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# Understanding distinctions in learning in hybrid, and online environments: an empirical investigation of the community of inquiry framework

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# Understanding distinctions in learning in hybrid, and online environments: an empirical investigation of the community of inquiry framework

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This study of 723 college students seeks to assess the adequacy of the Community of Inquiry (CoI) framework for describing and explaining differences in learning outcomes in hybrid and fully online learning environments. Hypothesizing that the CoI model's theoretical constructs of *presence* reflect educational effectiveness in a variety of environments, this article seeks evidence of whether students in varying learning environments are likely to rank them differently with regard to *teaching, social*, and *cognitive* presence. The study utilizes factor-, hierarchical-regression-, and path analyses to determine the validity of the CoI constructs as well as to characterize the nature of relationships between them. Results suggest that the model is coherent and accounts for the small but significant differences recently reported in the literature regarding the superiority of hybrid environments relative to fully online environments (Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies*. Washington, DC: US Department of Education, Office of Planning, Evaluation, and Policy Development). Recommendations for future research and practice are included.

**Keywords:** online learning; community of inquiry; study; hybrid; theory



## Introduction

Online learning exhibits significant growth and acceptance in US higher education and now represents a sizable percentage of all instruction for American college students. Current estimates suggest that more than 5.5 million students are studying in fully online environments in higher education in the US (Allen & Seaman, 2010). These figures indicate that nearly 30% of such students are enrolled in at least one fully online course. Recent research indicates that the learning outcomes for online students are equal (Allen, Bourhis, Burrell, & Mabry, 2002; Bernard et al. 2004; Cavanaugh, Gillan, Kromey, Hess, & Blomeyer, 2004; Tallent-Runnels et al., 2006; Zhao, Lei, Yan, Lai, & Tan, 2005) or superior to (Allen & Seaman 2010; Means, Toyama, Murphy, Bakia, & Jones, 2009) those of students in traditional classrooms.

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Moreover, this line of research indicates that students in hybrid environments (those that blend online and face-to-face instructional settings) outperform both classroom and fully online students (Means et al., 2009, p. ix). However, a lack of conceptual understanding currently exists with regard to how and why hybrid-online instruction might support superior outcomes. This article seeks to examine these questions from conceptual and empirical perspectives.

### *Hybrid vs. fully online environments: the role of interaction*

Hybrid and fully online environments differ along numerous dimensions. In hybrid courses learners have opportunities for significant face-to-face interaction with their instructor and other students whereas in fully online courses this typically does not occur. In this study, hybrid courses replaced classroom time with online activities. In both classroom and blended environments, interaction is deemed to be significant. For example, Bernard et al. (2009) conducted meta-analytic research of interaction in online education and concluded that interaction of all kinds is beneficial in terms of both learning outcomes and satisfaction, but that student–student and student–content interactions had stronger effects on achievement than student–teacher interactions. Given the importance of interaction on achievement, it is clear that a course that promotes such interaction offers advantages in terms of potential learning over those that do not. Understanding how it is that interaction supports learning requires conceptual framing. We turn to that task below.

### *Interaction and the Community of Inquiry model*

In their comprehensive review of the research on impacts of interaction treatments on learning in distance education, Bernard et al. (2009) concluded that "it is likely that we can expect noticeable improvements in all forms of interaction that involve collaboration, discussion, and feedback" (p. 1266). A theoretical framework that anticipates and explains these empirical findings can be found in the Community of Inquiry (CoI) model (Garrison, Anderson, & Archer, 2001). The CoI framework is based on a model of critical thinking and practical inquiry. The authors of the model conjecture that online learning occurs through collaboration of students and their instructor and is characterized as three highly integrated elements that contribute to a successful online learning community: *social presence* (SP), *teaching presence* (TP), and *cognitive presence* (CP). The CoI framework conceptualizes online knowledge building as a result of joint effort among members in learning communities characterized by instructional orchestration appropriate to the online environments (TP) and a supportive and collaborative online setting (SP). The TP construct delineates task sets such as organization, design, discourse facilitation, and direct instruction (Anderson, Rourke, Garrison, & Archer, 2001) and identifies the specific behaviors likely to create a productive CoI (e.g. Shea, Li, Swan, & Pickett, 2005). Instructor TP is hypothesized to be an indicator of online instructional quality. Empirical research has supported this view with evidence indicating strong correlations between the quality of TP and student satisfaction and learning (Bangert, 2008; Picciano, 2002; Shea, Pickett, & Pelz, 2003). SP is manifested in online discourse that promotes positive affect, interaction, and cohesion (Rourke, Anderson, Garrison, & Archer, 2001). Several studies (e.g. Shea & Bidjerano, 2008, 2009) have demonstrated that SP could act as an important mediator of the

relationship between students' perception of TP and their evaluation of learning. CP is construed as the significant learning processes that result from the practical inquiry cycle (Garrison et al., 2001). CP is characterized in the CoI model by learner engagement starting with a triggering event, proceeding through exploration, integration and resolution. CP can be viewed as a multivariate measure of critical and creative thinking that results from the cyclical process of practical inquiry within a community of learners. The specific form of interaction within the CP construct thus reflects a pragmatic inquiry-based view of learning (Dewey, 1933; Lipmann, 2003; Pierce, 1955).

