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Online Social Interchange, Discord, and Knowledge Construction

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Abstract

Online forums provide potential for new forms of collaborative work, study, and community that reduce barriers of time and distance. Yet the types of interaction and means by which individuals create new knowledge in online environments are not well understood. This study presents the results of an exploratory multimethod evaluation study and transcript analysis of an online forum. The researchers used a constructivist interaction analysis model developed by Gunawardena, Lowe, and Anderson (1997) to help understand and assess online learning. The model describes the phases that are attributed to learning development in an online forum. Analysis of the transcripts revealed that most of the online interactions during the forum were at the lower phases of the interaction analysis model. In addition, the researchers studied the interaction patterns that occurred during the online forum. Social-cognitive processes were observed among participants in the forum. The processes included significant time engaged in social interchange followed occasionally by social discord. The social discord served as a catalyst to the knowledge construction process observed. The results of the study illustrate that there are many types of

structures, motivations, and applications of online interaction that make the understanding of this communication medium both challenging and exciting.

Abstract

La conférence électronique est une application technologique qui peut susciter des formes inédites de travail et d'apprentissage collaboratifs, de même que de nouveaux types de communautés, en réduisant les obstacles que représentent le temps et la distance. Cependant, les types d'interaction et les modes de construction des connaissances adoptés par les usagers des environnements virtuels sont encore mal compris. La présente étude rapporte les résultats d'une étude d'évaluation préliminaire appliquant plusieurs méthodes d'analyse aux interactions et à la transcription d'une conférence électronique. Les chercheurs ont appliqué un modèle constructiviste d'analyse des processus d'interaction, proposé par Gunawardena, Lowe et Anderson (1997), pour tenter de comprendre et d'évaluer l'apprentissage en milieu virtuel. Ce modèle décrit les phases attribuées au développement de l'apprentissage au cours d'une conférence électronique. Une analyse des transcriptions révèle que la plupart des interactions électroniques au cours de la conférence se situaient aux niveaux inférieurs du modèle d'analyse des interactions. Les chercheurs se sont également penchés sur la configuration des interactions au cours de la conférence électronique. On a pu observer des processus sociocognitifs entre les participants, notamment un temps significatif accordé à des échanges sociaux, suivis à l'occasion par une discorde sociale; celle-ci servait de catalyseur au processus de construction des connaissances. Nos résultats illustrent le fait que les types de structures, de motivations et d'applications de l'interaction électronique sont multiples et

> font de celle-ci un objet d'étude à la fois
> exigeant et stimulant.

Introduction

In a previous study (Anderson & Kanuka, 1997), we demonstrated that online forums have the potential to become an important medium for continuing professional education and group collaboration. Building on these results, this study focused on understanding and assessing the learning that occurred during an online forum using a constructivist learning model developed by Gunawardena, Lowe, and Anderson (1997).

The Forum

The computer-mediated conference (the forum) investigated in this study was designed to create a professional development learning space and lead to the development of an online community. The Office of Learning Technologies (OLT), Human Resources Development Canada, funded the forum and its evaluation. (The report submitted to OLT is available online at http://www.atl.ualberta.ca/papers/OLT/OLTreport.htm.) The forum had the following objectives:

1. To expand the knowledge base relating to operations, funding, and planning of workplace learning centers.

2. To add to knowledge about the current and planned use of learning technologies.

3. To heighten awareness on the part of the participants about the potential of learning technologies, including online conferencing.

4. To share knowledge among participants from across the country and to develop a network among OLT stakeholders.

To meet these objectives, a three-week forum was organized with participation restricted to 25 invited managers of workplace learning centers located across Canada. Invited participants were from both large and small, public and private companies that have a focus and/or full-time staff employed in Canadian workplace learning centers. Workplace learning centers generally serve as a focus and facilitation center for a variety of corporate training and professional development activities. The forum was supported on an asynchronous, World Wide Web-based computer conferencing system (Caucus™) accessible via the Internet.

The Caucus™ software organized discussion messages by topics. All 252 forum messages were associated with the policy and practice of management in workplace learning centers. Table 1 shows the 15 topics

in the forum by title.

