participants were also provided a link to the experimenter's e-mail address if they had any further questions.

Dependent Variables

There were seven dependent variables: time, achievement, motivation, social interdependence, conflict regulation, post-controversy belongingness, technology acceptance, and task-technology fit. Students completed all measures independently after completing step 5 of the procedure and, save the achievement and time measures, all dependent variables were based on scale items ranging from 1 (not at all) to 7 (very much so).

Time. Time was assessed with two questions, the first asking students how much time they spent on the constructive controversy activity, and the second asking how much time they would have preferred to spend on the activity.

Social interdependence. Attitudes toward three forms of social interdependence were assessed with the Social Interdependence Scale (Johnson & Norem-Hebeisen, 1977): cooperation (7-items; $\alpha = .89$), competition (7-items; $\alpha = .93$), and individualism (7-items; $\alpha = .86$).

Conflict regulation. Two scales evaluating conflict regulation (Darnon et al., 2006) were assessed: relational regulation (3-items; $\alpha = .80$) and epistemic regulation (3-items, $\alpha = .82$).

Motivation. Relatedness (8-items; $\alpha = .88$), interest (7-items; $\alpha = .92$), and value (7-items; $\alpha = .93$) were assessed using 3 sub-scales of the Intrinsic Motivation Inventory (IMI) (Ryan, 1982).

Belongingness. Belongingness was assessed using three scales: belongingness (Williams, Chueng, & Chio, 2000) (3-items; $\alpha = .86$), interpersonal attraction (3-items; $\alpha = .91$) (Smith, Johnson, & Johnson, 1981) and relatedness (Ryan, 1982) (8-items; $\alpha = .88$).

Achievement. Knowledge and understanding of the controversy's background readings was assessed using 4 multiple-choice items ($\alpha = 0.41$). Critical thinking in the final joint essay was assessed using a modified form of a coding rubric (Kuhn & Crowell, 2011, see Appendix B for complete rubric): number of arguments ($\kappa = .95$), use of evidence ($\kappa = .90$), and integrative statements ($\kappa = .87$). Reliability was determined by comparing independent coding for 21 essays by the first author and a research associate.

Technology acceptance. Technology acceptance was assessed using 2 sub-scales of the Unified Theory of Acceptance and Use of Technology scale (UTAUT) (Venkatesh, Morris,

Davis, & Davis, 2003): attitude toward using technology (2-items; $\alpha = .90$) and self-efficacy (2-items; $\alpha = .69$).

Task-technology fit. Technology fit was assessed using 1 sub-scales of the Task-technology fit scale (Goodhue, 1998): presentation (2-items; $\alpha = .94$).

Results

Participant Flow

There were $n = 35$ participants in the asynchronous conditions (acceptance = 13, mild rejections = 12, control = 10) who did not complete the experiment, nor did they report why this occurred. All participants in the FTF and synchronous conditions completed the assignment. Therefore, the final number of participants used for data analysis was $n = 171$ (125 females), with a mean age of 19.48 years ($SD = 2.89$, Range = 18 to 24). Table 3 summarizes participant flow by condition and also reports descriptive statistics for each dependent variable.

Correlational Analysis

Relationships among dependent measures were examined by computing Pearson-product correlations. Supporting the statistical validity of this approach, visual inspection of scatterplots and boxplots provided no evidence of univariate outliers. Table 4 reports the results.

Focusing first on students' perceptions of social interdependence, cooperative perceptions were negatively correlated with individualistic perceptions ($r = -.55$. $p < .01$), and a small positive correlation was found between cooperative and competitive perceptions ($r = .30$, $p < .01$). There was no significant association between competitive and individualistic perceptions. Results suggest that cooperative and individualistic perceptions were inversely related while cooperative and competitive perceptions were moderately positively related.

For conflict regulation, relational and epistemic regulation were slightly positively correlated ($r = .19$, $p < .01$). As expected, relational regulation was also negatively correlated with post-controversy belongingness ($r = -.21$, $p < .01$) and strongly positively correlated with competitive perceptions ($r = .57$, $p < .01$). Likewise, epistemic regulation was highly positively correlated with measures of motivation (i.e., belongingness, interest-value) and cooperative perceptions, both *r*'s .46, *p*s < .01, and negatively correlated with individualism ($r = -.41$, $p < .01$). Results suggest that even while relational and epistemic regulation were slightly positively associated, only epistemic regulation was associated with increased motivation, increased, cooperative perceptions, and decreased individualistic perceptions. In contrast, relational regulation was associated with decreased motivation and increased competitive perceptions.

For motivation, there were strong positive correlations between relatedness and post-controversy belongingness ($r = .59$, $p < .01$), relatedness and interpersonal attraction ($r = .74$, $p < .01$), and post-controversy belongingness and interpersonal attraction ($r = .58$, $p < .01$) and, consequently, the three measures were aggregated to create a composite post-controversy belongingness variable. There was also a strong positive correlation between interest and value ($r = .78$, $p < .01$), so these two measures were aggregated to create a composite interest-value variable. As expected, there was a positive correlation between post-controversy belongingness and interest-value ($r = .46$, $p < .01$).

As expected, cooperative perceptions were highly positively correlated with both motivation measures (i.e., post-controversy belongingness, $r = .60$, $p < .01$; interest-value, $r = .78$, $p < .01$), and individualistic perceptions were highly negatively correlated with both measures (post-controversy belongingness $r = -.62$, $p < .01$; interest-value $r = -.45$, $p < .01$). Results suggest that cooperative perceptions were associated with increased motivation while

individualistic perceptions were associated with decreased motivation. Interestingly, small positive correlations were also found between students' competitive perceptions and interest-value ($r = .25$, $p < .01$), even as there was a slightly negative correlation with post-controversy belongingness ($r = -.18$, $p < .05$). Results suggest that competitive perceptions were also associated with increased motivation as measured by interest-value, but with decreased motivation as measured by post-controversy belongingness.

For achievement, there were no significant correlations between the multiple-choice scores and the 3 critical-thinking scores, even as the critical thinking scores were all positively correlated with *r*'s ranging from .21 to .67 (all *p*s < .05). Findings suggest that multiple-choice scores did not predict the critical thinking scores. Unexpectedly, neither multiple-choice scores nor critical thinking scores were significantly correlated with motivation and social interdependence measures. Results suggest that achievement was unrelated to motivation and perceptions of social interdependence.

For perceptions of technology, attitudes toward technology and task-technology fit were highly positively correlated ($r = .68$, $p < .01$). Further, both measures were highly positively correlated with all measures of motivation (*r*'s ranging from .32 to .77, all *p*s < .01), cooperative perceptions (*r*'s ranging from .60 to .79, all *p*s < .01), and competitive perceptions (*r*'s ranging from .24 to .27, all *p*s < .05). Results suggest that attitudes toward technology and task-technology fit were highly positively related, and also highly positively related with motivation. and cooperative perceptions. Though smaller in magnitude, perceptions of technology were also positively related with competitive perceptions.

Factorial Analysis

Experimental main effects and interactions were analyzed using a 3 (synchronicity: face-to-face, synchronous, asynchronous) x 3 (initial belongingness: acceptance, mild rejection, control) multivariate analyses of variance (MANOVA), and post hoc tests were conducted using Bonferroni multiple comparisons, where $\alpha = .05/c$, and c = the number of pairwise comparisons. Supporting the statistical validity of using MANOVA, there was no evidence of multivariate outliers and nonsignificant tests of Box's *M* suggested that the homogeneity of variance-covariance matrix assumption was not violated. To conserve space, non-significant results are not detailed.

Manipulation Check

A chi-square test of independence showed a significant relationship between the manipulation and reported levels of initial belongingness, χ^2 (4, N = 171) = 206.33, p <.01, with students in the acceptance condition more likely to say 'yes,' mild rejection more likely to 'no', and control more likely to report 'I don't know." Results confirm the effectiveness of the initial belongingness manipulation.

Time

For reported time, MANOVA results showed a significant multivariate omnibus for synchronicity, Wilks's $\lambda = .56$, $F(4, 322) = 26.21$, $p < .01$, $\eta^2 = 0.24$, and initial belongingness, Wilks's $\lambda = .93$, $F(4, 322) = 2.82$, $p = .02$, $\eta^2 = 0.03$. For synchronicity, the between-subject test was significant for time spent, $F(2, 162) = 41.18$, $p < .01$, $\eta^2 = 0.33$, and time preferred, $F(2, 162) = 11.81$, $p < .01$, $\eta^2 = 0.12$. For time spent, post hoc tests revealed significant differences favoring asynchronous over FTF ($p < .01$), and asynchronous over synchronous ($p < .01$). For time preferred, post hoc tests revealed significant differences favoring synchronous over

asynchronous ($p < .01$) and synchronous over FTF ($p < .01$). Findings suggest that asynchronous students spent more time on constructive controversy than synchronous and FTF students. Findings also suggest that only synchronous students would have preferred spending more time on the procedure compared to asynchronous and FTF students.

Social Interdependence

For perceptions of social interdependence, MANOVA results showed a significant multivariate omnibus for synchronicity, Wilks's $\lambda = .78$, $F(6, 320) = 6.80$, $p < .01$, $\eta^2 = 0.11$ and initial belongingness, Wilks's $\lambda = .91$, $F(6, 320) = 2.46$, $p = .02$, $\eta^2 = 0.04$. For synchronicity, the between-subject test was significant for cooperation, $F(2, 162) = 5.75$, $p < .01$, $\eta^2 = 0.06$, competition, $F(2,162) = 6.94$, $p < .01$, $\eta^2 = 0.07$, and individualism, $F(2, 162) = 10.24$, $p < .01$, $\eta^2 = 0.11$. For cooperation, post hoc tests revealed significant differences favoring FTF over asynchronous ($p < .01$) and, for competition, post hoc tests revealed significant differences favoring asynchronous over FTF ($p < .01$). For individualism, post hoc tests revealed significant differences favoring asynchronous over both FTF ($p < .01$), and synchronous ($p = .01$). As displayed in Figure 1, findings support the hypothesis that students' cooperative perceptions increase under FTF, while competitive and individualistic perceptions increase under asynchronous.

For initial belongingness, the between-subject test was significant for cooperation, $F(2, 162) = 6.58$, $p < .01$, $\eta^2 = 0.07$, and post hoc tests revealed significant differences favoring acceptance over control ($p < .01$). Findings support the hypothesis that students' cooperative perceptions increase under initial acceptance conditions.

