Community of Inquiry Framework and Learner Achievement

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Purpose of this Research

To examine the extent to which students’ perceptions of a community of inquiry are related to actual course learning achievement outcomes as assessed by the course instructor.
CoI and Learning Outcomes

“The elements of a **community of inquiry** can enhance or inhibit the quality of the educational experience and **learning outcomes.**”

- Garrison, Anderson, and Archer (p. 92, 2000)
Social-constructivist Framework

Essential Elements of a CoI

- Cognitive Presence
- Teaching Presence
- Social Presence
Rourke & Kanuka (2009)

Literature review of 252 CoI-based articles

Preoccupation with measurement of:
- communication,
- interaction, or
- student perceptions

Lack of learning outcome assessment:
- Only 5 studies had measures of student learning
- All 5 studies were based on perceived learning
Critique by Rourke & Kanuka (2009)

Deep and meaningful learning outcomes

- Cognitive Presence
- Social Presence
- Teaching Presence

?
Related Literature

CoI in distance education literature
  – Google Scholar: 1,050 1,111 citations to 2000 article
  – ProQuest database: “community of inquiry” in title or abstract of 60 studies

CoI research
  – Content analysis
  – Student perception surveys
    CoI presences
    Perceived learning and satisfaction

Beyond CoI research
  – Interaction theory and research (LL – LT – LC)
  – Whole class, group, and individual instruction
Research Questions

1. To what extent are student perceptions of CoI related to objective measures of student achievement?

2. To what extent are student perceptions of learning related to objective measures of student achievement?

3. To what extent are student perceptions of learning and course satisfaction related to student perceptions of CoI?
Participants

Five graduate-level courses in college of education
- Four instructional design theory and practice and one research methods
- Fifty-one consenting students (68% of enrolled)
- 96% were 26 or older and 57% were male

Geographically dispersed hybrid courses:
- 27% on the main campus
- 24% remote learning centers
- 49% other distance locations
## Synchronous & Asynchronous Activity

<table>
<thead>
<tr>
<th>Course</th>
<th>$n$</th>
<th>Total Minutes</th>
<th>Audio-Video</th>
<th>LMS Access</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Student ($M$)</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
<td>927</td>
<td>Two-way</td>
<td>597</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>1,368</td>
<td>Two-way</td>
<td>594</td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>1,693</td>
<td>One-way</td>
<td>617</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>1,172</td>
<td>Two-way</td>
<td>875</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>730</td>
<td>One-way</td>
<td>576</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>1,215</td>
<td></td>
<td>663</td>
</tr>
</tbody>
</table>
Design

Non-experimental study

Correlation analysis
  – Pearson bivariate correlation
  – Stepwise multiple regression

Data collection
  1. Instructor assessment of learning achievement
  2. Survey of student perceptions
  3. Other course data collection and observation
Instructor-assessed Achievement

Significant project or paper in course

– Project score: Cumulative assigned / possible points

– SOLO score: 5-point scale Structure of Observed Learning Outcomes taxonomy (Biggs & Collis, 1982)

Final course assessment

– Course score: Cumulative assigned / possible points
Student Perception Survey

Student perceptions of CoI
  – 37-items from CoI Survey (Shea & Bidjerano, 2009)
  – 5-point Likert-type scale
  – CoI composite and subscales from question groupings

Conducted twice (middle and end of semester)

Other student data and perceptions
  – Demographic data (age, gender, etc.)
  – Perceived learning
  – Course satisfaction
Community of Inquiry Survey

The community of Inquiry questionnaire is developed and validated by a collaborative research team. The members of the team, in alphabetical order, are Ben Arbaugh, Marti Cleveland-Innes, Sebastian Diaz, D. Randy Garrison, Phil Ice, Jennifer Richardson, Peter Shea and Karen Swan.

The results were presented at the Sloan-C Conference in Orlando in November. A three factor solution with oblique rotation was presented. All variables loaded cleanly on the expected factor/presence. This suggests a stable instrument that could be used in a variety of studies, including large scale inter-institutional or cross-disciplinary studies.