To support the conference, technical assistance was provided through the Network for Ontario Distance Education (NODE), and a moderator was contracted to stimulate and guide the discussion.

Literature Review

The online forum represents a complex learning environment in which group collaboration is practiced in a technologically mediated environment. The resulting interaction between individuals using different learning theories, styles and activities, and technologies can lead to the creation of vibrant communities of learners (Anderson, 1996). This review briefly outlines some of the literature relevant to this new learning milieu.

Constructivist Learning Theory

According to constructivist learning theories, how we construct knowledge will depend on what is already known. What we know depends on the kinds of experiences that we have had and how we have come to organize these into existing knowledge structures. A variety of labels are used to describe similar concepts inherent in many constructivist learning theories (e.g., generative learning, embodied cognition, cognitive flexibility, situated learning, educational semiotic, and cognitive apprenticeship). Behind the labels are several epistemological positions underpinning constructivist learning theories. The essential difference between each position relates to what constitutes a perception of reality and how this perception is created and maintained. Common to each position is that (a) we construct knowledge based on what we already know, and (b) learning is an active rather than a passive process.

There are two widely accepted constructivist learning theories: *critical constructivism* and *social constructivism*.

Critical constructivism assumes that knowledge is constructed as an integration of internal contradictions resulting from environmental interactions. It is not unlike the theory of *cognitive dissonance* (Carson, Butcher, & Coleman, 1988) or Schmidt's (Belkin, 1982) *cognitive restructuring*, or even Mezirow's (1990) *perspective transformation*. These are existing theories of learning that are essentially concerned with changes that occur as a result of new knowledge that is internally contradictory. Contradictions drive us to construct knowledge by conceiving of phenomena that lead toward greater understanding of unspecifiable complexities of organization and abstraction (Young, 1997). In this view, there is an objective universe that we aspire to understand.

The other prevalent position is *social constructivism*. This position is currently the most accepted epistemological position associated with online learning. In this view, the assumption is that knowledge is grounded in the relationship between the knower and the known. Knowledge is generated through social intercourse, and through this interaction we gradually accumulate advances in our levels of knowing. Vygotsky, a Russian psychologist and philosopher in the 1930s, is most often associated with social constructivism. Vygotsky (1978) emphasized the influence of cultural and social contexts in learning. In this view, we construct meanings actively and continuously in a social context (Young, 1997). Meanings emerge from the patterns of our social experiences that occur over time in a contextual, situated, and continually changing synthesis. Social constructivism, sometimes referred to as symbolic social interaction, uses conversational language for negotiation of meaning and conceptual delimitations. How we construct knowledge, in this position, is based on our social experiences where "the mind is instrumental and essential in interpreting events, objects, and perspectives on the real world, and that those interpretations comprise a knowledge base that is personal and individualistic" (Jonassen, 1991, p. 29). This position, according to Young (1997), views knowledge construction as a kind of *narrative* where "human beings who live in language, live in a *multiverse* rather than a universe" (p. 250). In this view, we all have a different understanding of the external world based on our individual experiences and beliefs about those experiences (Jonassen, 1991).

Constructivist learning theories are becoming widely accepted in all fields of education, including the application of technology to teaching and learning. This interest is related to the capacity of the computer to provide an interactive environment that creates "an effective means for implementing constructivist strategies that would be difficult to accomplish in other media" (Driscoll, 1994, p. 376). The use of computers and telecommunications technology supports this social construction of knowledge while simultaneously creating an archive of this interactive process (the online transcripts).

Models of Online Learning

Unique among forms of group interaction and collaborative learning is the automatic creation of the text-based archives or transcripts of interactions that make up the online forum (Harasim, Hiltz, Teles, & Turoff, 1995). Analysis of these transcripts provides a powerful tool to understand online learning. Various researchers have developed models and tools to facilitate this analysis, although there are as yet few publications in which these tools have been applied to actual online conferences.

Levin, Kim, and Riel (1990) describe a quantitative method of analyzing the structure and content of online interactions by the creation of

message maps that graphically display the interrelationships among the messages submitted to a conference. Levin et al. used this analysis to identify *threads* within a conference and to display the multithreaded nature of the conference interaction. In addition, they observed that some messages were particularly influential in producing numerous responses or lengthy sequences of responses. Unfortunately, the message maps often form confusing structures of threaded message archives as participants build on previous contributions that are hierarchical but nonlinear. The end result is that the value of the threading feature is limited simply to viewing the interrelationships of various messages.