Kuhn (1977) argued that determining the superiority of one theory over another was a matter of weighing competing values including accuracy, consistency, scope, simplicity and fruitfulness. In this article, we examine the degree to which the CoI model represents an advantageous theoretical framework for understanding online and hybrid learning based on these criteria. In a related sense Greeno (2006) argued that theoretical progress can be made in a number of ways, ranging from improvements that add to the scope of phenomena that a theory explains to improvements that increase the accuracy with which the theory accounts for phenomena it already explains. In this article, we also seek to validate the CoI model and to use it to account for recently discovered phenomenon, i.e. research results indicating that students in hybrid instructional settings outperform their classroom and fully online counterparts (Means et al., 2009). We are especially interested in understanding the accuracy and consistency with which the theoretical constructs of ''presence'' can be employed to account for these recent findings. We suggest that instructional modalities (online and hybrid) may result in varying levels of teaching and SP and that these differences should be evident in student assessments of teaching, social and CP in these varying modalities. We discuss some of these constructs in more detail below.

We conjecture that results will indicate that the quality of TP is an indicator of differences between learners in online and hybrid environments with students in hybrid courses more favorably disposed to their instructor TP behaviors. Additionally, we hypothesize that results will support those found by Shea and Bidjerano (2009) that the quality of TP and measures of SP will more clearly predict variance in learner ratings of the multivariate measure of learning processes reflected in the CP construct than other variables such as online experience, age, gender, or full-time versus part-time enrollment status.

### *Scope of the study*

While a number of researchers have suggested that hybrid-online environments are likely to lead to better satisfaction and learning among students in higher education (e.g. Lindsay, 2004; Voci & Young, 2001; Welker & Beradino, 2006), these claims have not been tested within the context of a theoretical framework. In this article, we examine survey data from more than 700 college students studying in either online or hybrid environments in a private college in the Northeastern United States. As the degree of interactivity within courses has been established in the empirical literature as one of the essential characteristics of productive learning environments, we examined the effect of interactivity on student perceptions of quality in online courses. To begin to develop a theory-based explanation of research findings that hybrid instruction leads to superior outcomes, we utilize the CoI instrument as a

metric to account for variance in student evaluations of instructional quality and their own learning.

The purpose of the study is threefold. The *first* objective is to determine the direct impact of environment (hybrid vs. fully online) on the CoI constructs. We sought to delineate the net effect of environment (hybrid vs. online) by controlling for attributes and status characteristics that are likely to be related to the theoretical constructs of interest. Given the recent results from quantitative reviews of the literature (e.g. Means et al., 2009) indicating that hybrid environments may lead to better learning outcomes, this kind of analysis seems crucial. We considered it likely that variables such as age and gender would have an impact on a student's ratings of elements of the CoI constructs of interest in the study. For example, previous research on the relationship between age and social isolation (Cattan, White, Bond, & Learmouth, 2005; Yeh & Sing, 2004) has found higher levels of social isolation with increases in age, thus suggesting possible variations in sense of SP by age. Other distinctions have been found in regard to gender (Bostock & Lizhi, 2005; Goldstein & Sadhana, 2004; Shumaker & Hill, 1991; Vandervoort, 2000) with females, in general, less socially isolated than males, suggesting possible variations in scores for SP by gender. It has also been suggested that age may be an important variable in predicting student comfort in online environments with students from the ''net generation'' more accustomed to working and socializing online (see Brown, 2002; Oblinger & Oblinger, 2005; Prensky, 2005). We also consider it likely that academic level (undergraduate vs. graduate) track distinctions in student age and therefore included that variable in the analysis. Further, it has been concluded that student ''commitment to degree'' is the best indicator of student persistence and success in college education (Horn & Neville, 2006). Variables such as student workload status (part time vs. full time), student employment status (part time, full time, and not employed) have been used as proxies for commitment to degree suggesting that full time students without other commitments, such as work, are more likely to be ''degree committed''. We therefore included these in the analysis conducted here. Finally, previous research (e.g. Shea, Fredericksen, Pickett, Pelz, & Swan, 2001) indicates that greater experience with online learning is correlated with satisfaction in online education and thus might have an influence on student responses to theoretical constructs of interest in this study.

*Second*, espousing the idea that the interactivity embedded into the course design could play a substantial role in students' perceptions, we queried as to whether the level of interactivity within online courses has a direct bearing on students' rating of teaching, cognitive and SP. We sought to understand how levels of interaction would impact student ratings of the CoI constructs of ''presence''.

*Finally*, consistent with previous research on the interrelatedness of the CoI constructs (e.g. Shea & Bidjerano, 2008, 2009), we further conjecture that the quality of instructor TP functions as the instructional orchestration leading to a social environment conducive to online learning predicting the quality of learners' ratings of CP.

## Method

### *Participants*

Participants in this study included 723 college students participating in a program of online and blended courses in the 2008–2009 academic year in a private college in the

Northeastern United States. More than half of the study participants were males (57%). Approximately one-third of the sample (37%) consisted of graduate students. The majority of the participants were full time students (56%) between 18 and 30 years of age (62%). Full time employment status was indicated by 47% of the respondents. For 18% of the participants, English was their second language. In addition, 36% of the participants reported a significant online experience.

