

## **Project 4**

## **Online Research - Content Analysis of CMC Discussions**

### **Context**

This research project was completed during Fall 1999 through Fall 2001. The project started as an original research paper for the Indiana University course, P600 Interactive Tools for Learning and Collaboration, offered by Professor Curtis J. Bonk. At the conclusion of the course, I continued to pursue this research in collaboration with Professor Bonk and Dr. Noriko Hara. The research culminated in a paper presented at Distance Teaching and Learning 2001 in Madison, Wisconsin and a manuscript in final draft form to be submitted for publication in 2002.

### **Conditions**

This project started as continuing research on COW (COW - Conferencing on the Web), an online collaboration tool used by Professor Bonk in classes at Indiana University. Two years earlier, a similar study was conducted on some of the COW data. I selected a different slice of data, revised the research method to accommodate my specific interests, and conducted the research to meet the requirements of the course. Near the conclusion of the project, Dr. Hara (then a graduate student at Indiana University) contributed a “second readers perspective” to increase the reliability of the results. Professor Bonk offered suggestions on the original research report, and assisted in the preparation and delivery of the presentation at Distance Teaching and Learning 2001.

### **Scope**

This research started as a class paper, developed into a paper presented at a major distance education conference, and is being prepared for submission to journals for publication in 2002.

### **Role**

My primary role was to conceptualize the research, conduct the primary research, and write the resulting paper. I collaborated extensively with Professor Bonk in the presentation at the Distance Teaching and Learning 2001 conference. I am also coordinating final revisions to the paper being prepared for publication.

### **Included Excerpt**

In this portfolio, I have included the proceedings paper and the presentation slides.

## **Online interaction: Just how smart are Starter-Wrapper discussions in the Smartweb?**

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### **Abstract**

This study analyzed the on-line discussions that took place during an introductory educational psychology course in the teacher education program at a large Midwestern American university. Thirty pre-service teachers, from both elementary and secondary education programs, engaged in weekly asynchronous discussions focused on assigned readings in educational psychology. Implementing a socio-cultural approach designed to create a student-centered social learning environment, the course instructor structured the discussions using the starter-wrapper format. The starter-wrapper format required each student to assume the role of discussion starter and the role of discussion wrapper at least once during the semester. During other weeks, students post at least one message discussing concepts from the week's assigned readings. Henri's (1992) model for content analysis was modified to fit the needs of this study. A comprehensive coding was developed and used by two independent coders. Research questions explored the use of text and peer referencing in student discussions, the use of social cues in messages, and the level of cognitive processing evident in the messages. Most messages were evaluated as cognitively 'deep' even though there was, on average, more than one social cue per message throughout the discussion. Overall, the amount of peer referencing decreased throughout the semester and the amount of authoritative referencing increased throughout the semester, providing evidence that students were using warranted discussion skills more as the semester progressed.

### **Background and Literature**

#### ***Sociocultural Learning***

Vygotsky's approach to understanding learning as a social process (Vygotsky, 1978) has been used to design and implement many online learning environments that facilitate socially negotiated learning (Bonk & King, 1998). A social learning environment using Vygotskian sociocultural principles takes advantage of both student peers and the instructor to provide scaffolded instruction at various intellectual levels (Hedegaard, 1990; Vygotsky, 1978). Since the entire class learns in individual (and overlapping) zones of proximal development, one of the key attributes of this environment is allowing for each student to engage in discourse at the appropriate level. Requiring the entire class to engage in a weekly CMC discussion provides discussion posts on the same topic at a variety of intellectual levels, along with opportunity for further questioning in a participative, dialogic manner. The online social learning environment also engenders the development of social interactions and relationships that are different than the relationships that might be formed in a solely face-to-face class (Walther, 1996).

#### ***Use of Starter-Wrapper Discussions***

Several recent studies have explored the use of CMC in both graduate and undergraduate educational psychology courses (Bonk, C.J., & Dennen, V., 1999; Hara, N., Bonk, C.J., & Angeli, C., 2000). These studies have explored effective student-centered learning environments created using web-based CMC tools. Some of these studies have used content analysis of discussion posts as a primary tool to understand student learning, and one study has reported the

characteristics of on-line student interactions in a graduate level Educational Psychology class using the starter-wrapper discussion format (Hara, Bonk, & Angeli, 2000). Hara et.al. described the interactions and level of discourse they found in the weekly discussions among graduate level educational psychology students. Students were found to post messages that were cognitively deep, embedded with peer references, and lengthy in general. Hara et.al. also reported indications that this was a student-centered learning environment.