Perhaps Henri (1992) has developed the most sophisticated cognitive analysis model for online interaction. She delineated four dimensions related to the quality of the messages:

1. Content that reflects the social dimension of conference interchanges.

2. Content relating to the interactive dimension of the conference.

3. Content indicating the application of cognitive skills.

4. Content showing metacognitive skills.

Henri (1992) also defined a fifth category related to the quantitative posting rate of the participants; this dimension is defined as the compilation of the number of messages or statements transmitted by one person or group.

Gunawardena, Lowe, and Anderson Model

Although Henri (1992) provides a sophisticated framework for cognitive analysis, shortcomings have been identified. Henri's model is based on a teacher-centered instructional paradigm, and as Gunawardena et al. (1997) note, such a paradigm is inappropriate in a constructivist environment where learning is based on the shared construction of knowledge. Gunawardena et al. therefore proposed the constructivist model of content analysis, which has been applied to this study. They theorized that the active construction of knowledge moves through five phases, and that although every instance of socially constructed knowledge may not progress linearly through each successive phase, they are nonetheless consistent with much of the literature related to constructivist knowledge creation. Based on these phases, a model was developed that could be used to analyze the construction of knowledge (constructivism) in computer conferencing transcripts.

Summarized, the phases are as follows.

Phase I. Sharing/comparing of information. In everyday transactions, this might take the form of ordinary observations, statements of problems, or questions. This phase may include an observation, opinion, agreement, corroborating example, clarification, and/or identification of a problem.

Phase II. Discovery and exploration of dissonance or inconsistency among the ideas, concepts, or statements advanced by different participants. This is defined as an inconsistency between a new observation and the learner's existing framework of knowledge and thinking skills. Operations, which may occur in this phase, might include identification of differences in understanding of terms, concepts, schemas, and/or questions to clarify the extent of disagreement.

Phase III. Negotiation of meaning and/or co-construction of knowledge. This phase includes negotiation or clarification of the meaning of terms, identification of areas of agreement, and proposal of a compromise or co-construction.

Phase IV. Testing and modification of proposed synthesis or co-construction. Events that occur in this phase include testing against an existing cognitive schema, personal experience, formal data experimentation or contradictory information from the literature.

Phase V. Phrasing of agreement, statement(s), and applications of the newly constructed meaning. This phase encompasses summarizing agreement(s) and metacognitive statements that illustrate new knowledge construction and application.

Method

The research study focused on the analysis of data obtained from participants in the online forum. We read postings, but did not participate in the forum. At the end of the two-week forum, an online survey was distributed to all participants and a transcript analysis was undertaken. Finally, a telephone survey was conducted with a stratified sample of participants.

Results

Survey instrument. Before participating in the online forum, all participants were asked to submit a consent form to one of the researchers using e-mail. No one refused. The online survey was completed by 11 of the 16 active participants giving a return rate of 69%. We did not investigate why five participants did not complete the survey, although all participants were busy individuals and the time required to complete the survey may have been a deterrent. The survey

consisted of 27 Likert scale questions, four demographic questions, two questions related to time spent online during the forum, and four open-ended questions. The 5-point Likert scale questions (where 1 is strongly disagree and 5 is strongly agree) asked participants to indicate their agreement with statements related to three areas of investigation: construction of knowledge, creation of learning communities, and technical issues.

The first part of the online survey (Table 2) related to the perception of the learning environment by participants during the online forum. The responses indicated that the forum was perceived by the participants as successful in providing opportunities for reflection and exposure to multiple perspectives on topics that were relevant to the participants. There seemed less agreement, however, with the notion that the forum provided opportunity for application of new knowledge and deeper understanding of the issues.

The last part of the online survey was designed to collect demographic information about the participants. Analysis of the data showed that the respondents were in two major age groups: those over 45 and those under 30. Technically, the respondents were a sophisticated group of computer users. Ten of 11 respondents described themselves at the good or expert level of computer experience.