### *Instruments*

#### *The Community of Inquiry*

The CoI, part of the 52-item survey, was developed and validated through a collaboration of a team of researchers investigating online education through the CoI lens (Arbaugh et al., 2008; Shea & Bidjerano, 2008; Swan et al., 2008). The instrument consisted of 42 items reflecting indicators of instructional presence in the CoI model. Items are summarized in Table 1. As can be seen, 15 items correspond to



Table 1. Results from factor analysis.

| Item | Factors | | | | |
|---|---|---|---|---|---|
| | TP | CS | CP | CI | AC |
| The instructor communicated course topics | **0.87** | 0.07 | −0.06 | 0.09 | −0.05 |
| The instructor communicated course goals | **0.90** | 0.06 | −0.01 | 0.09 | −0.03 |
| The instructor provided clear instructions | **0.86** | 0.10 | 0.02 | 0.10 | −0.10 |
| The instructor communicated due dates | **0.76** | 0.13 | −0.04 | 0.14 | −0.13 |
| The instructor helped students learn | **0.83** | −0.04 | −0.01 | −0.10 | 0.08 |
| The instructor helped students clarify their thinking | **0.86** | −0.02 | −0.01 | −0.06 | 0.06 |
| The instructor kept students engaged and participating | **0.87** | −0.04 | 0.03 | −0.02 | 0.11 |
| The instructor kept students on task | **0.90** | −0.03 | 0.04 | −0.08 | 0.07 |
| The instructor encouraged students to explore new ideas | **0.73** | −0.03 | −0.13 | −0.04 | 0.06 |
| The instructor established a sense of course community | **0.79** | 0.03 | 0.03 | −0.06 | 0.15 |
| The instructor helped focus discussion on issues that aided student learning | **0.59** | −0.05 | −0.21 | −0.10 | 0.02 |
| The instructor gave feedback that helped students | **0.67** | −0.08 | −0.17 | −0.13 | 0.00 |
| The instructor provided feedback in a timely fashion | **0.71** | −0.04 | −0.12 | −0.16 | −0.01 |
| My instructor provided feedback to the class during the discussions or other activities to help us learn. | **0.77** | −0.07 | −0.02 | −0.18 | 0.00 |
| My instructor asked for feedback on how this course could be improved. | **0.53** | 0.03 | −0.01 | −0.18 | 0.12 |
| Getting to know others gave students a sense of belonging in the course | 0.20 | 0.09 | −0.17 | 0.03 | **0.63** |
| Students formed distinct impressions of course participants | 0.16 | 0.18 | −0.09 | −0.01 | **0.59** |
| Students found online or web-based communication an excellent medium for social interaction | 0.00 | 0.32 | −0.12 | −0.03 | **0.47** |

(*continued*)

Table 1. (*Continued*).

| Item | Factors | | | | |
|---|---|---|---|---|---|
| | TP | CS | CP | CI | AC |
| Students felt comfortable conversing online | 0.02 | **0.82** | −0.04 | −0.02 | 0.03 |
| Students felt comfortable participating in discussions | 0.07 | **0.87** | −0.03 | −0.01 | −0.02 |
| Students felt comfortable interacting with course participants | 0.09 | **0.84** | −0.02 | .02 | 0.03 |
| Students felt comfortable disagreeing with others | −0.07 | **0.52** | −0.05 | −0.27 | 0.18 |
| Students felt their points of view were acknowledged by others | −0.02 | **0.47** | −0.11 | −0.21 | 0.22 |
| Online discussions helped students develop a sense of collaboration | 0.01 | **0.40** | −0.08 | −0.20 | 0.34 |
| Getting to know the instructor gave me a sense of belonging in the course. | 0.27 | 0.09 | −0.10 | **−0.54** | 0.09 |
| I was able to form a distinct impression of the course instructor. | 0.18 | 0.13 | −0.10 | **−0.51** | 0.10 |
| I was able to identify with the thoughts and feelings of the instructor during the course. | 0.26 | 0.12 | −0.08 | **−0.55** | 0.09 |
| I felt comfortable interacting with the instructor of the course. | 0.20 | 0.20 | −0.26 | **−0.47** | −0.11 |
| I felt comfortable disagreeing with the instructor of the course while still maintaining a sense of trust. | 0.06 | 0.20 | −0.16 | **−0.58** | −0.01 |
| I felt that my point of view was acknowledged by the course instructor. | 0.20 | 0.17 | −0.24 | **−0.51** | −0.07 |
| Problems posed increased interest in course issues | 0.04 | −0.02 | **−0.69** | −0.16 | 0.01 |
| Course activities piqued curiosity | 0.01 | −0.06 | **−0.79** | −0.12 | 0.01 |
| Students felt motivated to explore content related topics | 0.06 | −0.07 | **−0.78** | −0.09 | 0.03 |
| Students utilized a variety of resources during the course | −0.04 | −0.06 | **−0.83** | 0.07 | 0.13 |
| Students brainstormed and found relevant information to aid them in resolving questions | −0.03 | −0.06 | **−0.76** | 0.01 | 0.19 |
| Online discussions helped students appreciate different perspectives | 0.09 | 0.21 | **−0.41** | 0.00 | 0.28 |
| Combining new information helped students answer questions | 0.10 | 0.09 | **−0.65** | −0.10 | 0.08 |
| Learning activities helped students create solutions | 0.08 | 0.05 | **−0.72** | −0.06 | 0.05 |
| Reflection on course content and discussions helped students understand fundamental concepts | 0.11 | 0.09 | **−0.72** | −0.04 | −0.03 |
| Students can describe ways to test and apply their new knowledge | 0.00 | 0.10 | **−0.86** | 0.03 | −0.11 |
| Students developed solutions to course problems that can be applied in practice | 0.03 | 0.09 | **−0.83** | 0.06 | −0.09 |
| Students can apply knowledge created in their courses to work or other non-class related activities | 0.06 | 0.10 | **−0.82** | 0.05 | −0.11 |
| Eigenvalue | 24.83 | 3.02 | 1.64 | 1.20 | 1.01 |
| Percent of variance explained | 59.10 | 7.19 | 3.91 | 2.87 | 2.41 |
| Chronbach's Alpha | **0.97** | **0.92** | **0.96** | **0.95** | **0.87** |