In the starter-wrapper discussions, each student was required to post at least once each week. As Harisim (1990) pointed out, and every instructor who has used on-line conferencing for class discussion is no doubt aware, students do not regularly participate in on-line discussions unless the course structure requires them to. Accordingly, in this class, their weekly participation contributed to their final class grade. Indeed, in this class, their weekly discussion participation was required, since there were no face to face meetings for most of the semester. An instructor invitation and a student 'starter' post began the discussion each week. The starter post was intended to provide a summary of the main concepts in the assigned reading for the week. The other students were expected to comment upon the most interesting aspects of the week's readings after the starter began the discussion. At the end of the week, another student was assigned the role of 'wrapper.' The wrapper post was intended to provide a summary of the main points of conference discussion for the past week. In addition to the weekly discussion invitation, the instructor also contributed an additional 'wrapper' post most weeks. This intention of this post was to model effective discussion weaving for the student wrapper. Some weeks, the student wrapper did not complete their task by the end of the assigned time period, so the instructor's wrapper post provided the final post for the week. (All student wrapper posts were eventually completed, though some were not completed until several days after the week ended.)

### **Method**

We looked at five weeks of a twelve-week conference, analyzing student posts in both the Elementary and Secondary groups. We chose a regular pattern of weeks so that we could look for trends over time. At the outset, we looked at all the posts in the discussions, both students and instructor. We decided not to include the instructor's posts, starter's posts, or wrapper's posts in our analysis, since we were more interested in the non-programmed discussions of the students throughout the conference. (The format of the instructor's, starter's, and wrapper's posts was very similar from week to week.) This provided approximately 165 student posts (some students posted more than once to a particular discussion) to analyze, approximately 50% of the total for the course.

### ***Unit of Analysis***

The unit of analysis in this study varied for the different analyses we conducted. For the participation and surface vs. depth of processing analyses, the unit of analysis was an individual post. Each post was treated as a separate unit, regardless of by whom it was posted. An exception to this was made in the case of several early posts that were clearly identical repeating posts, posted in error. Repeated posts were coded once only.

The entire message as a unit did not provide the level of granularity we desired for the other analyses in this study, however. For the amount of referencing (both text and peer referencing) and amount of social cuing analyses, we needed to count each occurrence of either a reference or use of a social cue. As our analysis progressed, it became obvious that one student post could contain multiple references to texts and peers as well as more than one use of a social cue. Therefore, we decided to use each occurrence of either a text or peer reference or the use of a social cue as the unit of analysis for these measures.

### ***Content Analysis***

For this study, we chose to implement a modified version of the tool developed for content analysis by Henri (1992). The original tool provided for analysis of five key dimensions of analysis in online discussions: participation, interaction, social cues, cognitive skills, and depth of processing. We decided to look specifically at Henri's dimensions of participation, interaction, social cues, and depth of processing. In-depth processing occurs when learners critically evaluate information, organize it conceptually, and compare and contrast it with previously held understandings. In addition, we also looked for patterns of student references to their assigned readings (text) or other authors. One of the important emphases in the course discussions, both online and face-to-face, was to develop in students the skill of supporting their own beliefs and thoughts with citations from authoritative sources.

### ***Multiple Coders***

In order to improve the accuracy and reliability of our coding, two researchers coded each message independently. Then, the researchers met to discuss the results. For the referencing (both text and personal) the coders found over 90% agreement. Social cue coding agreed at greater than 80%. Initially, the agreement on depth of processing was only about 60%. The two researchers discussed each post and reached consensus on over 95% of the posts. The remaining 5% of the depth of processing coding decisions were judged by an independent third coder.

### ***Quantitative Analysis***

The quantitative analysis consisted of several different analyses. One analysis used simple descriptive statistics to determine the pattern of student participation over the semester. We completed a word count for each post to determine the average length of each student post. Another analysis determined the ratio of deep to surface cognitive processing posts for each discussion. This provided a number representing the relative amount of deep processing compared to surface-only processing. Finally, the occurrences of social cuing or referencing (text or personal) were summed by post and averaged for each discussion. Comparisons were made for all three analyses (depth of processing, referencing, and social cuing) by time in semester, plotting the processing ratio or average number of occurrences by discussion week. In addition, a simple graphical comparison of all three analyses was made between the Elementary and Secondary discussion groups as the semester progressed.