Conflict Regulation

For relational and epistemic conflict regulation, MANOVA results showed a significant multivariate omnibus for synchronicity, Wilks's $\lambda = .86$, $F(4, 274) = 5.08$, $p < .01$, $\eta^2 = 0.06$ and initial belongingness, Wilks's $\lambda = .93$, $F(4, 274) = 2.51$, $p = .04$, $\eta^2 = 0.03$. For synchronicity, the between-subject test was significant for relational regulation, $F(2, 138) = 6.27$, $p < .01$, $\eta^2 = 0.08$, and epistemic regulation, $F(2, 138) = 3.45$, $p = .03$, $\eta^2 = 0.04$. For relational regulation, post hoc tests revealed significant differences favoring asynchronous CMC over FTF ($p < .01$) and, for epistemic regulation, post hoc tests revealed significant differences favoring FTF over asynchronous ($p = .03$). As displayed in Figure 2, findings support the hypothesis that relational regulation increases and epistemic regulation decreases under asynchronous CMC.
For initial belongingness, the between-subject test was significant for epistemic regulation, $F(2, 138) = 4.21$, $p = .01$, $\eta^2 = 0.05$, and post hoc tests revealed significant differences favoring acceptance over control ($p < .01$). Findings support the hypothesis that epistemic regulation increases under acceptance conditions.

Motivation

Students' motivation was operationalized as post-controversy belongingness and interest-value. For motivation, MANOVA results showing a significant multivariate omnibus for synchronicity, Wilks's $\lambda = .77$, $F(4, 318) = 11.10$, $p < .001$, $\eta^2 = 0.12$, and initial belongingness, Wilks's $\lambda = .92$, $F(4, 318) = 3.19$, $p = .01$, $\eta^2 = 0.03$. For synchronicity, the between-subject test was significant for post-controversy belongingness, $F(2, 160) = 23.02$, $p < .001$, $\eta^2 = 0.22$, and interest-value, $F(2, 160) = 3.39$, $p = .03$, $\eta^2 = 0.04$. For post-controversy belongingness, post hoc

tests revealed significant differences favoring FTF over asynchronous ($p < .01$) and synchronous over asynchronous ($p < .01$). For interest-value, post hoc tests revealed significant differences favoring synchronous over asynchronous only ($p = .04$). Results indicate that post-controversy belongingness was greater for FTF compared to asynchronous, and for synchronous compared to asynchronous. Interest-value was greater for synchronous compared to asynchronous. As displayed in Figure 3, findings support the hypothesis that motivation depends on synchronous interaction, and that FTF and synchronous CMC have additive effects on post-controversy belongingness, and that synchronous CMC has additive effects on interest-value.

For initial belongingness, the between-subject test was significant for post-controversy belongingness, $F(2, 160) = 4.61$, $p = .01$, $\eta^2 = 0.05$, and interest-value, $F(2, 160) = 3.26$, $p = .04$, $\eta^2 = 0.03$. For post-controversy belongingness, post hoc tests revealed significant differences favoring acceptance over both control ($p = .04$) and mild rejection ($p = .01$). For interest-value, post hoc tests revealed significant differences favoring acceptance over control ($p = .02$). Findings support the hypothesis that motivation depends on initial belongingness.

Achievement

For achievement, only 59.7% ($n = 55$ of 92) of students in asynchronous completed the constructive controversy procedure (i.e., completed multiple-choice test and submitted final consensus statement), compared to 100% ($n = 64$; Fisher's exact test; $p < .01$) in synchronous and 100% ($n = 62$; Fisher's exact test; $p < .01$) in FTF. This suggests that achievement, at least as defined by completion rates, decreased under asynchronous CMC conditions and supports the hypothesis that constructive controversy achievement depends on synchronous interaction.

Next, ANOVA was used to examine students' multiple-choice scores. The synchronicity-initial belongingness interaction was significant, $F(2,162) = 3.19$, $p = .01$, $\eta^2 = 0.07$, and the

means revealed that under mild rejection conditions, multiple-choice scores increased more under *asynchronous* compared to FTF and synchronous. In contrast, under acceptance conditions, achievement decreased more under asynchronous compared to FTF or synchronous. Contrary to predictions, findings suggest that initial belongingness neither buffers or has additive effects on asynchronous CMC. Instead, under asynchronous CMC, mild rejection had positive effects on multiple-choice scores and acceptance had negative effects.

For critical thinking in the final joint essay, MANOVA results showed a significant multivariate omnibus for synchronicity, Wilks's $\lambda = .77$, $F(6, 152) = 3.54$, $p < .01$, $\eta^2 = 0.12$, and the between-subjects tests were significant for evidence, $F(2, 78) = 3.72$, $p = .02$, $\eta^2 = 0.08$, and integrative statements, $F(2, 78) = 4.23$, $p = .01$, $\eta^2 = 0.09$. For evidence, post hoc results showed that synchronous was greater than FTF, $p = .03$, and for integrative statements, post hoc results showed that FTF was greater than asynchronous, $p = .01$. Results indicate that more evidence was used in the final joint essay under synchronous compared to FTF. Results also indicate that more integrative statements in the final joint essay were produced under FTF compared to asynchronous.

Perceptions of Technology

Technology acceptance. For technology acceptance, ANOVA results showed significant main effects for synchronicity, $F(1,102) = 8.31$, $p < .01$, $\eta^2 = 0.07$), favoring synchronous over asynchronous CMC (see Figure 4).

Task-technology fit. For task-technology fit, ANOVA results showed significant main effects for initial belongingness, $F(2,83) = 3.11$, $p = .05$, $\eta^2 = 0.07$, and post hoc test revealed significant differences favoring acceptance over control ($p = .05$).

Discussion

This study tested four different theory's accounts of how CMC moderates constructive controversy outcomes, examining whether synchronicity and initial belongingness moderate the effects of constructive controversy on social interdependence, conflict regulation, motivation, achievement, and perceptions of technology. Each outcome is discussed in turn but, first, it is necessary to discuss how much time students spent on the constructive controversy procedure.

Time

The first goal of the analysis was to examine whether time accounted for any differences. Results showed that asynchronous CMC students reported spending more time on the procedure than FTF and synchronous students, and that only synchronous CMC students would have preferred spending more time on constructive controversy. These results contradict what might be expected from the social information processing theory of CMC, as this study's outcomes generally declined under asynchronous CMC *despite the fact* that students reported spending more time than other conditions. These results are also inconsistent with educational researchers who attribute achievement gains in asynchronous CMC to the increased time for processing and review compared to FTF (see e.g., Benbunan-Fich et al., 2003; Hara, Bonk, & Angeli, 2000; Johnson, Howell, & Code, 2005; Nussbaum et al., 2007; Zion et al., 2005). The additional finding that asynchronous CMC students did not want to spend more time on constructive controversy suggests that other variables – e.g., social, social-cognitive, motivational – besides time may be needed to explain how CMC affects the procedure's outcomes.

Social Interdependence

Three different forms of social interdependence were measured: cooperative, competitive, and individualistic perceptions. Correlational results showed that cooperative

perceptions were strongly associated with increased epistemic regulation, post-controversy belongingness, and interest-value, while individualistic perceptions were strongly associated with decreases in these same measures. These findings support social interdependence theory's (Deutsch, 1949, 1973; Johnson & Johnson, 1989, 2005) account of the way cooperative perceptions lead to positive outcomes, including increased motivation and more positive attitudes toward the activity and those individuals who promote one's success. Interestingly, a small, positive correlation was also found between competitive perceptions and interest-value, while a negative correlation was found between competitive perceptions and post-controversy belongingness. It may be that students associated arguing conflicting points of view with competition which, in the cooperative context of working toward a joint final consensus statement, resulted in enhanced interest-value (cf. Tichy, Johnson, Johnson, & Roseth, 2010). This view is consistent with the idea of constructive competition, or creating the conditions (e.g., cooperative superordinate goals) in which competition enhances motivational outcomes (Johnson & Johnson, 1978, 1999; Johnson, Johnson, & Roseth, under review; Stanne, Johnson, & Johnson, 1999). This same 'halo-effect' of embedding competition in a cooperative context did not extend to post-controversy belongingness, however, supporting conflict elaboration theory's view that belongingness needs may particularly vulnerable to competition's social comparison processes.

For synchronicity, results indicated that students' cooperative perceptions were higher in FTF compared to asynchronous CMC, while competitive perceptions were higher in asynchronous CMC compared to FTF. Also, students' individualistic perceptions were higher in asynchronous CMC than both FTF and synchronous. These findings are consistent with Roseth et al. (2011) and support media richness views that greater media richness (e.g., FTF,

synchronous CMC) is more conducive to positive social relations (e.g., Baltes et al., 2002; Gunawardena, 1995; Short, Williams, and Christie, 1976), in this case increasing cooperative perceptions and, as a result, enhancing promotive interaction, goal achievement, social relationships, and motivation. Likewise, less media richness (e.g., asynchronous CMC) is less conducive to social relations, in this case increasing both competitive and individualistic perceptions and, as a result, increasing oppositional interaction, obstructing goal achievement, and decreasing interpersonal attraction and motivation.

For initial belongingness, results indicated that cooperative perceptions increased under acceptance compared to the control condition. These findings support belongingness theories (i.e., belongingness theory: Baumeister & Leary, 1995; self-determination theory: Deci & Ryan, 2000) and the idea that satisfying belongingness needs is a prerequisite condition for positive social relations. Unexpectedly, cooperative perceptions did not differ significantly between initial mild rejection and acceptance conditions. While it would be a mistake to over-interpret a null finding, this result parallels others in the study suggesting that mild rejection was *not* deleterious under all conditions (see e.g., conflict regulation, interest-value, and multiple choice achievement below).

Conflict Regulation

Two forms of conflict regulation were assessed: relational and epistemic. For synchronicity, results indicated that relational regulation increased under asynchronous CMC compared to FTF, and epistemic regulation increased under FTF compared to asynchronous. Again, findings support media richness views that greater media richness (e.g., FTF) is more conducive to positive social relations, in this case increasing epistemic regulation and decreasing relational regulation. Likewise, less media richness (e.g., asynchronous CMC) is less conducive

to social relations, in this case increasing relational regulation and decreasing epistemic regulation. In conjunction with the social interdependence finding discussed above, the conflict regulation results provide additional specificity about the way CMC affects social relations. That is, rather than CMC theories pointing to unspecified increases in ambiguity for less rich media, this study's results suggest that changes in social interdependence (i.e., cooperative, competitive, and individualistic perceptions) and, as a result, conflict regulation (i.e., epistemic and relational regulation) may be the mechanisms by which CMC affects social relations.