Note: The highest loadings are in boldface; TP, teaching presence; CS, open communication/students; CP, cognitive presence; CI, open communication/instructor; AC, affective communication.

TP and 12 items reflect the CP construct. As noted above, TP can be seen as instructional orchestration while CP is meant to capture the cyclical process of inquiry within the CoI model. Components of CP include triggering events, exploration, integration and resolution/application. The remaining items correspond to components of the SP construct in which learners are asked to rate their perceptions of the online medium and their experiences in it to connect with other participants in the course.

Responses were provided on a 5-point Likert type scale, ranging from 1-"strongly agree" to 5-"strongly disagree". Results from previous factor analyses have suggested that the variance among the items in the instrument could be explained by either three (Shea & Bidjerano, 2009) or four factors (Shea & Bidjerano, 2008), depending on the amount of modifications made in terms of item content and format. Since factor solutions are expected to vary to some extent across samples and versions, we performed principal axis factoring with Oblimin rotations on the 42 items reflecting the presence constructs in the survey. Five factors with eigenvalues greater than one emerged. While all TP and CP items' loadings were consistent with those found in previous studies (e.g. Shea & Bidjerano, 2008, 2009), the SP items collapsed into three distinct factors. These three factors were labeled tentatively: "Open Communication with Instructor" (CI), "Affective communication" (AC), and "Open Communication with Students" (CS). The results from the factor analysis are presented in Table 1.



### *Interaction*

We collected objective data throughout the semesters to assess the degree of interaction within each course. The level of interaction was determined by the sum of indicators of student and instructor participation (e.g. total online discussion messages in the large- and small-group areas, total news announcements, total calendar events posted, total comments left in grade book, and total feedback left in the dropbox), divided by the number of students plus one (to take into account the teacher). The courses were classified into low- and high-interaction by the means of median split based on the derived metric of interaction. The collected objective data was triangulated with a survey, asking both students and instructors to evaluate the level of interaction within each course. This analysis confirmed that students did report higher levels of interaction in courses in which there were more overall postings and activity as described above. While we recognize that these are imperfect measures, given the meta-analytic synthesis (e.g. Bernard et al., 2009) indicating the importance of interaction on learning we were particularly interested to understand the impact of objectively measured interaction levels on the theoretical constructs reflective on online learning in this study.

## *Procedure*

Students were asked to complete a 52-item survey using an online form that allowed for monitoring of response rates. The survey (described below) had to be completed in terms of the course (hybrid or fully online) currently taken. All faculty teaching in this program undergo the same training, have access to a common helpdesk, and utilize the same learning management system. All faculty members teaching in the program are assigned to an instructional designer, who provides one-to-one

consultations in online and blended course design, development, delivery, and assessment. In addition, the instructional designer coordinates all CMS training, library support, and media development support for their faculty. The instructional design team offers a regular series of seminars, workshops, multi-week online training courses, web-based tutorials, and learning communities specifically intended for online and blended faculty. Not surprisingly, the majority of online and blended courses at the college include at least one large-group (whole-class) asynchronous discussion activity per week, and many include an online small-group (team) discussion component. These discussions are designed to foster inquiry and critical thinking, and accordingly constitute a significant portion (20–40%) of the final grade. Instructors communicate with their students by posting announcements, facilitating discussion threads and/or web-conferences, and commenting on and grading work.

The survey was administered through Vovici®. An initial invitation and three follow-up communications were sent via email. The final response rate was approximately 42%.