### ***Coding Guide***

Each student message was coded along three major dimensions; depth of cognitive processing, the presence of social cuing, and referencing other texts or peers. In-depth processing occurs when learners critically evaluate information, organize it conceptually, and compare and contrast it with previously held understandings. This is thought to occur when learners translate new information into their own terms, for example connecting it to their own lived experiences (Henri, 1992, p. 130). Social cues are identified throughout a message, and reported as an aggregate number for each message. The social element of a conference message can be defined as any statement or part of a statement not related to the formal content of subject matter or the metacognitive process of the message author. Previous studies have suggested that the importance of social dynamics in computer conferencing cannot be ignored (Henri, 1992; Kuehn, 1994; Rice & Love, 1987; Walther, 1996). Referencing is defined as citing or referring to another source of content information, subject matter, or discussion participant. Text referencing may follow a traditional citation format, or may use a more informal approach, simply referring to a text or author without page numbers or year of publication. References to other discussion forum participants include both the name of the referred and the specific topic or statement that is being referred to.

## **Findings**

### ***Participation***

Most students participated every week of the semester. Overall, student participation averaged 90%, with approximately two-thirds (20 of 31) of the students posting in each week of the study, and approximately one-third (10 of 31) posting more than once in at least one discussion. The number of words per message varied in the range of 300 to 500 words from week to week, with no distinguishable pattern over time. The posts in the Elementary discussion tended to be slightly longer, however, averaging 436.2 words overall compared to the Secondary discussion post average of 364.1.

### ***Cognitive Depth and Social Cues***

Most posts (77%) in both discussions contained elements of cognitively 'deep' thinking (Henri, 1992) even though there was, on average, more than one (1.4) social cue per message over the five weeks of discussion posts. On average, there were 19.2 posts each week that contained evidence of deep cognitive processing, and only 5.6 posts that seemed to contain only surface cognitive processing. The ratio of depth to surface messages varied from a low of 1.9 in Week 6, the midpoint of the study, to a high of 7.0 in Week 8. No significant or consistent differences were found in discussion depth vs. surface comparisons between the Elementary and Secondary pre-service teacher groups.

The use of social cues was consistent throughout the study. In each group, posts averaged more than 1 social cue throughout the semester, with a low of 1.21 social cues per message for the Secondary group week 6 discussion, and a high of 1.95 cues per message in the Elementary discussion of week one. It is very possible that the students were still using formal discussion patterns, with polite social openings and closings to posts, early in the semester. We did not specifically code for this use of social cues, however.

### ***Referencing Authorities and Others***

Overall, the amount of peer referencing decreased throughout the semester from an average of .70 references per message in Week 2 (the first week of study) to .53 references per message in Week 10 (the last week of study). The amount of text referencing increased throughout the semester, from an average of approximately 0.4 references per post in Week 2, to approximately 0.7 references per post in Week 10. This may have been due to instructor modeling or encouragement. The amount of both peer and text referencing was generally greater among the Elementary group than among the Secondary group.

### **Implications**

The amount of text citation increased considerably, while conversely, the amount of peer referencing decreased consistently over the course of the semester. Perhaps this was due to the modeling of authoritative justification evident in instructor posts. Occasionally, we noted the instructor praising one or more students who had incorporated text citations into their own posts. It seems that a combination of scaffolding strategies can be effective in helping undergraduate students develop citation skills.

When compared to the findings of Hara et al. (2000), a study of discussion patterns in a graduate level educational psychology course, we found similar patterns of cognitive depth (approximately 70% of messages). It seems that undergraduate students are at least as capable and willing to use their cognitive skills in their posts as are graduate students. Another similar finding to Hara et al. (2000) is the decrease in the presence of social cues in messages over the course of a semester. Perhaps, as a semester progresses, students become more task focused and include less social cues in their posts, even though they may actually know their fellow students better than before. The overall consistent use of social cues throughout the semester (average of more than one per post in each week, in both groups) may be an indicator of social interaction expected in a participative discussion, a characteristic of a sociocultural learning environment.

### ***Further Research***

Further studies could explore the relationship between social cues and metacognitive statements, explore whether the on-line discussions help the development of a sense of community, and explore more comprehensively the combination of face-to-face and on-line interactions and content-focused discussions that occur in distributed learning environments. Research such as this is important since it extends previous findings with graduate students to the undergraduate arena. If we can find ways to bolster the intellectual interactions of students online, no matter what their domain or level, such research will contribute to improvement of pedagogy in the use of WWW for education.