The open-ended questions in the survey provided the respondents with an opportunity to make general comments. This produced a variety of suggestions, comments, complaints, and compliments related to the forum experience. One theme that emerged was the value of *finding out what others are doing, making contacts*, and other functions normally associated with face-to-face conferences and meetings. A second theme was a sense of disassociation with other forum members. Comments illustrating this included *sometimes difficult to identify with others, did not discover similar experiences*, and *could not always relate to others*. These comments reflect a perceived lack of community perhaps caused by the low social presence engendered by only three weeks of sporadic interaction in a text-based environment.

Telephone Interview. The online survey was followed by a semistructured telephone interview with seven participants. We chose participants from the following three categories based on participation: (a) active participation in the online forum (7-15 postings); (b) moderate participation (3-6 postings); and (c) low participation (0-2) postings. We attempted to contact three forum participants from each of the categories. We were unable to contact two of the nine participants; the seven who were contacted agreed to an interview: three who had actively participated, one who had moderately participated, and three who had low participation.

All participants acknowledged that the forum was of value. Responses

included sharing of ideas, flexibility, ability to discuss with peers and discover what others are doing, acquisition of a bank of people to contact in the future, and not being forced to listen to everyone's comments as in face-to-face settings.

Transcript analysis. To make sense of the data, we unitized and categorized the postings from the online forum. The unitizing process involved a coding operation that separated the participants' online interactions (postings that fell in phases I through V) from other postings, such as the moderator's summaries or other general announcements. To categorize the postings, we analyzed and assessed each posting based on the interaction analysis model and then placed each posting in one of the phases. After the postings had been categorized, we observed patterns that had emerged in the interaction analysis model.

The transcript analysis procedure consisted of reading each message and assigning it to one or more phases. A message that contained two or more distinct ideas or comments was coded in two or more phases (the messages were coded independently by both researchers). Discrepancies were discussed, and a single coding was determined from these discussions.

Table 3 shows the first coding sheet we used to categorize the online transcripts, as well as the total number of messages coded to each category (or *phase*). What is immediately apparent from the transcript analysis and coding (Table 3) using the Gunawardena et al. (1997) model is the overwhelming number of messages coded to the first phase (Phase I: Sharing/Comparing) of knowledge construction. However, in determining the allocation of messages to the phases, we had not always been comfortable with the arbitrariness of some of the assignments and felt modifications to the theoretical framework with respect to the five phases were required. This led us to expand the investigation to include grounded theory methodology.

Grounded theory. We used grounded theory data analysis methods (Strauss & Corbin, 1994) to investigate the observed patterns of interaction between and among the participants. Grounded theory provided a useful collection of strategies (such as constant comparison and analytic meaning) when little is known about a phenomenon—as was the case in this study where the focus was to investigate knowledge construction and social interaction in an online environment. Using grounded theory, we reassessed and then recategorized the postings. When we thought that new categories for the online postings were exhausted, rules were constructed that defined which postings should be included or excluded from each category and a new coding sheet was developed. This process is called the constant comparative method (Glaser & Strauss, 1967) and required us to do many revisions, modifications, and amendments until all the postings were placed into

appropriate categories and further analysis did not provide new information or insights. During the constant comparison process, a new pattern emerged from the transcript analysis (Table 4). These two new categories were generated from the data: social interchange and social discord and knowledge construction.

Social interchange. Before we describe social interchange, it should be made clear that it is not the same as social constructivism, although there are similarities. As discussed in the literature review, social constructivism assumes that language is used for negotiation of meaning and conceptual delimitations. Most of the online interactions did not appear to happen in this manner. That is, there was little evidence of negotiation of meaning resulting in new knowledge construction. Rather, most of the online interaction was an acquisition of information that was compatible with existing knowledge, thereby increasing the participants' overall knowledge base. In this type of interaction, additional information was acquired, but the basic structures of the participant's views remained unchanged. We refer to this type of interaction, where information is exchanged between online participants, as *social interchange.*

Following are examples of social interchange that occurred in the online forum. Examples #1a and 1b illustrate interaction typical of the online forum where information is exchanged between participants. This type of learning adds to the overall knowledge about the subject being discussed, but there is no evidence that the basic structure of the participants' perspectives has been changed.