## Results

### *The effect of type of instruction*

To determine the effect of type of instruction (online vs. hybrid) on learner assessments of the five constructs (TP, CP, AC, CI, and CS) we performed five separate hierarchical multiple regressions. In all regressions, we controlled for the following prior student characteristics: gender, age, academic level (undergraduate vs. graduate), student workload status (part-time vs. full time), student employment status (part time vs. full time), and experience with online learning. The results are presented in Table 2. Controlling for prior characteristics, type of instruction (hybrid versus online) had a small, but significant positive effect on student ratings of TP [$F\,(8{,}537) = 5.03$, $p < 0.001$, $\Delta R^2 = 0.02$], CP [$F\,(8{,}537) = 5.73$, $p < 0.001$, $\Delta R^2 = 0.01$], AC [$F\,(8{,}537) = 5.36$, $p < 0.001$, $\Delta R^2 = 0.01$], and CI [$F\,(8{,}537) = 4.61$, $p < 0.001$, $\Delta R^2 = 0.01$].

It is interesting to note that in all five regressions performed, the effect of age was statistically significant, suggesting that older students produced higher ratings on the constructs of TP, CP, AC, CI, and CS. The effects of experience with online courses and academic level varied across regression analyses. In general, graduate students tended to show higher standing on the constructs of TP, CP and AC, not taking into account the type of courses they were enrolled in. The effect of academic level on CP remained consistent even when type of course (online vs. hybrid) was used as a predictor of CP. In addition, despite the impact of type of course, students with more educational experiences in online environment rated their AC and open communication with other students significantly more favorably as compared to those with less online experience.

### *The effect of interaction within fully online courses*

The effect of interaction was examined in one-way MANOVA with interactivity level (low vs. high) as independent variable and the five CoI constructs as dependent variables. The results revealed that, overall, interaction contributes to the model beyond statistical chance, Hotelling's Trace = 0.06, $F\,(5{,}528) = 5.70$, $\eta^2 = 0.05$. Multivariate tests of significance further indicated that interaction levels have an

Table 2. Summary of hierarchical regression analysis for variables predicting teaching presence, cognitive presence, affective communication, open communication/instructor, and open communication/students.

| | TP | | | CP | | | AC | | | Open communication/ instructor (CI) | | | Open communication/students (CS) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predictors | *B* | SE B | *β* | *B* | SE B | *B* | *B* | SE B | *B* | *B* | SE B | *B* | *B* | SE B | *B* |
| *Step 1* | | | | | | | | | | | | | | | |
| Gender | 0.06 | 0.07 | 0.03 | 0.01 | 0.06 | 0.01 | 0.02 | 0.08 | 0.01 | 0.03 | 0.07 | 0.02 | 0.02 | 0.06 | 0.01 |
| Age | 0.09 | 0.02 | 0.25** | 0.09 | 0.02 | 0.28** | 0.09 | 0.02 | 0.23** | 0.09 | 0.02 | 0.24** | 0.05 | 0.02 | 0.17* |
| Academic level | 0.16 | 0.07 | 0.10* | 0.19 | 0.06 | 0.13* | 0.16 | 0.08 | 0.09* | 0.18 | 0.07 | 0.11 | 0.02 | 0.06 | 0.02 |
| Student workload | −0.35 | 0.18 | −0.22 | −0.23 | 0.16 | −0.17 | −0.25 | 0.20 | −0.14 | −0.29 | 0.19 | −0.18 | −0.22 | 0.15 | −0.17 |
| Employment | −0.03 | 0.06 | −0.03 | −0.00 | 0.05 | −0.00 | 0.01 | 0.07 | 0.01 | −0.02 | 0.06 | −0.02 | 0.08 | 0.05 | 0.10 |
| Registration status | −0.06 | 0.19 | −0.04 | −0.07 | 0.16 | −0.05 | −0.19 | 0.20 | −0.11 | −0.09 | 0.19 | −0.05 | −0.04 | 0.15 | −0.03 |
| Online exp. | 0.02 | 0.02 | 0.04 | 0.03 | 0.02 | 0.06 | 0.08 | 0.03 | 0.15* | 0.03 | 0.02 | 0.06 | 0.05 | 0.02 | 0.12* |
| | $R^2 = 0.05$, $p < 0.001$ | | | $R^2 = 0.07$, $p < 0.001$ | | | $R^2 = 0.07$, $p < 0.001$ | | | $R^2 = 0.05$, $p < 0.001$ | | | $R^2 = 0.04$, $p < 0.001$ | | |
| *Step 2* | | | | | | | | | | | | | | | |
| Gender | 0.06 | 0.07 | 0.04 | 0.02 | 0.06 | 0.01 | 0.03 | 0.07 | 0.02 | 0.04 | 0.07 | 0.02 | 0.02 | 0.06 | 0.01 |
| Age | 0.09 | 0.02 | 0.25** | 0.09 | 0.02 | 0.29** | 0.09 | 0.02 | 0.23** | 0.09 | 0.02 | 0.24** | 0.05 | 0.02 | 0.17* |
| Academic level | 0.07 | 0.08 | 0.04 | 0.13 | 0.07 | 0.09* | 0.09 | 0.08 | 0.05 | 0.10 | 0.08 | 0.06 | 0.00 | 0.06 | 0.00 |
| Student workload | −0.31 | 0.18 | −0.19 | −0.21 | 0.16 | −0.15 | −0.22 | 0.20 | −0.12 | −0.25 | 0.18 | −0.16 | −0.21 | 0.15 | −0.16 |
| Employment | −0.02 | 0.06 | −0.02 | 0.00 | 0.05 | 0.00 | 0.01 | 0.07 | 0.01 | −0.01 | 0.06 | −0.01 | 0.08 | 0.05 | 0.10 |
| Registration status | −0.04 | 0.18 | −0.02 | −0.05 | 0.16 | −0.04 | −0.17 | 0.20 | −0.10 | −0.06 | 0.19 | −0.04 | −0.04 | 0.15 | −0.03 |
| Online exp. | 0.03 | 0.02 | 0.07 | 0.03 | 0.02 | 0.08 | 0.09 | 0.03 | 0.17** | 0.04 | 0.02 | 0.08 | 0.05 | 0.02 | 0.12* |
| Online vs. hybrid | 0.38 | 0.12 | 0.15** | 0.27 | 0.10 | 0.12* | 0.31 | 0.13 | 0.11* | 0.35 | 0.12 | 0.14* | 0.10 | 0.10 | 0.05 |
| | $R^2 = 0.07$, $p < 0.001$ | | | $R^2 = 0.08$, $p < 0.001$ | | | $R^2 = 0.08$, $p < 0.001$ | | | $R^2 = 0.06$, $p < 0.001$ | | | $R^2 = 0.05$, $p < 0.001$ | | |