\*A full paper with tables and figures is available. Please send your request to [bjbeatty@indiana.edu](mailto:bjbeatty@indiana.edu).

### References

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### Biographical sketches

**Brian Beatty** is a doctoral candidate in the Instructional Systems Technology department at Indiana University Bloomington. His areas of research interest include social interaction in online learning, content analysis of CMC discussions, and the use of assessments in varied online learning environments. He is also a Director of Course Development at Unext, creating online courses for academic and executive education programs. Brian holds an M.A. in educational technologies from San Francisco State University, and a B.S. in electrical engineering from Marquette University.

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**Curt Bonk** is an associate professor in the Counseling and Educational Psychology and Instructional Systems Technology departments at Indiana University Bloomington. Professor Bonk is also a core member of the Center for Research on Learning and Technology within the School of Education, and the president and founder of CourseShare.com. He has been a visiting scholar in Finland, Canada, and Australia, and is currently a Senior Consortium Research Fellow with the Army Research Institute. Curt holds a Ph.D. and M.S. in educational psychology from the University of Wisconsin-Madison, and a B.A. in accounting from the University of Wisconsin-Whitewater.

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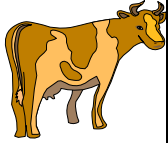
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Slide 1

Online Interaction ... 

Just how smart are Starter-Wrapper  
discussions in the Smartweb?  
August 9, 2001

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Slide 2

Introduction

- Learning assumptions
- What is the Smartweb?
- Starter-wrapper discussion format
- Context of the study
- Methods used
- Findings
- Implications

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Slide 3

**Learning assumptions**

- Sociocultural learning theory says ...

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Slide 4

**What is the Smartweb?**

- Undergraduate educational psychology

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Slide 5

## Starter-wrapper discussions

- Student-centered discussion
- Multiple roles for students
  - Starting a discussion
  - Contributing
  - Wrapping a discussion
- Instructor's role
  - Facilitate
  - Model

Slide 6

## Study context

- Thirty undergraduate students
  - Pre-service teacher program
- Class meets online, with two exceptions
- Students read cases, text, and then discuss online.
- Participation requirements

Slide 7

## Research Questions

- How often do social cues occur?
- How often do expert references occur?
- How often do peer references occur?
- Does discussion depth vary between elementary and secondary pre-service teacher groups?
- Does discussion depth vary between teacher groups?

Slide 8

## Study Methods

- Five weeks of discussion (2, 4, 6, 8, 10)
  - 165 student posts
- Two discussion groups – elementary and secondary pre-service teachers
  - N=15 for each
- Content analysis
  - Modified framework (Henri 1992)

Slide 9

## Content analysis

- Five dimensions
  - Participation – simple count
  - Depth of of cognitive processing - Surface vs. deep
  - Social cues - presence
  - Interaction – referencing peers
  - Referencing experts – text citations
- Multiple coders

Slide 10

## Surface vs. Depth

- Surface
  - Repeating information, adding no new elements to discussion
  - Proposing solution without explaining, making judgments without justification
- Deep
  - Justifications, explanation, original elements of discussion, linking previous ideas, providing proof or supporting examples

Slide 11

## Social cues

- Post openings – “Wow, all of this psychology stuff just blows right over my head ... fancy mumbo-jumbo ... eek!”
- Personal statements – “I’m feeling great ...”
- Apologies – “Sorry everybody, I am the discussion starter and I didn’t realize it! Oops!”
- Jokes, compliments, emoticons, verbal support

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## Referencing peers

- “Melinda mentions that it’s easier to ...”
- “I agree with George that incentives can definitely do ...”
- “... in reply to Nancy’s comments about teacher’s jobs ...”

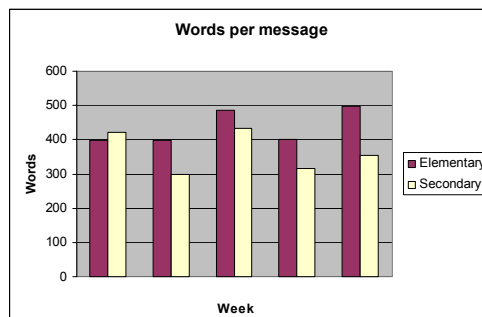
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## Referencing experts

- Formal citations
  - “Learners must individually discover and transform information if they are to make it their own (Slavin, 270)”
  - “They are listed and explained in depth on pages 278-279.”
- Informal references
  - “... the different teaching techniques as described in Slavin, but ...”
  - “I don’t think teachers should ... as the Slavin book pointed out.”