For initial belongingness, results indicated that epistemic regulation increased in acceptance over control conditions. Again, this finding supports belongingness theories, suggesting that belongingness satisfaction has an additive affect on adaptive cognitive functioning (i.e., epistemic regulation). This finding also adds specificity to belongingness theories, suggesting that increased cooperative perceptions and, in turn, epistemic regulation may be the mechanisms by which satisfying belongingness needs leads to increased achievement and motivation. Unexpectedly, relational and epistemic regulation did not differ significantly between initial mild rejection and acceptance conditions. While again recognizing the limitations of a null finding, this represents the second indication that mild rejection was not deleterious under all conditions.

Motivation

Motivation was assessed in two ways: post-controversy belongingness and interest-value. For synchronicity, results indicated that post-controversy belongingness and interest-value were greater under FTF and synchronous CMC compared to asynchronous. Results are consistent with Roseth et al.'s (2011) findings that belongingness, interest, and value were all higher in FTF compared to asynchronous CMC. Results also support the view that motivation in constructive

controversy depends on FTF and synchronous CMC, and that post-controversy belongingness and interest-value may be particularly enhanced by FTF interaction. Results also support social interdependence theory in that motivational increases resulted from increasing cooperative perceptions under FTF and synchronous CMC, and motivational decreases resulted from increases in individualistic perceptions in asynchronous CMC.

These findings also provide partial support for media richness views that greater media richness (e.g., synchronous CMC) facilitates relational formation by, for example, providing immediate ability to clarify meaning. It is important to note that similarly to Roseth et al.'s (2011) findings, post-controversy belongingness was greater in synchronous over asynchronous CMC despite the fact that, in this study, communication was confined to text-based interaction only. This suggests that media richness views may need to be modified to indicate that synchronicity rather than the presence (or absence) of nonverbal social cues (e.g., vocal inflection, facial and emotional expressions, hand gestures, physical appearance) is the mechanism by which CMC affects social relations. Following the social information processing theory of CMC (Walther, 1992), it may be that communicators adapt to the absence of non-verbal cues, and that this explains why no differences emerge between FTF and text-based synchronous CMC. However, adapting to asynchronous CMC may be more difficult, not only requiring additional time but also particular social, social-cognitive, and motivational conditions to rival social relations under FTF and synchronous conditions. This study adds to the CMC literature by suggesting that positive interdependence (i.e., cooperative perceptions), epistemic regulation, and satisfying initial belongingness conditions all contribute to CMC's effects.

For initial belongingness, results indicated that post-controversy belongingness was greater under acceptance over control and mild rejection, and that interest-value was greater

under acceptance over control. Again, these findings support belongingness theories and the idea that satisfying belongingness needs is a prerequisite condition for positive social relations. Unexpectedly, interest-value did not differ significantly between initial mild rejection and acceptance conditions. This represents the third indication, all limited as null findings, that mild rejection was not deleterious under all conditions.

Achievement

Achievement was measured in terms of completion rate, multiple choice scores, and the final joint essay. For synchronicity, completion rates were significantly greater under FTF and synchronous CMC, with 100% of FTF and synchronous CMC students completing constructive controversy compared with only 59.7% of asynchronous CMC students. This is consistent with Roseth et al. (2011) who found that 63.8% of students in asynchronous CMC finished the procedure. This is also consistent with research reporting attrition rates ranging from 20-50% for online courses (e.g., Frankola, 2001; Patterson & McFadden, 2009), which is approximately 10-20% higher than attrition rates in comparable FTF courses (see e.g., Carr, 2000, Tyler-Smith, 2006, Xu & Jaggers, 2011).

For those students who completed the constructive controversy, there was a small (η^2 = 0.07) but statistically significant interaction between synchronicity and initial belongingness on students' multiple-choice scores. Unexpectedly, under the initial mild rejection condition, multiple-choice scores *increased* more under asynchronous compared to FTF and synchronous conditions. In contrast, under the initial acceptance condition, achievement *decreased* more under asynchronous compared to FTF or synchronous conditions. These findings were exactly opposite of the expected additive effects of initial belongingness on synchronous CMC, and the expected buffering effects of initial belongingness on asynchronous CMC. For mild rejection,

this statistically significant finding also parallels the three previous nulls showing no difference between mild rejection and acceptance conditions (see cooperative perceptions, conflict regulation, and interest-value above).

One explanation of these seemingly contradictory findings is that asynchronous CMC amplifies mild rejection to the extent that students employ "compensatory actions" to amend belongingness needs (see e.g., Deci & Ryan, 2000; Leary 1999; Jamison, Harkins, & Williams, 2010), perhaps compensating for belongingness by focusing achievement efforts (i.e., multiple choice scores) and, noting the previously mentioned null findings, also promoting cooperative perceptions, epistemic regulation over relational regulation, and enhancing interest-value. In contrast, under initial acceptance conditions, asynchronous CMC may reduce initial acceptance enough to have maladaptive effects on achievement, but not enough to induce a compensatory response having adaptive effects on achievement or other constructive controversy variables. Supporting this interpretation, social psychological research finds that individuals exhibit adaptive behaviors to reduce a rejecting partners' negative evaluation when given explicit control and tangible opportunities to do so (see e.g., Romero-Canyas et al., 2010; Sleebos, Ellemers, & de Gilder, 2006; Warburton, Williams, & Cairns, 2006; Williams & Sommer, 1997). Thus, for asynchronous CMC, perhaps spacing constructive controversy over multiple days affords more tangible opportunities (e.g., multiple written responses) and more explicit control (e.g., choice of when and how to respond to their partner on the website) over compensating for mild rejection. In contrast, the pace of FTF and synchronous CMC versions of constructive controversy may constrain students' tangible opportunities to compensate for initial mild rejection, resulting in decreased achievement and other maladaptive responses to unsatisfied belongingness (see also Twenge, et al., 2001; Leary, Twenge, & Quinlivan, 2006). While this study's results support the

idea that asynchronous CMC amplifies mild rejection and post-controversy belongingness, future research is needed to clarify whether declining belongingness represents a threshold variable triggering maladaptive responses at one level and adaptive compensatory responses at another.

A second explanation of initial mild rejection's apparently benign or, in the case of multiple choice scores under asynchronous CMC, positive effects is that the constructive controversy procedure itself buffers outcomes. Following social interdependence theory, when individuals perceive that they can reach their goals if and only if the other individuals with whom they are cooperatively linked also reach their goals, they tend to seek outcomes that are beneficial to all those with whom they are cooperatively linked. Motivation and goal achievement increase as responsibility forces resulting from cooperative perceptions impel each individual to interact in ways that promote each other's success, and successful goal attainment in turn leads to more positive attitudes toward the activity and those individuals who promoted one's success. In short, the cooperative processes underlying constructive controversy may ameliorate the effects of initial mild rejection.

Two additional points must be made about the effects of mild rejection. First, the two explanations (i.e., a compensatory response and constructive controversy itself) are not incompatible, and it may be that compensatory responses enhance the buffering effects of constructive controversy. Second, while results suggest that multiple-choice scores may increase more under mild rejection than acceptance in asynchronous CMC contexts, this should not be interpreted as endorsing rejection as a way of increasing achievement under asynchronous CMC conditions. For one, the deleterious outcomes of long-term social exclusion and loneliness are well documented (see e.g., Capcioppo, Fowler, Christakis, 2009; Hawkley & Cacioppo, 2010) and other research on mild-rejection in synchronous CMC (e.g., Cyberball, Williams, Cheung, &

Choi, 2000) have found evidence of extremely adverse reactions by participants. Moreover, the positive effect found in this study was small in magnitude and must be interpreted in the context of the study's more compelling results favoring FTF and synchronous CMC over asynchronous for almost all variables. Thus, while mild rejection may result in short-term, compensatory increases in achievement, it remains unclear if these gains are meaningful, lead to long-term gains, or outweigh the negative effects of mild rejection and asynchronous CMC on other constructive controversy outcomes.

Finally, for critical thinking on the final joint essay, FTF students utilized less evidence than synchronous CMC and more integrative statements than asynchronous CMC. This is inconsistent with Roseth et al.'s (2011) finding a marginal effect favoring asynchronous CMC over synchronous for the knowledge rating score on the final joint essay. One explanation is that Roseth et al.'s (2011) knowledge scale may be more congruent with the current study's operationalization of pieces of evidence used on the joint essay. Importantly, and in contrast to previous studies, this study analyzed "pieces of evidence" as a separate coding category to capture parts of the joint essay that were likely copied directly from the provided bullet sheets – something that would be much easier to do in CMC over FTF conditions given easy access to text-based summaries of their opening arguments within the online constructive controversy scaffold. Thus, by differentiating integrative statements from the use of evidence, this study provides a more multidimensional view of students' critical thinking in CMC contexts.

For integrative statements, results are also inconsistent with research reporting higher levels of critical thinking in asynchronous CMC compared to FTF (e.g., Benbunan-Fich et al., 2003; Kuhn, Goh, Iordanou, & Shaenfield, 2008; Nussbaum, Windsor, Aqui, & Poliquin, 2007; Zion et al., 2005). As noted previously, these studies often cite extended "think time" as an

important affordance of asynchronous CMC that increases achievement. Yet, in this study, while asynchronous CMC students reported spending more time than both FTF and synchronous CMC students on constructive controversy, they also performed worse on integrative statements for their joint essay. One explanation is that by promoting cooperative perceptions, FTF and synchronous CMC also facilitate perspective taking and, by promoting competitive perceptions, asynchronous CMC increases rigid adherence to one's own argument. Thus FTF and synchronous CMC may, in turn, promote the development of integrative statements that require a balance of arguments from both sides of a controversial issue. This view is supported by research finding that FTF interaction increases empathy (Schulte-Rüther, Markowitsch, Fink, & Piefke, 2011) while asynchronous CMC increases egocentrism (Kruger, Epley, Parker, & Ng, 2005) and decreased information sharing (Baltes et al. 2002).

Finding that integrative statements decreased under asynchronous CMC also supports social interdependence theory account of the way increased cooperative perceptions under FTF and synchronous CMC conditions led to increased achievement, while increased competitive and individualistic perceptions under asynchronous CMC led to decreased achievement. Thus, in constructive controversy, it may be that the positive effect of cooperative perceptions outweigh the affordance of time in asynchronous CMC.