Note: *$p < 0.05$; **$p < 0.001$.

effect on AC [$F$ (1,354) = 15.77, $\eta^2 = 0.03$], Open Communication/Students [$F$ (1,534) = 12.55, $\eta^2 = 0.02$, and Open Communication/Instructor [$F$ (1,534) = 4.47, $\eta^2 = 0.01$]. The effects of interaction on ratings of TP [$F$ (1,534) = 1.42] and CP [$F$ (1,534) = 0.71] were not significant.

### *Results from path analyses*

Prior research has suggested that SP variables could play an important role in students' perceptions of their learning in online contexts (e.g. Shea & Bidjerano, 2008, 2009). It has been found that SP explains a significant proportion of the relationship between prior characteristics, student perceptions of TP and CP. To cross-validate the model suggested by Shea and Bidjerano (2008) in relation to medium of instruction (hybrid vs. fully online), we developed three path analytic models. In each model, one of the SP constructs (AC, CI and CS) was hypothesized as a partial mediator between student ratings of TP and perceptions of their own CP. In all three models, depicted in Figures 1–3, we used the contextual variable of online vs. hybrid environment and student prior characteristics (age, academic level and experience in online experience) as distal predictors of CP. The fit indices for the three models were as follows: $\chi^2$ (8) = 40.66, $p < 0.001$, CFI = 0.98, GFI = 0.97, TLI = 0.92, NFI = 0.97, SRMR = 0.04, RMSEA = 0.08 [Model 1: AC]; $\chi^2$ (8) = 55.31, $p < 0.001$, CFI = 0.97, GFI = 0.96, TLI = 0.96, NFI = 0.96 SRMR = 0.04, RMSEA = 0.08 [Model 2: Open communication/Students]; $\chi^2$ (8) = 37.51, $p < 0.001$, CFI = 0.98, GFI = 0.98, NFI = 0.98, TLI = 0.94, SRMR = 0.04, RMSEA = 0.08 [Model 3: Open Communication/Instructor]. The unstandardized and standardized (given in parentheses) regression coefficients are displayed on the figures. In all three models, environment (hybrid vs. online) and age predicted ratings

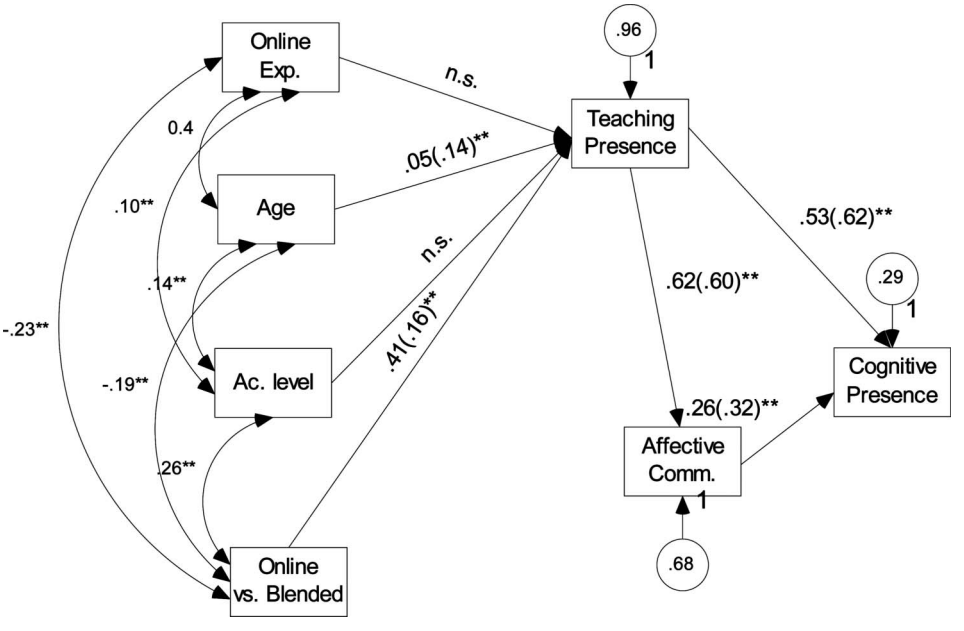


Figure 1. A model of the relationship between TP and CP with AC as a partial mediator.