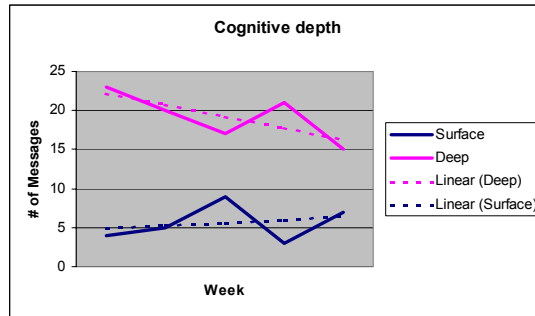
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## Findings: Participation



Slide 15

### Findings: Cognitive depth

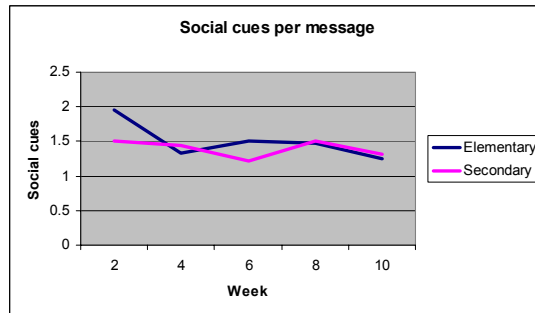


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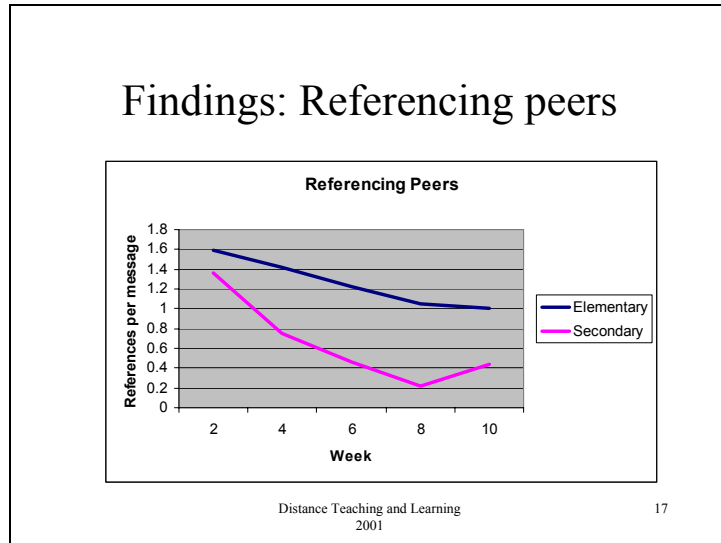
### Findings: Social cues



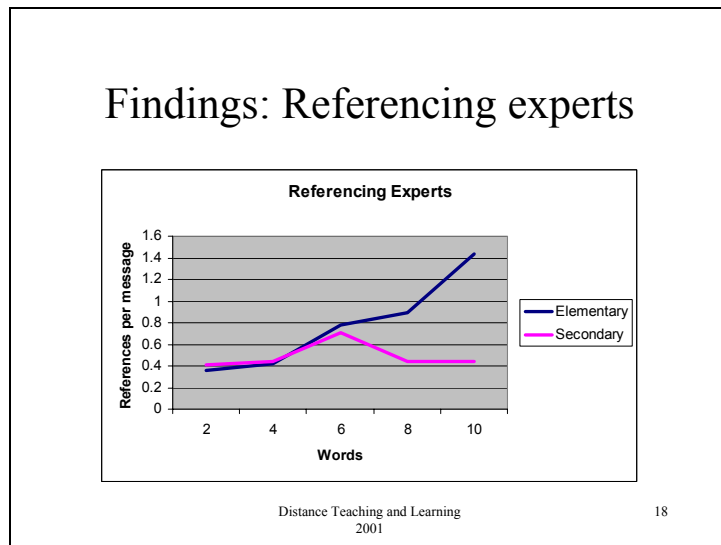
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## Implications

- Comparison to related research
  - Hara, Bonk, & Angeli 1999
  - Bonk, Fischler, & Graham 2000
- Further studies
  - Measuring the impact of instructor modeling through content analysis
  - Others?