Perceptions of Technology

Perceptions of technology were assessed in two ways: technology acceptance and task-technology fit. Correlational results showed that both technology acceptance and task-technology fit were highly positively correlated with both motivation measures (i.e., post-controversy belongingness and interest-value). For synchronicity, results indicated that technology acceptance was greater for synchronous over asynchronous CMC. Findings support the

Technology Acceptance Model (Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003), which posits that users' perceptions of the usefulness and ease of use of technology leads to increased motivation to use technology which, in turn, produces increased task performance (e.g., achievement). Thus, findings suggest that users were more accepting of the CMC technologies used for synchronous over asynchronous conditions, which provides a potentially alternate explanation for positive achievement and motivational increases under synchronous CMC conditions. For example, communications researchers suggest that users' perceptions of technology is the most important factor in determining social presence (Gunawardena, 1995), motivation (Shroff, Vogel, & Coombes, 2008), and self-efficacy (Wang & Newlin, 2002). In contrast, it may be that, per social interdependence theory, increasing cooperative perceptions influence goal achievement which, in turn, promotes positive feelings toward the activity itself, others involved in the activity, and the technology used during the activity.

For initial belongingness, results indicated that task-technology fit was greater for acceptance over mild rejection and mild rejection over control. This finding supports belongingness theories and the idea that satisfying belongingness needs is a prerequisite condition for intrinsic motivation or, in this case, interest in and enjoyment of technology itself.

Interestingly, there was no difference between synchronous and asynchronous CMC with regard to task-technology fit. These findings do not support research on task-technology fit (cf., Media Synchronicity Theory: Maruping & Agarwal, 2004), which posits that correspondence (i.e., fit) between information systems functionality (i.e., synchronicity) and task requirements leads to positive user perceptions (cf., motivation) and increased task performance (Goodhue, 1998; Goodhue & Thompson, 1995; Larsen, Sørebø, & Sørebø, 2009). According to this view, either synchronous CMC or asynchronous CMC should fit better with the task demands of

constructive controversy, but this result was not found in the current study. One explanation for this is that there may be different task demands required over the course of the 5-step constructive controversy procedure. Specifically, it has been found that lower communication synchronicity (e.g., asynchronous communication channels such as email) fit better with conveyance tasks (simple dissemination of information; Burke & Chidambaram, 1999), while high synchronicity (e.g., face-to-face discussions or synchronous CMC interactions) fits better on convergence tasks (development of shared meaning; Murthy & Kerr, 2003). In adapting constructive controversy for online settings, it may be that the procedure's step should be differentiated as conveyance and convergence tasks and that different levels of synchronicity should be used to fit with tasks' different interpersonal demands. For example, steps 1 and 2 of the controversy activity (akin to conveyance tasks) may fit better with asynchronous communication while steps 3 through 5 (akin to convergence tasks) with face-to-face or synchronous CMC. Thus, it may be the case that varying synchronicity to better fit the task demands of constructive controversy may ameliorate the achievement and motivational antecedents of student attrition. Further, fitting various educational and interpersonal task demands with communication synchronicity may maximize the positive affects of the hybrid educational model. Future research is necessary to further substantiate whether varying synchronicity to match task demands of online constructive controversy ameliorates achievement deficits of asynchronous CMC and whether this generalizes to other cooperative learning tasks.

Finally, considering the high correlation between outcomes of perceptions of technology and motivation, their congruent relationships to synchronicity and preconditions of belongingness, and the low amount of variance explained by the perceptions of technology alone, it may be that both scales are measuring the same phenomenon. Further research is needed

to determine whether or not measures of perceptions of technology capture users feelings toward an activity beyond that which is captured by the intrinsic motivation scale.

Limitations

This study's results are limited by the characteristics of the sample, type of task, the role of time, and specific operationalizations of the dependent variables. Specifically, it remains unclear whether the preponderance of women (73%) in the sample limits the generalizability of findings. Many researchers argue that social role expectations orient men toward agency and women toward cooperation (see e.g., Eagly & Carli, 1981; Tannen, 1990), and consequently women may be especially sensitive to CMC contexts that constrain relationship formation (for review, see Prinsen, Volman, & Tewel, 2007). Specifically, women may be more sensitive to decreased cooperative and increased individualistic perceptions associated with asynchronous CMC constructive controversy, which would then lead to and additive effect of even further decreased belongingness outcomes for women. Only preliminary evidence supports this view, however, with two studies (i.e., Dennis, Kinney, & Hung, 1999; Guadagno & Cialdini, 2002) demonstrating that for women but not men, synchronous text-based CMC (i.e., chat and e-mail) led to decreased performance and less agreement compared with FTF interaction. Future research is needed to determine the extent to which this study's results may be conditioned by the differential impact of FTF and CMC versions of constructive controversy on male and female participants.

Another possible limitation of this study is whether the outcomes of constructive controversy generalize to other cooperative learning procedures. It may be that the experience of arguing conflicting points of view, as is the case in constructive controversy, is particularly sensitive to the constraints of asynchronous CMC and explains decreases in cooperative

perceptions, motivation, and achievement. On the other hand, other cooperative procedures that do not require conflicting points of view may not be as sensitive to asynchronous CMC and produce more positive outcomes. Thus, future research should test asynchronous CMC versions of cooperative learning procedures that do not involve arguing conflicting points of view. For example, jigsaw (see Johnson, Johnson, & Holubec, 1998) is a cooperative learning procedure that involves creating social interdependence without necessitating conflicting points of view.

The role of time in constructive controversy must also be further specified in future research. Results from this study suggest that time-on-task may not explain positive outcomes of constructive controversy as students in the asynchronous condition reported spending more time on constructive controversy but still performed worse than students in FTF and synchronous CMC conditions. Future research should examine whether the frequency (e.g., 5 steps over 6 days) and chronicity (time between) of each step are distinctive factors in explaining why CMC synchronicity moderates constructive controversy's outcomes. For example, asynchronous CMC may be less deleterious if the frequency of steps were increased (e.g., from 5 steps over 6 days to 5 steps over 3 days) and chronicity decreased (e.g., time between steps reduced from 24 to 12 hours). This view is supported by work showing that time in CMC also increases goal decay (Monk, et al., 2008) and interactional incoherence (Herring, 1999), and that users naturally prefer short response latencies regardless of communication medium (Kalman, Ravid, Raban, & Rafaeli, 2006). Questions of frequency and chronicity highlight boundary (or threshold) issues between synchronous and asynchronous interaction and future research is needed to determine at what point the affordances of one give way to the constraints of the other.

Finally, the reliability of the multiple-choice achievement outcome was also problematic ($\alpha = 0.41$) and the lack of intercorrelation between multiple choice scores and joint essay scores

also raises questions of congruence between the multiple-choice and critical thinking metrics.

Implications for Theory

Despite these limitations, this study contributes to the literature in several important ways. First, this study's findings have strong internal validity, as the use of random assignment, an experimental-control design, and video-taped instructions all served to strengthen confidence that differences between conditions were due to the independent variables. Second, by systematically comparing the effects of synchronicity and belongingness with a FTF version of a theoretically grounded and empirically verified instructional procedure (i.e., constructive controversy), this study avoids unnecessary reinvention of instructional procedure and instead builds on solid psychological and educational foundations. Third, guided by four theoretical accounts (i.e., CMC theories, social interdependence theory, conflict elaboration theory, and belongingness theories), this study adds much needed specification of the mechanisms by which CMC affects constructive controversy outcomes.

For theory, this study suggests that multiple theoretical perspectives may need to be integrated to fully specify the mechanisms by which CMC affects constructive controversy. First, results indicate that the belongingness satisfaction is a prerequisite condition for constructive controversy. Thus, social interdependence theory should be modified to include belongingness as a prerequisite condition moderating the effects of positive interdependence and cooperative perceptions. Likewise, conflict elaboration theory should be modified to include belongingness as a prerequisite condition indirectly affecting epistemic and relational regulation.

Second, this study's results suggest that conflict elaboration theory more precisely specifies social interdependence theory's account of how arguing conflicting points of view in cooperative conditions produces positive outcomes. Specifically, under cooperative conditions,

relational regulation (i.e., regulating uncertainty about one's competence compared to the other person) decreases and epistemic regulation (i.e., regulating uncertainty about the correct response) increases leading to increased achievement and motivation. In contrast, under competitive conditions, relational uncertainty increases and epistemic regulation decreases leading to decreased achievement and motivation. In short, it may be that adaptive cognitive reactions and epistemic regulation more precisely explain how perceptions of social interdependence lead to differential outcomes.

Third, this study's results suggest that media richness views of how CMC affects constructive controversy is more precisely specified by both social interdependence theory and conflict elaboration theory. Specifically, social interdependence theory suggests that cooperative perceptions are the mechanism by which CMC affects outcomes, and conflict elaboration theory suggests that cognitive reactions to the experience of arguing conflicting points of view also contributes to CMC's effects.

Implications for Practice

Practical implications of this study emphasize the role of belongingness in ameliorating the deleterious effects of asynchronous CMC. First, at the partner assignment stage, results suggest that developing belongingness between students is an important precondition for promoting cooperative perceptions, which leads to increased achievement and motivation outcomes. This is especially true in asynchronous contexts as preconditions of belongingness may ameliorate (buffer) the deleterious effects of asynchronous CMC on motivation and cooperative perceptions.

Second, during deliberate discourse, results suggest that instructors should monitor for students' cooperative perceptions and relational and epistemic regulation as these are likely the

mechanisms by which asynchronous CMC moderates outcomes. For example, during deliberate discourse instructors may introduce a brief classroom assessment technique (e.g., short questionnaire) to evaluate whether students are engaging in relational over epistemic regulation. If this is the case, instructors may be able to interject with probing questions or reminders (e.g., "remember, the goal of this activity is to develop the best joint essay which includes the best arguments from both sides of the controversy and for both of you to succeed on the post-activity quiz") aimed at increasing cooperative perceptions which, in turn, will enhance epistemic uncertainty and promote achievement and motivation.

In addition, at the deliberate discourse stage and as discussed previously, varying synchronicity (synchronous and asynchronous CMC) to match the different task demands of constructive controversy may maximize the affordances and minimize the constraints of each respective communication method. Accordingly, instructors should consider using asynchronous CMC for steps 1-2 and synchronous CMC for steps 3-5 of the constructive controversy procedure. This is supported by research that hybrid education, which naturally involves varying synchronicity, may ameliorate retention problems associated with asynchronous-only online education (see e.g., Jaggers & Xu, 2010; Xu & Jagger, 2011).

Fourth, at the post activity stage, social interdependence theory's account of the benign spiral suggests that good feelings brought about by goal achievement will positively influence more promotive interaction on subsequent group activities. Thus, instructors should consider increasing the salience of goal achievement by celebrating achievement and interpersonal processing gains by students in order to maximize benign spiral effects on future learning activities.