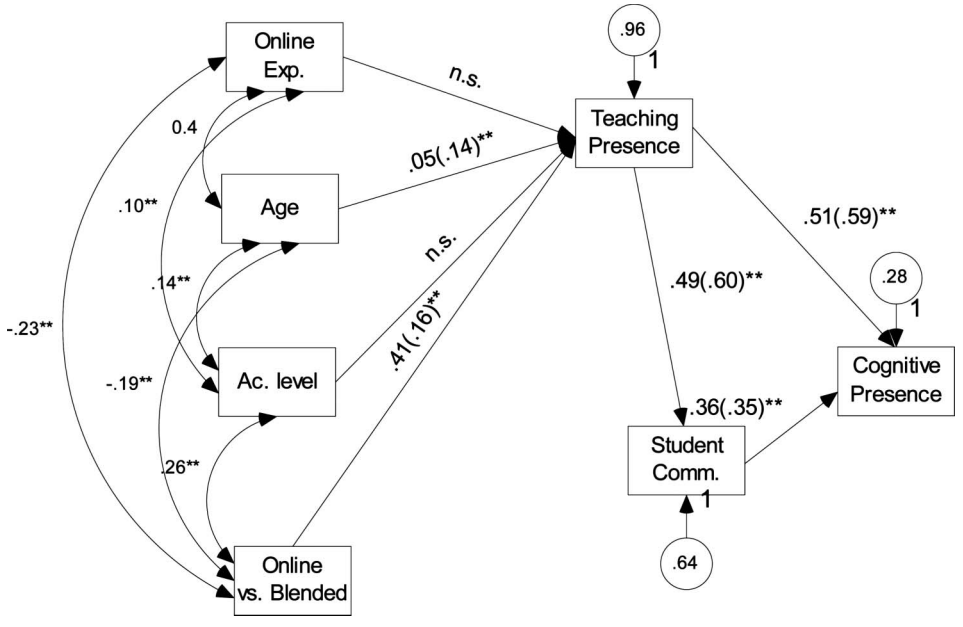


Figure 2. A model of the relationship between TP and CP with Open Communication with students as a partial mediator.

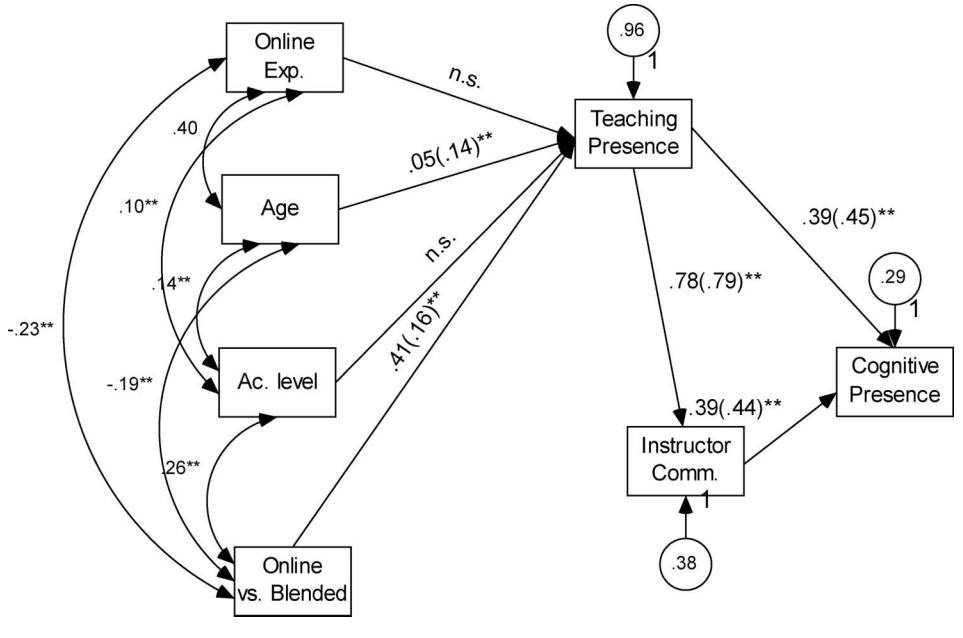


Figure 3. A model of the relationship between TP and CP with Open Communication with instructor as a partial mediator.

of TP beyond statistical chance. The construct of TP was a complete mediator of the relationship between age and the SP constructs as well as between environment and the SP constructs. The variance explained in CP in Model 1 (with AC as a partial

mediator), Model 2 (with CS as a partial mediator), and Model 3 (with CI as a partial mediator) was 70.9%, 71.6%, and 71.2% respectively. Significant, but small proportion of these variances (approximately 4% in each of the models) was attributable to age and type of course (online vs. hybrid).