Download the CoI survey

The recent articles about the development of validation of the instrument have been published. See the article below.
Mean Perceptions of CoI

Perceptions from Second Survey

Course

Mean Survey Response

Teaching
Cognitive
Social

1 2 3 4 5 All

Old Dominion University
Instructional Design & Technology
Descriptive Statistics

CoI measures:

– Statistically significant increase in perception of cognitive presence during the semester
– Social presence significantly smaller than both the cognitive presence and teaching subscales
– No significant difference between courses for the CoI composite or subscale measures
– Significant difference between place of attendance for social presence subscale
Learning Outcome by Course

![Bar chart showing learning outcomes by course. The chart displays the mean scores for SOLO, Project, Course, and Perceived for each course and the overall average across all courses.]
Descriptive Statistics

Learning outcome measures:

– Significant mean difference between courses for:
  SOLO score: Course 1 < Course 3 and 5
  Project score: Course 1 < All other courses

– Significant increase in student perceived learning over semester

– Instructor-assessed course score significantly larger than student perceived learning score
Q1: CoI and Learning Achievement

CoI and Instructor-assessed Learning Achievement Correlations

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
<tr>
<td>1. Teaching presence</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Social presence</td>
<td>.52***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Cognitive presence</td>
<td>.74***</td>
<td>.55***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. CoI</td>
<td>.92***</td>
<td>.76***</td>
<td>.88***</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. SOLO score</td>
<td>.10</td>
<td>-.09</td>
<td>.09</td>
<td>.05</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>6. Project score</td>
<td>.26</td>
<td>-.00</td>
<td>.29*</td>
<td>.23</td>
<td>.76**</td>
<td>-</td>
</tr>
<tr>
<td>7. Course score</td>
<td>.20</td>
<td>.05</td>
<td>.16</td>
<td>.17</td>
<td>.57**</td>
<td>.43**</td>
</tr>
</tbody>
</table>

* * * p < .001 level, two-tailed. ** p < .01 level, two-tailed. * p < .05 level, two-tailed.
Q2: Objective & Perceived Learning

Achievement Measures and Student Perceived Learning Correlations

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. SOLO</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2. Project</td>
<td>.76*</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3. Course</td>
<td>.57*</td>
<td>.43*</td>
<td>-</td>
</tr>
<tr>
<td>4. Student perceived learning</td>
<td>-.04</td>
<td>-.07</td>
<td>-.04</td>
</tr>
</tbody>
</table>

* $p < .01$ level, two-tailed.
## Q3: Perceived Learning & Satisfaction

CoI, Satisfaction, and Perceived Learning Correlations

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Teaching presence</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Social presence</td>
<td>.52**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Cognitive presence</td>
<td>.74**</td>
<td>.55**</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. CoI</td>
<td>.92**</td>
<td>.76**</td>
<td>.88**</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>5. Satisfaction</td>
<td>.57**</td>
<td>.38**</td>
<td>.54**</td>
<td>.59**</td>
<td>-</td>
</tr>
<tr>
<td>6. Perceived learning</td>
<td>.58**</td>
<td>.30*</td>
<td>.71**</td>
<td>.63**</td>
<td>.76**</td>
</tr>
</tbody>
</table>

* $p < .05$ level, two-tailed. ** $p < .001$ level, two-tailed.
The Big A-ha

– No relationship suggested between the CoI composite score and any of the three instructor-assessed learning achievement measures.

– No relationship suggested between any of the instructor-assessed learning achievement measures and student perceived learning.

– Student perceived learning, satisfaction, and CoI were significantly positively correlated.
Implications

Outcome measures influence interpretation:

– Student self-reports of learning and the CoI survey-based measures are best used as approximations of student attitude toward the course, but not of objective measures of student learning achievement.

– Challenges studies that have relied on self-reports.

– Supports findings that self-reports not a substitute for objective measures of achievement.
Implications

Insufficient guidance to instructors:

– As a social-constructivist framework, the CoI “describes a generic educational experience” (Akyol et al., 2009, p. 124).

– As others have suggested, constructivism offers a philosophical framework, but has yet to evolve into a refined theory that describes effective instruction or design strategies (Tobias & Duffy, 2009).
Implications

Direction needed regarding design of interaction:

– What is the optimal design of LL – LT - LC interactions?

– Social presence predicted less than 5% of the variance in perceived learning and was not a predictor of instructor-assessed learning achievement or satisfaction.

– Findings support those who suggest research has not offered sufficient evidence of the instructional value of social interaction (Annand, 2011; Mayer, 2009).
Conclusion

In support the Rourke & Kanuka (2009) critique:

– Research to date has yet to offer evidence that a CoI is related to enhanced learning outcomes.