Example #1a

Participant 1

We're just starting to look into linking our courses with universities and colleges.... how did you begin the process?

Participant 2

We first tracked down all of the professional organizations linked to every area of our business. If you'd like I can post this list or mail it to you …

Participant 1

Hi … I would really appreciate that list.

Example #1b

Participant 1

Another training management system I've only just discovered is AdminSTAR by Turn-key Training Technologies Inc …

Participant 2

Thanks for the lead … I just downloaded the AdminSTAR demo, I'll check it out later this evening.

At times online discussions moved in ways that could have resulted in the construction of new knowledge. Example #2 is an illustration of a thread of postings where there are inconsistencies between the participants' views of what ". *great manager is*"; however, notice that there is no public acknowledgement between participants that there are inconsistencies between views on this topic.

Example #2

Participant 1

I can't help feeling that a great manager would be in constant communication with his/her employees to indicate how the job is shifting focus …

Participant 2

We find they are just too busy to know exactly what each employee is achieving on a day to day basis. I am talking about a manager with 50-60 direct reports. Overall—my point is whether daily performance improves because of some intervention is better gauged by the employee himself and—or his direct clients.

Participant 3

We ask managers because we want them to develop the supporting habit of knowing the answer to those questions … even if at first they don't. The fact that we ask about the learning progress and changes in job performance promotes an interest in tracking their employees, and to make an effort to couple job assignments with a need to learn …

Participant 1

Managers need to learn to develop employees themselves. Whatever method works, use it. As you said, it is different in different organizations.

The result is a discussion that lacks the kind of fluidity that occurs in conversational language where knowledge construction is a process of

constant evolution based on social interaction and meaning negotiation. The lack of communication by the participants to clarify and discuss inconsistencies results in a nonfluid and nonsequential discussion. Thus, although there are conflicting or inconsistent views on the topic discussed, it is still an exchange of information between participants, and existing paradigms appear to remain unchanged.

As mentioned, online social interaction is *similar* to the social constructivist learning theory; however, as example #2 illustrates, meanings (i.e., *what is a good manager*) were not negotiated through the text in a format that is similar to conversational language in the social constructivist learning theory. In conversational language, the conceptual inconsistencies of *what is a good manager* would be discussed, clarified, and delimitations about the focus would be stated. Rather, inconsistencies were left unchallenged, and changes of topic focus and concepts were not negotiated as they would be in a conversational language. Overall, most of the information-sharing that occurred online resulted in a broadening of the participants' general knowledge base that was in some way useful in their working environments, as is evident in Examples #1a and 1b.

It should be noted that individual participants might be processing information internally in a reflective manner but not sharing these thoughts with other participants. The asynchronous nature of conferencing environments can be an effective stimulation to this type of internal knowledge creation. However, this kind of individual processing was not shared and allowed to grow in the social context of the conferencing environment and thus was invisible both to the other participants and to us. This study (and perhaps all but the lowest level of physiological investigation) examined only the externally revealed thinking and assumes that the postings are a reflection of the internal thinking that occurs. We acknowledge that there is much additional internal processing that is not documented in this study.

Social discord and knowledge construction. We also observed that occasionally new knowledge was constructed as a synthesis of contradictions resulting from social interchanges. As discussed in the literature review, critical constructivism assumes that knowledge is constructed as an integration of internal contradictions resulting from environmental interactions. Interaction occurred, albeit infrequently, in the online forum that was comparable to critical constructivism. Specifically, there were a few instances of interaction between the forum participants that involved inconsistencies or contradictions in information and/or ideas that resulted in a new or changed perspective. The contradictions between the forum participants were similar in nature to *cognitive dissonance* (Carson et al., 1988).