Table 1

Constructive Controversy Five Steps

Step	Deliberate Discourse				Shared Goal
	1	2	3	4	5
Position	Same		Opposite		None
Dyad #1	① = ③	① ≠ ②	① ≠ ②	② ≠ ①	① = ②
#2	② = ④	③ ≠ ④	③ ≠ ④	④ ≠ ③	③ = ④
Task	Prepare	Opening Argument	Discussion	Reverse Positions	Integrative Agreement

Table 2

Materials Used to Facilitate Both Asynchronous and Synchronous Communication

Synchronicity	All Belongingness Conditions	Duration
FTF	-Video Instructions [a] -Review Sheet [b]	70 min
Synchronous	-Google Docs™ Scaffold [c] -Video Instructions -Review Sheet	70 min
Asynchronous	-Custom WordPress™ Online Web Application [d] -Video Instructions -Review Sheet	6 days

[a] Video instructions for the five steps of the controversy procedure were recorded and presented in identical form to each group in the study. [b] A bullet sheet was given to each participant pertaining to the main points of their respective position in the controversy. [c] The Google Docs™ editable online platform was used to scaffold the activity and facilitate the collaborative completion of the activity by dyads (See Appendix A). [d] The custom WordPress™ web application was used to facilitate asynchronous communication and posting by dyads.

Table 3

Demographics and Descriptive Statistics

	F-to-F			Sync			Async		
	Acceptance	Mild-rejection	Control	Acceptance	Mild-rejection	Control	Acceptance	Mild-rejection	Control
Eligible *n* (*n* enrolled)	24(22)	24(21)	24(19)	24(24)	24(21)	22(19)	40(32)	40(32)	38(28)
Analyzed *n* (*n* female)	22(14)	20(16)	19(13)	22(19)	21(14)	17(14)	18(13)	16(10)	16(12)
Social interdependence									
Cooperative	42.4(7.5)	39.1(7.6)	34.5(9.6)	40.0(9.0)	34.0(7.4)	34.3(9.5)	34.1(10.5)	35.1(8.6)	29.9(7.9)
Competitive	20.8(10.0)	20.0(9.2)	18.0(8.8)	26.3(11.6)	23.8(8.9)	19.2(9.0)	26.2(12.3)	28.6 (9.6)	24.9 (6.3)
Individualistic	15.2(7.0)	16.3(7.7)	13.7(5.6)	16.0(7.9)	17.8(4.9)	17.9(9.3)	19.8(8.1)	20.8(6.5)	24.0(9.7)
Conflict regulation									
Relational	11.4(4.3)	9.6(3.8)	9.8(3.2)	11.8(3.5)	12.1(4.2)	10.1(4.5)	12.8(3.6)	12.7(3.7)	12.2(9.2)
Epistemic	17.0(2.7)	15.2(3.9)	15.0(3.4)	15.8(3.5)	13.6(3.5)	13.2(4.4)	14.6(2.9)	14.7(4.1)	13.8(3.1)
Motivation									
Belongingness[a]	74.9(11.7)	71.3(12.9)	68.2(9.3)	72.9(16.0)	58.1(15.0)	66.8(16.9)	58.8(9.9)	54.6(11.5)	51.5(13.9)
Interest-value[b]	69.0(16.8)	62.3(21.4)	56.5(17.8)	68.5(18.9)	60.1(12.1)	59.8(19.1)	55.7(17.4)	59.2(15.1)	49.8(12.5)
Achievement									
Multiple-choice	2.7(0.9)	2.3(0.9)	2.2(1.1)	2.3(1.2)	2.1(1.0)	2.7(0.9)	2.3(1.0)	2.8(0.9)	1.5(1.0)

Table 3 (cont'd)

Critical Thinking									
Arguments	7.3(2.0)	6.9(2.9)	8.1(2.3)	5.3(2.8)	7.2(3.0)	4.5(2.7)	7.9(3.3)	6.8(2.8)	7.1(2.5)
Evidence	4.5(1.9)	3.6(1.5)	4.6(2.6)	7.0(2.1)	5.7(3.0)	6.0(2.6)	5.3(2.6)	5.0(3.1)	4.5(2.7)
Integrative	0.6(0.6)	1.1(0.7)	1.0(0.6)	0.8(0.6)	0.6(0.8)	0.6(0.8)	0.2(0.4)	0.5(0.7)	0.4(0.7)
Perceptions of Technology									
Tech acceptance[c]				33.5(8.2)	28.4(7.5)	30.0(7.9)	27.9(6.8)	26.3(8.1)	24.8(6.9)
Technology fit[d]				11.5(2.5)	9.6(2.4)	10.1(3.3)	11.1(1.9)	11.2(2.3)	8.9(3.2)

Note. F-to-F = face-to-face; Async = asynchronous; Sync = synchronous. [a]Belongingness is the result of adding the relatedness, belongingness, and interpersonal attraction scales together. [b]Interest-value is the result of adding both respective scales together. [c]ATT is attitudes toward technology. [d]TTF is task-technology fit.

Table 4

Intercorrelations Among Dependent Variables

	2	3	4	5	6	7	8	9	10	11	12	13
Social interdependence												
1. Cooperation	.30**	-.55**	.19*	.66**	.60**	.78**	.07	.05	.07	-.01	.79**	.60**
2. Competition	--	.12	.57**	.12	-.18*	.25**	-.00	-.02	.06	-.03	.24*	.27**
3. Individualism		--	.09	-.41**	-.62**	-.45**	.02	-.18	.03	-.07	-.60**	-.36**
Conflict Regulation												
4. Relational			--	.19**	-.21**	.14	-.10	-.17	.06	-.04	.17	.21**
5. Epistemic				--	.46**	.61**	.04	.20	.06	.07	.62**	.47**
Motivation												
6. Belongingness					--	.46**	.08	.17	.04	.04	.64**	.32**
7. Interest-Value						--	.08	.07	.03	.03	.77**	.57**
Achievement												
8. Multiple choice							--	-.07	.09	.09	.00	.21*
Critical thinking												

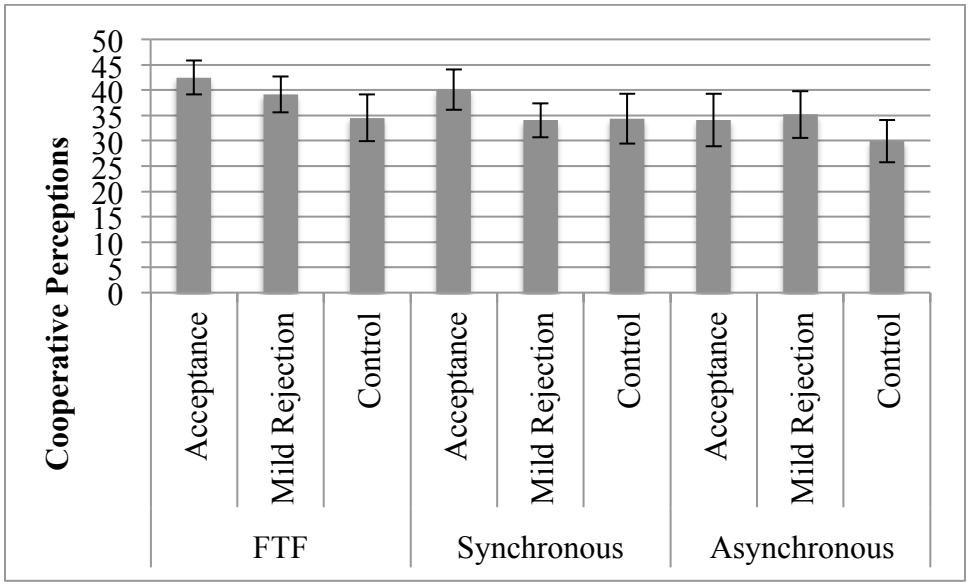
Table 4 (cont'd)

9. Arguments	--	.67**	.25*	.12	.06
10. Evidence		--	.21*	.06	.06
11. Integrative			--	.11	.15
Perceptions of technology					
12. Tech acceptance[a]				--	.68**
13. Tech fit[b]					--

* $p < .05$, ** $p < .01$. [a]Technology acceptance. [b]Task-technology fit

Figure 1

Social Interdependence Perceptions by Condition



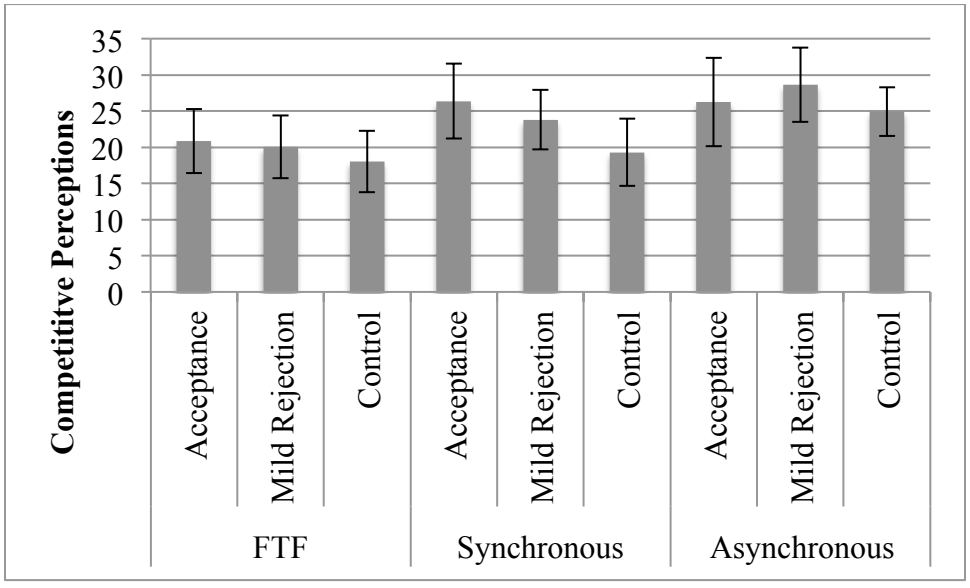


Figure 1 (cont'd)