## Discussion

In attempting to understand how and why hybrid instruction might lead to superior learning among students in higher education we conducted a study utilizing the CoI instrument. There are several results warranting commentary here. In brief, we utilized factor analysis to demonstrate that the items in the instrument applied in this study cohere as interpretable factors reflecting the intended theoretical constructs. Using these factors as criteria in a series of hierarchical multiple regressions, we found that despite prior status characteristics (e.g. gender, age, experience, educational level and workload), students in hybrid courses tend to rate their instructors TP behaviors significantly higher, to perceive their own learning as better, as well as to feel more affectively and socially connected to their peers. Moreover, it was established that interaction levels within online courses significantly contributes to learners' perceptions of SPs (e.g. AC, open communication among students, and open communication with the instructor). Finally, consistent with previous research, our analyses provided supporting evidence that social interactions across learning environments are an important mediator of the link between ratings of teaching behaviors and student ratings of their own learning outcomes.

It is worth focusing on the elements of CP included in this study. Given that the students in these courses were enrolled in many different courses across a variety of disciplines it is necessary to define learning outcomes that are desirable across a range of topics. In this study we took as foundational the model of critical thinking and inquiry reflected in Dewey's work (1933); items included in the study reflect the cyclical process of inquiry distinctive to the CoI Model. Critical thinking outcomes that students are asked to rate include their understanding of fundamental concepts, abilities to test and apply new knowledge, capacity to develop solutions to course problems in practice and the ability to apply knowledge beyond the class. These indicators of critical thinking can be seen as desirable in many higher education settings.

### *Medium of instruction as a predictor of teaching, cognitive and social presence*

It should be noted that student assessment of their own CP, a multivariate factor reflecting the quality of learning in the CoI model suggests that students in hybrid courses rate their instructors TP behaviors more highly. These findings are interesting in light of the result indicating that the quality of instructors' TP behaviors is a significant predictor of social and CP scores. From a theoretical standpoint this correlation helps explains the small yet significant differences suggesting that students in hybrid courses outperform their online and classroom counterparts (Means et al., 2009). Reflecting the CoI framework students in hybrid courses reported better levels of instructional design, facilitation of productive discourse, and direct instruction – the components of the TP construct. These students also had more positive perceptions about the social setting in which they participated as reflected in two of three SP constructs in the model. AC, open

communication among students, and open communication with instructor are important mediators of the relationship between TP and ratings of instructional contexts (online vs. blended) and ratings of critical thinking reflected in the CP construct. This result supports past research which has indicated that ratings of CP can be modeled on the quality teaching and SP in fully online education settings (Shea & Bidjerano, 2009) and we found similar results among students in hybrid environments.

### *The role of interaction within fully online environments*

In the current study we examined interaction as a variable of interest in predicting student ratings of the quality of the processes (teaching and SP) and the outcome (CP) that were the objects of our research. We found that students in courses with higher levels of interaction rated SP more favorably. While Bernard et al. (2009) did not speculate on the connection between social forms of interaction and achievement, we conclude that (a) AC, (b) open communication among students, and (c) open communication with the instructor (collectively defined here as SP) are important mediators between instructional quality (TP) and student ratings of the quality of learning outcomes (CP). The majority of the variance in ratings of CP can be explained by the direct effects of TP and by the mediated effect of TP through SP on CP. In other words the quality of the instructional process (TP) appears to facilitate meaningful learning (CP) directly, through an unmediated effect, and to enhance learning indirectly, by supporting a supportive social online milieu (SP) in which students feel affectively cohesive and connected. One of the contributions of this study, therefore, is to provide evidence as to why the social aspects of the online learning environment are important to consider. The feelings of connectedness and positive affect reflected in the SP construct are predictive, in part, of meaningful learning as defined in the CP construct. Students in courses with higher levels of interaction reported more SP than in course with lower levels of interaction. Given that SP is predicted by TP, and that student ratings of instructional design as defined by the CoI model are part of this prediction, we can concluded that a portion of the variance in SP is due to the design of the course. This design element that accounts for variance in ratings of SP includes whether the instructor clearly communicated course topics, course goals, time frames and due dates, and how to complete course learning activities successfully. Where students agree more strongly that an instructor is doing these task well, they also report better levels of SP. In looking at the prediction of CP we see that the model represents both indirect and direct predictive paths between instructional design quality, (as represented by TP) and both social and CP ratings.

From a practical standpoint these results indicate that the CoI framework can be construed as a touchstone for aspects of instructional design in both fully online and hybrid learning environments. Results demonstrating that the majority of variance in learner ratings of their own CP is accounted for by variance in teaching and SP suggests that faculty and instructional designers should consider focusing efforts on these aspects of instructional design. Providing students with clear course goals, topics, due dates, timely feedback and assisting them to collaborate in effective ways with their classmates allows them to develop productive interactions both with content and other students, which in turn advances joint knowledge construction. Confirming results from Means et al. (2009) it appears from these results that

students in hybrid courses rate forms of presence more highly then those in fully online courses. However these findings do not necessarily indicate that instruction in fully online environments cannot be designed more effectively. We believe that these results suggest that a focus on the instructional and social processes reflected in the CoI framework holds promise as a mechanism to improve learning in multiple environments.

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