According to Carson et al. (1988), when new information contradicts existing assumptions, an unpleasant state of tension occurs. To remove

this state of discomfort, new information is either assimilated in a distorted manner to fit with the existing belief system or ignored. We observed that when contradictory ideas were shared, the information did not appear to be assimilated in a distorted manner; rather, when many of the forum participants experienced information contradiction, there was a tendency to ignore it (as Example #2 illustrates). It seems that the relative anonymity and asynchronous nature of online conversation makes it much easier to ignore conflicting information in online discussions than in conversational language. It was also observed that those forum participants who chose to pursue an understanding of the contradictory information followed a pattern that included clarification of the inconsistent information that can be best described as a *discord* discussion—closely resembling Phase II of the interaction analysis model. This type of discussion included contradictory or inconsistent opinions that resulted in a new or changed perspective. When knowledge was constructed in the online forum, it was through discord discussions resulting in changed or new paradigm structures. Thus social discord served as a catalyst to the knowledge construction process observed.

Following is a thread of postings from the online forum that provides an example of a discord discussion. The first posting by the moderator asks for an opinion and information. The second posting by participant 1 provides the information and offers an explanation. The following two postings by participant 2 and participant 3 agree with the problem cited by participant 1, but disagree with the explanation provided by participant 1. The last posting by participant 1 states that as a result of exposure to the different points of views of the forum participants, he had gained new understandings of the issues.

Example #3

Moderator

As I recall, your plan was to bring managers through while you were doing the technical testing in Phase I so they could start seeing how online learning could provide them with some practical solutions. Has that been a successful strategy?

Participant 1

The toughest sell is, we've found, the middle managers. They already have work systems in place. This type of change impacts them greatly. They have to rethink their entire work flow, employee relationships and reporting mechanisms, etc. This is a BIG headache for them. They can be tough to convince of the benefits of Intranet and an Online learning Institute. They can put up big barriers.

Participant 2

Managers resisting technology based learning: Depends on their age and their habitual learning style. When under pressure to produce a result that requires learning new skills, many managers only know from their personal years of experience that instructor led training can be relied upon to work quickly. They see sitting in front of computers as "not real training" because they don't know how to support the process. We have had to spend a lot of time demonstrating how computer based learning technologies work, and how the manager can use them to accomplish their objectives.

Participant 3

I found managers on the whole to be reluctant to try innovative delivery mechanisms for exactly the reasons expressed by participant #1— above…. when I did my needs assessment—I found the average age of the employee was over 50 and that "they used computers to stand on to get books" (one man actually said this to me!) …

Participant 1

The ability to work with a group wrestling with the same problem, yet with different viewpoints, organizational priorities as well as individual strengths provides for quite complete information or at least, a good understanding of the issues, concerns and options. I believe that there is a good sharing of knowledge.

In this abbreviated example, we can see that participant 1 believes the problem with middle managers adopting new technologies is due to the difficulty of convincing them that technology-based learning works better than their current work systems. Participant 2 agrees that managers do resist new technologies, but argues that it is due to their age and their learning styles; he also provides supporting rationale for his position. Participant 3 supports participant 2's position and provides examples to support her position. The result is a changed perspective of the issue for participant 1, as the last posting indicates. We can see in this example that the conflicting position was not ignored as it was in Example #2. Rather, there is an acknowledgement between participants that there are inconsistencies between views on this topic. This example illustrates a discussion that is moving toward the kind of fluidity that occurs in face-to-face conversational language where knowledge construction is a social process. However, as Table 4 shows, this type of discord discussion occurred only occasionally.

Discussion

What is immediately apparent from the transcript analysis and coding using the interaction analysis model (Table 3) is the overwhelming

number of messages coded to the first phase of knowledge construction (phase I: sharing/comparing). This outcome raises a few interesting questions: Was the model or its application biased toward the first phase rating? Does the coding accurately reflect the interaction that took place in this forum?

Evidence from the surveys, telephone interviews, and transcript analysis indicates that the coding accurately reflects the interaction and knowledge construction that occurred in this forum. Most of the conversation was of a sharing and comparing nature. Dissonance and inconsistency were not actively explored, little testing of evidence against experience or the literature was expressed, and rarely did participants state the relevance or application of new knowledge that was created. The outcome of the transcript analysis was further supported with the data from the open-ended question section on the online survey, as well as the telephone interviews. Themes that emerged from these questionnaires included the value of sharing of ideas, networking, and discovery of what others are doing in the field.