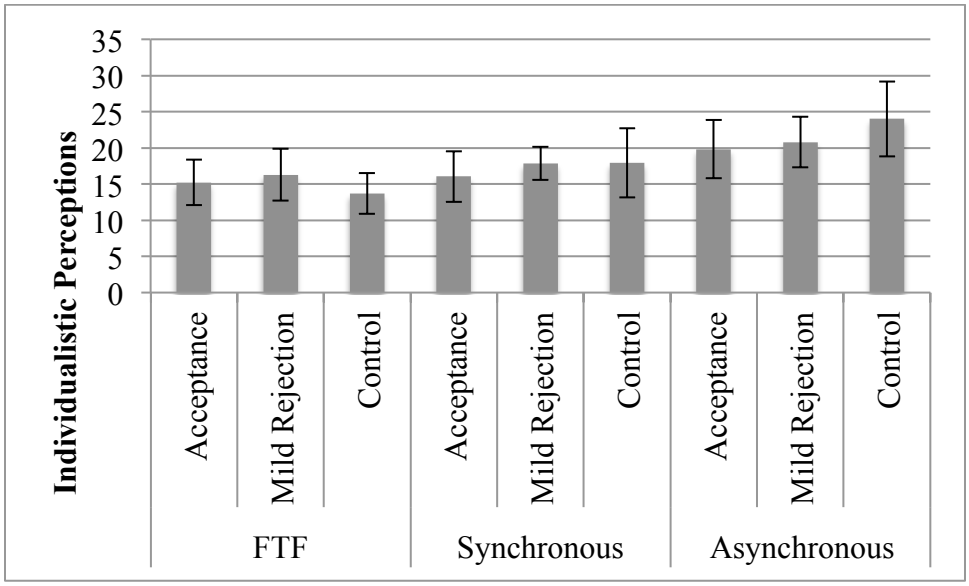
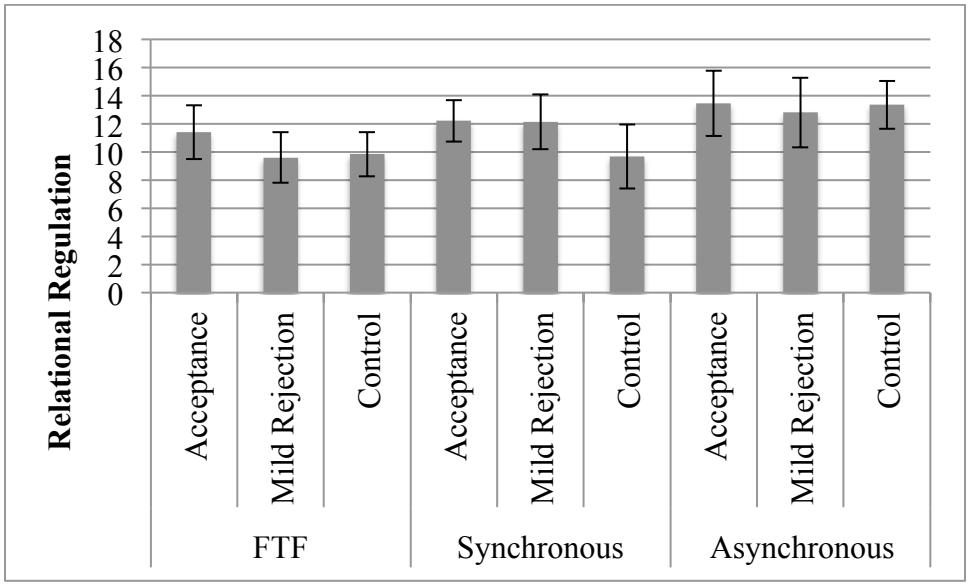


Figure 2

Conflict Regulation by Condition



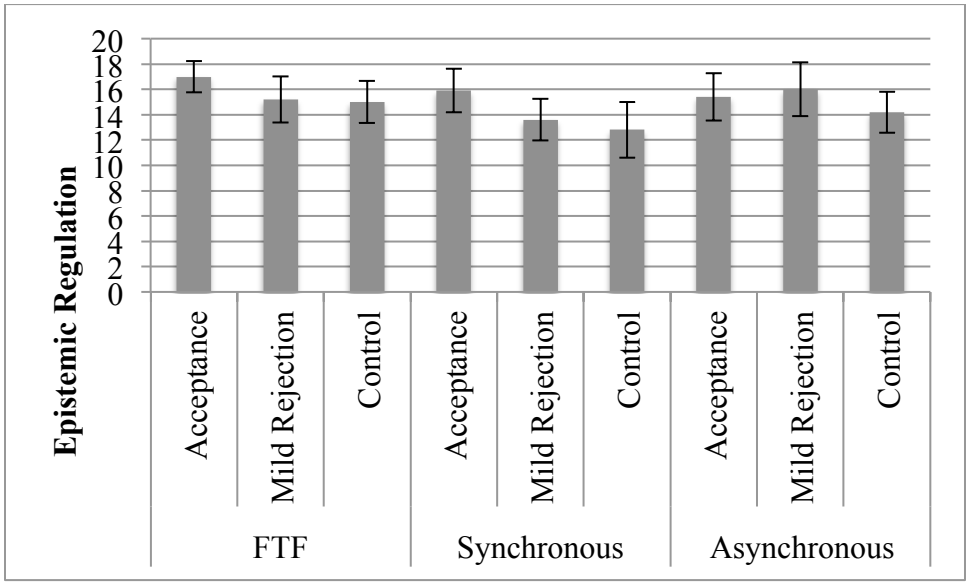
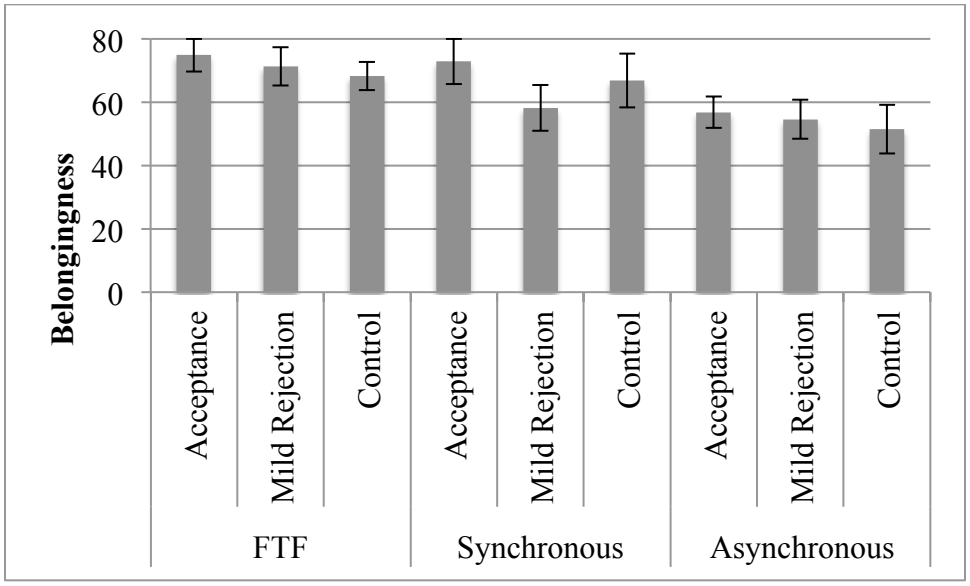


Figure 3

Motivation by Condition



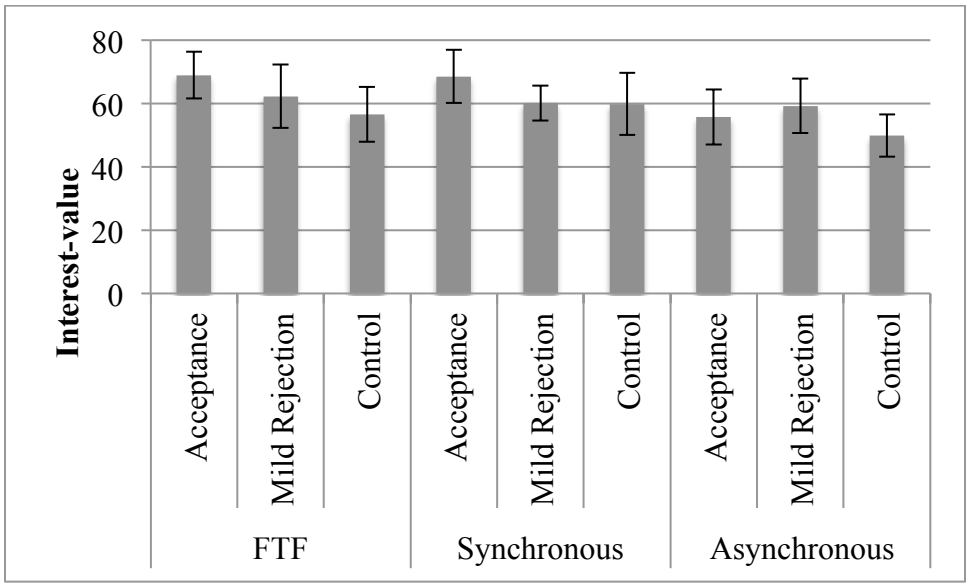
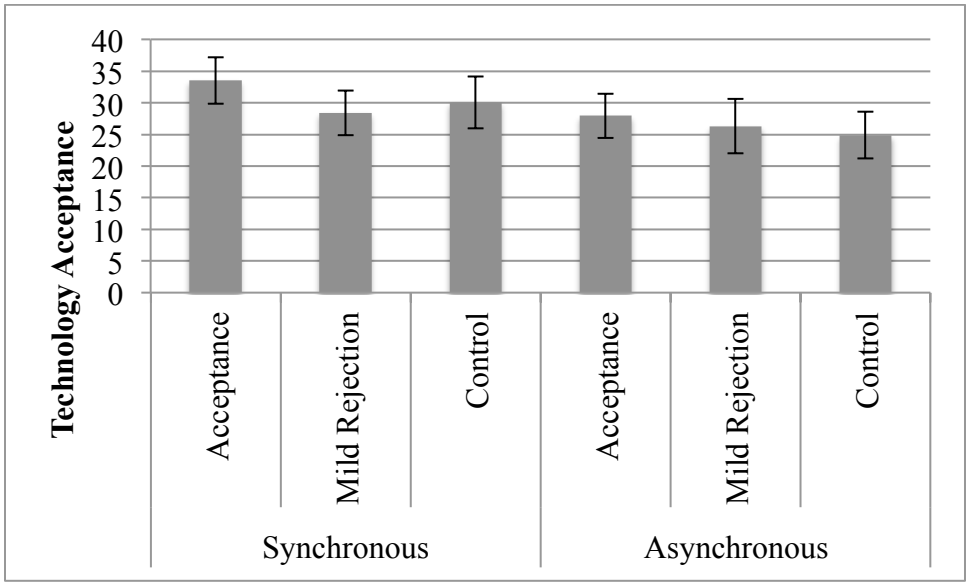
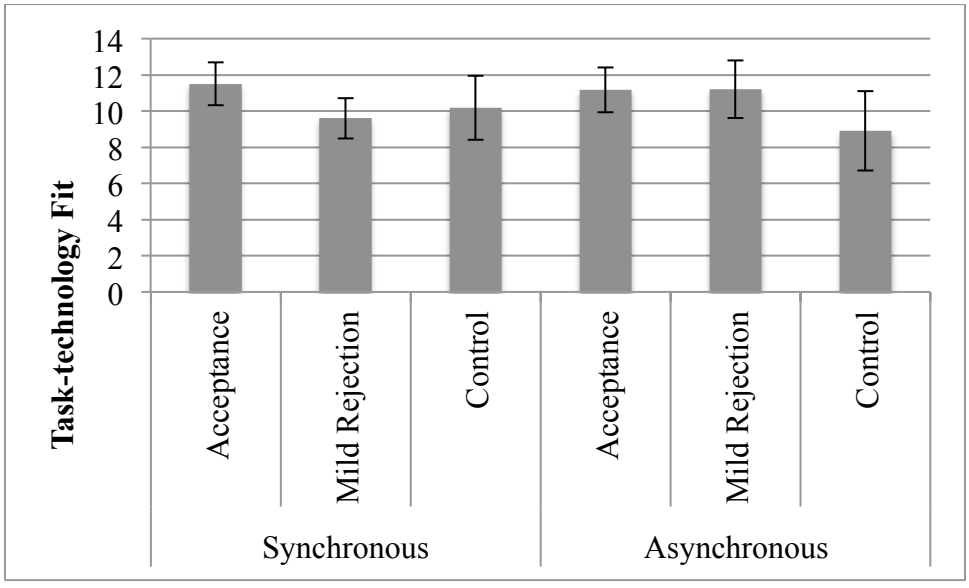