– With no relationship suggested between the CoI framework and objective measures of learning, the value of the CoI as an educational process model remains challenged.
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References


References


Research Questions

1. To what extent are student perceptions of CoI related to objective measures of student achievement?

2. To what extent are student perceptions of learning related to objective measures of student achievement?

3. To what extent are student perceptions of learning and course satisfaction related to student perceptions of CoI?

4. To what extent are student characteristics, course engagement features, and student course perceptions related to objective measures of student achievement, student perceptions of learning, and student perceptions of CoI?

5. To what extent do designed course interactions contribute to student perceptions of achievement?
Q4: Student Characteristics, Course Engagement, and Course Perception

<table>
<thead>
<tr>
<th>Student Characteristics</th>
<th>Course Engagement</th>
<th>Course Perceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Enrolled course</td>
<td>Difficulty</td>
</tr>
<tr>
<td>Gender</td>
<td>Live session location</td>
<td>Workload</td>
</tr>
<tr>
<td>Prior distance-learning</td>
<td>Live session minutes</td>
<td>Effort</td>
</tr>
<tr>
<td>Computer expertise</td>
<td>Student LMS access</td>
<td>Satisfaction</td>
</tr>
<tr>
<td>Live conferencing proficiency</td>
<td>Instructor LMS access</td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>Predictor(s)</td>
<td>$R^2_{adj}$</td>
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<tr>
<td>------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>SOLO score</td>
<td>Perceived workload</td>
<td>.10</td>
</tr>
<tr>
<td>Project score</td>
<td>Step 1: Enrolled course</td>
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</tr>
<tr>
<td></td>
<td>Step 2: Live session minutes</td>
<td>.40</td>
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<tr>
<td>Course score</td>
<td>Step 1: Prior distance-learning (-)</td>
<td>.10</td>
</tr>
<tr>
<td></td>
<td>Step 2: Student LMS activity</td>
<td>.20</td>
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<tr>
<td>Perceived learning</td>
<td>Step 1: Satisfaction</td>
<td>.58</td>
</tr>
<tr>
<td></td>
<td>Step 2: Cognitive presence</td>
<td>.70</td>
</tr>
<tr>
<td></td>
<td>Step 3: Social presence (-)</td>
<td>.72</td>
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<tr>
<td>CoI</td>
<td>Satisfaction</td>
<td>.34</td>
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<tr>
<td>Social presence</td>
<td>Step 1: Cognitive presence</td>
<td>.29</td>
</tr>
<tr>
<td></td>
<td>Step 2: Prior distance-learning (-)</td>
<td>.33</td>
</tr>
<tr>
<td></td>
<td>Step 3: Live session location *</td>
<td>.39</td>
</tr>
<tr>
<td>Cognitive presence</td>
<td>Step 1: Teaching presence</td>
<td>.54</td>
</tr>
<tr>
<td></td>
<td>Step 2: Social presence</td>
<td>.57</td>
</tr>
<tr>
<td></td>
<td>Step 3: Instructor LMS (-)</td>
<td>.60</td>
</tr>
<tr>
<td>Teaching presence</td>
<td>Step 1: Cognitive presence</td>
<td>.54</td>
</tr>
<tr>
<td></td>
<td>Step 2: Computer expertise (-)</td>
<td>.58</td>
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<tr>
<td></td>
<td>Step 3: Satisfaction</td>
<td>.61</td>
</tr>
</tbody>
</table>
Q5: Perceived Contribution of Class Interactions to Learning

Achievement Measures and Student Perceived Learning Correlations

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>1. Live Session</td>
<td>-</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>2. Readings</td>
<td>.55**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Teacher One-on-One</td>
<td>.65**</td>
<td>.47**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Projects or Papers</td>
<td>.37**</td>
<td>.65**</td>
<td>.44**</td>
<td></td>
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<tr>
<td>5. Online discussions</td>
<td>.36*</td>
<td>.35*</td>
<td>.48**</td>
<td>.35*</td>
<td></td>
</tr>
<tr>
<td>6. Student perceived learning</td>
<td>.59**</td>
<td>.54**</td>
<td>.48**</td>
<td>.49**</td>
<td>.29*</td>
</tr>
</tbody>
</table>

* *p < .05 level, two-tailed. ** *p < .01, two-tailed.
Q5: Results

No significant difference over semester or courses

Stepwise multiple regression analysis:

- 40% of the variance in student perceived learning was explained by students’ perceptions of the learning contribution of (a) live sessions, and (b) papers and projects.

- Yes ... **class sessions** and **homework** were predictors of perceived learning. Go figure!