For a number of reasons, this may not be a criticism of the outcome or value of the online forum used for this type of professional development application. First, this type of discussion is common in informal dialogue (coffee-room chat) that occurs at face-to-face professional development activities. Second, there was no subject matter expert to draw out and develop new concepts nor a teacher empowered to require participants to deal with issues, resulting in participants sharing at a safe and comfortable level. Third, the satisfaction ratings of those who completed the survey and the telephone interviews confirm that the participants felt the forum was of value and generally met their expectations. Overall, it was made clear by the participants that the greatest value of the online forum was the ability to share and receive information, as well as to *network*—not to construct new knowledge.

A number of possible hypotheses can be generated from the data theorizing why the vast majority of interaction was at the first level. One hypothesis is that the participants were limited in their communication ability due to the limitations of a text-only environment and a low social presence (Short, Williams, & Christie, 1976) with no opportunity to convey body language or graphic illustration. An alternate hypothesis explaining the absence of negotiation of meaning is that it is much easier to ignore or not respond to online messages that are incompatible with existing knowledge than it is in a face-to-face environment.

It may also be possible that the construction of knowledge is not an observable activity. For example the participants may have been reflecting on the issues presented in the forum, resulting in the construction of knowledge that was not shared with other participants. Or perhaps knowledge construction occurred over time, after the forum closed. It must be acknowledged, then, that a transcript analysis

provides only an indicator of the knowledge construction process and is based on the assumption that the construction of knowledge is an observable process.

Conclusions

Most of us accept the importance of information acquisition supplementing what we already know or have experienced; that is, we construct new meaning based on our prior experiences. This construction of new knowledge process is further developed as we share and compare our observations and understanding with others. The learning process, then, is transformed from a personal activity to a social activity as we are exposed to challenges and confrontations of our own meanings through interaction with others. This study explored the dynamics of learning community creation and support through a text-based mediated form of interaction occurring asynchronously over a limited time span.

We concluded that the interaction analysis model developed by Gunawardena et al. (1997) used to analyze the data for evidence of knowledge construction was a useful preliminary tool for transcript analysis. Specifically, the model provided sufficient conceptual density (explanatory power) to assess accurately the construction of knowledge in an online environment. However, we also concluded that the model needed fewer and more explicit boundaries between phases. A limited number of exchanges showed evidence of movement from phase I up through the higher phases. The pattern that emerged was of a cognitive process involving social interchange and limited amounts of social discord. Based on this pattern, we theorized that we construct knowledge in online learning environments through social interchange and a discord discussion, which is a logically sequenced developmental process.

Further research is required to understand why most of the online postings observed in this study were limited to the social interchange category. A likely explanation could be the absence of a learning environment that demands greater understanding of the content—such as university or college courses where learners are required to display evidence of their levels of understanding. Another possible explanation could be an inability on the part of the participants to communicate in a textual environment in any other way. Simply put, it may be possible that the participants were locked in the text. This may lead one to ask if we are limited in our communication in online textual environments and whether we will ever be able to construct knowledge as we do in face-to-face conversational language. Based on the results, another question needs to be asked: How does a socially constructed reality in a textual environment alter our symbolic interaction from facial expression, body language, pictures, and words to symbolic interaction with text on a computer screen? Is it possible that we are just beginning to evolve and develop in our understanding and skills relevant to communication in online learning environments? Is online communication such a distinct

genre of social interaction that new ways of social construction are needed to understand and explain knowledge creation?

Finally, implications for facilitating the construction of new knowledge in an online environment include (a) the provision of learning opportunities that capitalize on inconsistencies and contradictions between participants, and (b) the incorporation of activities that help participants become explicit about their own understanding by comparing it with that of other participants.

The use of online professional development has exploded during the past 18 months. An Alta Vista WWW search in September 1998 provided links to 7,686 documents or promotions in which the term *virtual conference* was mentioned. The tremendous cost advantage to participants and organizers compel educators to learn how best to use this environment to promote effective professional development activities. This study has provided a first glance at understanding how knowledge is created and distributed in this environment. It also illustrates the use of first-generation content analysis tools to further this understanding. We look forward to a great deal of additional research and reflection on the use of this environment for continuing professional education.

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