Figure 4

Perceptions of Technology by Condition





APPENDICES

APPENDIX A

Constructive Controversy Activity Scaffold - Synchronous

Controversy Topic: <u>Should Schools Decrease Class Size to Improve Student Outcomes?</u>

"Yes" Participant ID:

"No" Participant ID:

Step 5: Synthesis

In Step 5, the final step, you and your opposing partner will now drop all advocacy of your assigned positions, working together to find a mutually agreeable synthesis of the best and most valid arguments on both sides of the debate.

Your assignment is twofold. First, working together you will write a brief, 125- to 250-word statement that (a) summarizes the best and most valid arguments on both sides of the debate and (b) synthesizes these arguments into a consensus position that is more rational than the two originally assigned positions. Each of you will be asked to sign this statement, indicating that you agree with it and consider it ready to be evaluated.

Second, each of you will individually take a short quiz on both positions, followed by a short survey with questions about your experience.

Consensus Statement:

"**Yes**" Participant - I fully agree with this Consensus Statement:
"**No**" Participant - I fully agree with this Consensus Statement:

ALMOST FINISHED!
PLEASE CLICK THE LINK BELOW AND COMPLETE THE SURVEY
<u>Conclusion, Quiz, and Survey</u>

APPENDIX B

Critical Thinking Rubric (Adapted from Kuhn & Crowell, 2011)

Table B1
Critical Thinking Rubric

Definition	Parameters	Examples
Arguments	• Positive or negative attributes given for a given • Reason's why, an idea "in their own words" • Must have at least one premise and one conclusion	• "Disadvantaged students, as well as younger students both tend to benefit from a smaller class.
Pieces of Evidence	• Number of references to specific evidence on the provided bullet sheets	• "Small class sizes are good for students in younger grades (k-6) and for disadvantaged students"
Integrative Statements	• Includes points on both sides of the constructive controversy • Likely includes words such as although, despite, on the other hand, alternatively, or "yeah but" • There must be two arguments in every integrative statement	• "Although it does seem unfair the school is basing your salary on age [point against seniority pay], it's a clever way to keep good teachers for a longer time [point against seniority pay]."
Contingent Claims	• Claims that the outcome depends on certain conditions • Conjecture is not contingent as it is not based on facts of the matter, but a made up by the author	• "For small classrooms to be effective they have to be paired with quality teachers and good facilities."
Creative Solutions (cf. Nussbaum et al., 2007)	• Generation of novel, creative solutions that realize advantages while minimizing disadvantages	• "If we trained teachers to use better techniques and only cut class sizes in areas that would most benefit from smaller classes (e.g., learning disabled, urban), that would be a great compromise."

REFERENCES

REFERENCES

Abbeduto, L., & Symons, F. J. (2008). *Taking sides: Clashing views in educational psychology*. Boston, MA: McGraw-Hill Higher Education.

Baltes, B., Dickson, M., Sherman, M., Bauer, C., & LaGanke, J. (2002). Computer-mediated communication and group decision-making: A meta-analysis. *Organizational Behavior and Human Decision Processes, 87,* 156-179.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*, 497–497.

Baumeister, R. F., & DeWall, C. N. (2005). The inner dimension of social exclusion: Intelligent thought and self-regulation among rejected person. In K. D. Williams, J. P. Forgas, & W. von Hippel (Eds.), *The social outcast: Ostracism, social exclusion, rejection, and bullying* (pp. 53– 73). New York: Psychology Press.

Baumeister, R. F., Twenge, J., & Nuss, C. (2002). Effects of social exclusion on cognitive processes: Anticipated aloneness reduces intelligent thought. *Journal of Personality and Social Psychology, 83,* 817– 827.

Benbunan-Fich, R., Hiltz, S., & Turoff, M. (2003). A comparative content analysis of face-to-face vs. asynchronous group decision making. *Decision Support Systems, 34,* 457-469.

Burke, K., & Chidambaram, L. (1999). How much bandwidth is enough? A longitudinal examination of media characteristics and group outcomes. *MIS Quarterly, 23,* 557-579.

Butera, F., & Mugny, G. (2001). Conflicts and social influences in hypothesis testing. In C.K.W. De Dreu & N.K. De Vries (Eds.), *Group consensus and minority influence implications for innovation* (pp. 160-182). Oxford: Blackwell.

Carr, S. (2000, February 11). As distance education comes of age, the challenge is keeping the students. *The Chronicle of Higher Education*. Retrieved from http://chronicle.com/article/As-Distance-Education-Comes-of/14334

Cacioppo, J. T., Fowler, J. H., & Christakis, N. A. (2009). Alone in the crowd: The structure and spread of loneliness in a large social network. *Journal of Personality and Social Psychology*, *97*, 977.

Culnan, M. J., & Markus, M. L. (1987). Information technologies. In F. Jablin, L. L. Putnam, K. H. Roberts, & L. W. Porter (Eds.), *Handbook of organizational communication: An interdisciplinary perspective* (pp. 420-443). Newbury Park, CA: Sage.

Darnon, C., Buchs, C., & Butera, F. (2002). Epistemic and relational conflicts in sharing identical vs. complementary information during cooperative learning. *Swiss Journal of Psychology*, *61*(3), 139–151.

Darnon, C., Muller, D., Schrager, S. M., Pannuzzo, N., & Butera, F. (2006). Mastery and performance goals predict epistemic and relational conflict regulation. *Journal of Educational Psychology*, *98*(4), 766.

Deci, E. L., & Ryan, R. (2000). The what and why of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*, 227-268.

Dennis, A. R., Kinney, S. T., & Hung, Y-T. (1999). Gender differences in the effects of media richness. *Small Group Research, 30,* 405-437.

Doise, W., & Mugny, G. (1984). *The social development of the intellect*. Oxford, UK: Pergamon.

Deutsch, M. (1949). A theory of cooperation and competition. *Human Relations*, *2*, 129-152.

Deutsch, M. (1962). Cooperation and trust: Some theoretical notes. In M. R. Jones (Ed.), *Nebraska symposium on motivation* (pp. 275–319). Lincoln, NE: University of Nebraska Press.

Deutsch, M. (1973). *The resolution of conflict*. New Haven, CT: Yale University Press.

Deutsch, M. (1985). *Distributive justice: A social-psychological perspective*. Yale University Press NewHaven, CT: Yale University Press.

Dubrovsky, V., Kiesler, S., & Sethna, B. (1991). The equalization phenomenon: Sta- tus effects in computer mediated and face-to-face decision making groups. *Human-Computer Interaction*, 6, 119-146.

Eagly, A. H., & Carli, L. L. (1981). Sex of researchers and sex-typed communications as determinants of sex differences in influenceability: A meta-analysis of social influence studies. *Psychological Bulletin, 90,* 1-20.

Eysenck, H. J., & Eysenck, S. B. G. (1975). *Manual of the Eysenck Personality Questionnaire*. London: Hodder & Stoughton.

Frankola, K. (2001). Why online learners drop out. *Workforce*, *80*, 52–61.

Fuller, R. M., & Dennis, A. R. (2009). Does fit matter? The impact of task-technology fit and appropriation on team performance in repeated tasks. *Information Systems Research*, *20*, 2–17.

Goodhue, D. L. (1998). Development and measurement validity of a task-technology fit instrument for user evaluations of information system. *Decision Sciences*, *29*, 105–138.

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS Quarterly*, *19*(2), 213-236. doi:10.2307/249689

Gunawardena, C. N. (1995). Social presence theory and implications for interaction and collaborative learning in computer conferences. *International Journal of Educational Telecommunications, 1,* 147-166.

Guadagno, R. E., & Cialdini, R. B. (2002). Online persuasion: An examination of gender differences in computer-mediated interpersonal influence. *Group Dynamics: Theory, Research, and Practice, 6,* 38-51.

Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: a theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine*, *40,* 218-227. doi: 10.1007/s12160-010-9210-8

Herring, S. (1999). Interactional coherence in CMC. *Journal of Computer-Mediated Communication*, *4*, 1-28.

Jamieson, J. P., Harkins, S. G., & Williams, K. D. (2010). Need Threat Can Motivate Performance After Ostracism. *Personality and Social Psychology Bulletin*, *36*(5), 690. doi: 10.1177/0146167209358882

Johnson, G. M., Howell, A. J., & Code, J. R. (2005). Online discussion and college student learning: Toward a model of influence. *Technology, Pedagogy and Education*, *14*(1), 61-76.

Johnson, D. W., & Johnson, R. T. (1978). Social interdependence within instruction. *Journal of Research and Development in Education, 12(1),* 3-15.

Johnson, D. W., & Johnson, R.T. (1989). *Cooperation and competition: Theory and research.* Edina, MN: Interaction Book Company.

Johnson, D. W., & Johnson, R. T. (2005). New developments in social interdependence theory. *Psychology Monographs*, *131*(4), 285-358.

Johnson, D. W., & Johnson, R. T. (2007). *Creative controversy: Intellectual challenge in the classroom* (4th ed.). Edina, MN: Interaction Book Company.

Johnson, D. W, & Johnson, R. T. (2009). Energizing learning: The instructional power of conflict. *Educational Researcher*, *38*(1), 37.

Johnson, D. W., Johnson, R. T., & Holubec, E. J. (1998). Cooperation in the classroom: Edina, MN, Interaction Book Company.

Johnson, D. W., Johnson, R. T., & Roseth, C. J. (under review). Competition and performance: More facts, more understanding. *Psychological Bulletin.*

Johnson, D., Johnson, R., & Smith, K. (2007). The state of cooperative learning in postsecondary and professional settings. *Educational Psychology Review*, *19*, 15-29.

Stanne, M., Johnson, D. W., & Johnson, R. T. (1999). Social interdependence and motor performance: A meta-analysis. *Psychological Bulletin, 125(1),* 133-154.

Johnson, D. W., & Norem-Hebeisen, A. (1977). Attitudes toward interdependence among persons and psychological health. *Psychological Reports*, *40*(3), 843-850.

Juvonen, J. J. (2006). Sense of belonging, social bonds, and school functioning. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (pp. 655–674). Mahwah, NJ: Erlbaum.

Kalman, Y. M., Ravid, G., Raban, D. R., & Rafaeli, S. (2006). Pauses and response latencies: A chronemic analysis of asynchronous CMC. *Journal of Computer-Mediated Communication*, *12*, 1–23.

Kuhn, D., & Crowell, A. (2011). Dialogic Argumentation as a Vehicle for Developing Young Adolescents' Thinking. *Psychological Science*, *22*, 545 -552. doi:10.1177/0956797611402512

Kuhn, D., Goh, W., Iordanou, K., & Shaenfield, D. (2008). Arguing on the computer: A microgenetic study of developing argument skills in a computer‐supported environment. *Child Development*, *79*, 1310-1328. doi:10.1111/j.1467-8624.2008.01190.x

Kruger, J., Epley, N., Parker, J., & Ng, Z.-W. (2005). Egocentrism over e-mail: Can we communicate as well as we think? *Journal of Personality and Social Psychology*, *89*(6), 925-936.

Larsen, T. J., Sørebø, A. M., & Sørebø, Ø. (2009). The role of task-technology fit as users' motivation to continue information system use. *Computers in Human Behavior*, *25*(3), 778-784.

Leary, M. R. (1999). Making sense of self-esteem. *Current Directions in Psychological Science*, *1*, 32-35. doi: 10.1111/1467-8721.00008

Leary, M. R., Twenge, J. M., & Quinlivan, E. (2006). Interpersonal rejection as a determinant of anger and aggression. *Personality and Social Psychology Review*, *10*, 111.

Maruping, L. M., & Agarwal, R. (2004). Managing team interpersonal processes through technology: A task-technology fit perspective. *Journal of Applied Psychology, 89,* 975-990.

Murthy, U. S., & Kerr, D. S. (2003). Decision making performance of interacting groups: An experimental investigation of the effects of task type and communication mode. *Information & Management, 40,* 351-360. doi:10.1016/S0378-7206(02)00017-4

Nezlek, J. B., Kowalski, R. M., Leary, M. R., Blevins, T., & Holgate, S. (1997). Personality moderators of reactions to interpersonal rejection: Depression and trait self-esteem. *Personality and Social Psychology Bulletin*, *23*(12), 1235.

Nussbaum, E. M., Winsor, D. L., Aqui, Y. M., & Poliquin, A. M. (2007). Putting the pieces together: Online argumentation vee diagrams enhance thinking during discussions. *International Journal of Computer-Supported Collaborative Learning, 2,* 479-500.

Osterman, K. F. (2000). Students' seed for belonging in the school community. *Review of Educational Research*, *70*, 323 -367. doi:10.3102/00346543070003323

Patterson, B., & McFadden, C. (2009). Attrition in online and campus degree programs. *Online Journal of Distance Learning Administration*, *12*, 1-9.

Pérez, J. A. & Mugny, G. (1996). The conflict elaboration theory of social influence. In E. Witte & J. Davis (Eds.), *Understanding group behaviors: Vol. 2. Small group processes and interpersonal relations.* Hillsdale, NJ: Erlbaum.

Piaget, J. (1975). L'équilibration des structures cognitives. Paris: Presses Universitaires de France.

Prinsen, F. R., Volman, M. L. ., & Terwel, J. (2007). Gender‐related differences in computer‐mediated communication and computer‐supported collaborative learning. *Journal of Computer Assisted Learning*, *23*(5), 393-409. doi:10.1111/j.1365-2729.2007.00224.x

Quiamzade, A., & Mugny, G. (2001). Social influence dynamics in aptitude tasks. *Social Psychology of Education*, *4*, 311–334.

Reicher, S. D., Spears, R., & Postmes, T. (1995). A social identity model of deindividuation phenomena. *European Review of Social Psychology, 6,* 161-198.

Romero-Canyas, R., Downey, G., Reddy, K. S., Rodriguez, S., Cavanaugh, T. J., & Pelayo, R. (2010). Paying to belong: When does rejection trigger ingratiation? *Journal of Personality and Social Psychology*, *99*, 802-823.

Roseth, C. J., Saltarelli, A. J., & Glass, C. R. (2011). Effects of face-to-face and computer-mediated constructive controversy on social interdependence, motivation, and achievement. *Journal of Educational Psychology, 103(4),* 804-820. doi: 10.1037/a0024213

Ryan, R. M. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. *Journal of Personality and Social Psychology*, *43*(3), 450-461.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*(1), 54–67.

Sato, T. (2005). The Eysenck Personality Questionnaire Brief Version: Factor structure and reliability. *The Journal of Psychology*, *139*, 545-552.

Sleebos, E., Ellemers, N., & de Gilder, D. (2006). The paradox of the disrespected: Disrespected group members' engagement in group- serving efforts. *Journal of Experimental Social Psychology, 42,* 413– 427.

Schulte-Rüther, M., Markowitsch, H. J., Fink, G. R., & Piefke, M. (2011). Mirror neuron and theory of mind mechanisms involved in face-to-face interactions: A functional magnetic resonance imaging approach to empathy. *Journal of Cognitive Neuroscience*, *19*(8), 1354-1372.

Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications*. London: John Wiley & Sons.

Shroff, R. H., Vogel, D. R., & Coombes, J. (2008). Assessing individual-level factors supporting student intrinsic motivation in online discussions: A qualitative study. *Journal of Information Systems Education, 19,* 111-126.

Smith, K., Johnson, D. W., & Johnson, R. T. (1981). Can conflict be constructive? Controversy versus concurrence seeking in learning groups. *Journal of Educational Psychology, 73*, 651-663.

Tannen, D. (1990). *You just don't understand: Men and women in conversation.* New York: Ballantine Books.

Tichy, M., Johnson, D. W., Johnson, R. T., & Roseth, C. J. (2010). The impact of constructive controversy on moral development. *Journal of Applied Social Psychology*, *40*, 765–787.

Tidwell, L. C., & Walther, J. B. (2002). Computer-mediated communication effects on disclosure, impressions, and interpersonal evaluations: Getting to know one another a bit at a time. *Human Communication Research*, *28*, 317-348. doi:10.1111/j.1468-2958.2002.tb00811.x

Tyler-Smith, K. (2006). Early attrition among first time elearners: A review of factors that contribute to drop-out, withdrawal and non-completion rates of adult learners undertaking elearning programmes. *Journal of Online Learning and Teaching*, *2*, 73–85.

Twenge, J. M., Baumeister, R. F., Tice, D. M., & Stucke, T. S. (2001). If you can't join them, beat them: Effects of social exclusion on aggressive behavior. *Journal of Personality and Social Psychology*, *81*, 1058-1069.

Venkatesh, V., Morris, M. G., Davis, G. B., Davis, F. D., DeLone, W., McLean, E., Jarvis, C. B., et al. (2003). User acceptance of information technology: Toward a unified view. *Information Management*, *27*(3), 425–478.

Walther, J. B. (1992). Interpersonal effects in computer-mediated interaction: A relational perspective. *Communication Research*, *19*, 52-90. doi:10.1177/009365092019001003

Walther, J. B. (1996). Computer-mediated communication: Impersonal, interpersonal, and hyperpersonal interaction. *Communication Research, 23,* 3-43.

Walther, J. B. (2009). Theories, boundaries, and all of the above. *Journal of Computer-Mediated Communication*, *14*(3), 748–752.

Walther, J. B., Loh, T., & Granka, L. (2005). Let me count the ways: The interchange of verbal and nonverbal cues in computer-mediated and face-to-face affinity. *Journal of Language and Social Psychology, 24,* 36-65.

Wang, A. Y., & Newlin, M. H. (2002). Predictors of web-student performance: The role of self-efficacy and reasons for taking an on-line class. *Computers in Human Behavior, 18,* 151-163.

Walther, J. B., & Parks, M. R. (2002). Cues filtered out, cues filtered in: Computer-mediated communication and relationships. *Handbook of Interpersonal Communication*, *3*, 529–563.

Warburton, W. A., Williams, K. D., & Cairns, D. R. (2006). When ostracism leads to aggression: The moderating effects of control deprivation. *Journal of Experimental Social Psychology*, *42*, 213–220.

Wentzel, K. R. (1998). Social relationships and motivation in middle school: The role of parents, teachers, and peers. *Journal of Educational Psychology*, *90*, 202–209.

Williams, K. D., Cheung, C. K., & Choi, W. (2000). Cyberostracism: Effects of being ignored over the Internet. *Journal of Personality and Social Psychology*, *79*, 748–762.

Williams, K. D., & Sommer, K. L. (1997). Social ostracism by coworkers: Does rejection lead to loafing or compensation? *Personality and Social Psychology Bulletin, 23,* 693–706.

Xu, D. & Jaggars, S. S. (2011). Online and hybrid course enrollment and performance in washington state community and technical colleges. *CCRC Working Paper, 31,* 1-33.

Zion, M., Michalsky, T., & Mevarech, Z. R. (2005). The effects of metacognitive instruction embedded within an asynchronous learning network on scientific inquiry skills. *International Journal of Science Education, 27,* 957-983.