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ABSTRACT

This paper reviews the authors' attempts to find appropriate interaction analysis/content analysis techniques to assist in examining the negotiation of meaning and co-construction of knowledge in collaborative learning environments facilitated by computer conferencing. This study was undertaken in order to find appropriate interaction analysis techniques to address the following two evaluation research questions: whether analysis of the computer conference transcript yields evidence that knowledge was constructed within the group by means of the exchanges among participants; and whether individual participants change their understanding or create new personal constructions of knowledge as a result of interactions within the group. The new interaction analysis model was developed using a grounded theory building approach which involved analysis of the interactions that occurred in a global online debate conducted through computer conferencing. The following five phases and related operations of the interaction analysis model are outlined: (1) sharing/comparing of information; (2) discovery and exploration of dissonance or inconsistency among ideas, concepts, or statements; (3) negotiation of meaning/co-construction of knowledge; (4) testing and modification of proposed synthesis or co-construction; (5) and agreement statement(s)/applications of newly-constructed meaning. (AEF)

Transcript Analysis of Computer-Mediated Conferences as a Tool for Testing Constructivist and Social-Constructivist Learning Theories

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Introduction

The presentation based on this paper will offer participants the opportunity to practice application of the authors' new model for analysis of collaborative construction of knowledge in online conferences. Participants will also have the opportunity to discuss how such analysis can inform future elaboration of constructivist theory. In particular, the authors hope to explore the question how individual construction of knowledge relates to the social construction of knowledge within a group.

The exchange of messages among a group of participants by means of networked computers, for the purpose of discussing a topic of mutual interest, is referred to as computer-mediated conferencing or computer conferencing. The use of computer conferencing as a medium for collaborative learning has in many respects outstripped the development of theory on which to base such utilization. One significant question which has not yet been satisfactorily answered is how to assess the quality of interactions and the quality of the learning experience in a computer-mediated conferencing environment. This question formed the starting point for the study described in this paper.

In addressing the question of quality in evaluating computer conferences, the authors determined that little had as yet been done to establish rationales or procedures for evaluating the actual learning which takes place during a conference, especially when that learning is defined according to constructivist principles as the co-construction of knowledge by negotiation of meaning. Other questions relating to conference quality, such as amount or pattern of participation and participant satisfaction, have been answered fairly successfully using several methods. Among them are participation analysis techniques (Levin, et al. 1990, Hiltz 1990) which analyze the capacity of a conference to engage members or which analyze comparative patterns of participation among learners from varying backgrounds. Participants' own reports of learning or satisfaction with the learning experience are also important; these may be studied as found in the transcript of a conference or by means of online or paper surveys. However, to settle for such measures in evaluating computer conferences is to overlook the unparalleled opportunity to observe knowledge construction in progress offered by transcript analysis. Transcripts give us participants' own statements,

which are certainly the most direct evidence of what they know. Transcripts also give us the opportunity to follow the interaction between participants in the give-and-take of a conference; if knowledge is indeed socially constructed within a group of participants, analyzing this interaction should give us a view of how that knowledge was co-constructed in the specific instance. Therefore, in order to assess the quality of interactions and the quality of the learning experience in a computer mediated conferencing environment, content analysis or interaction analysis of computer transcripts is a new opportunity which cannot be overlooked.

The Purpose of This Paper

This paper briefly reviews the authors' attempts to find appropriate interaction analysis/ content analysis techniques to assist in examining the negotiation of meaning and co-construction of knowledge in collaborative learning environments facilitated by computer conferencing. After analyzing interactions that occurred in a Global Online Debate, the authors proposed a new definition of "interaction" for the CMC context and proposed a new Interaction Analysis Model for Examining Social Construction of Knowledge in Computer Conferencing (Gunawardena, Lowe and Anderson, 1997).

Development of a New Interaction Analysis Model

This study was undertaken in an effort to find appropriate interaction analysis techniques to address the following two evaluation research questions with respect to computer conferences:

1. Does analysis of the computer conference transcript yield evidence that knowledge was constructed within the group by means of the exchanges among participants?

2. Did individual participants change their understanding or create new personal constructions of knowledge as a result of interactions within the group?

The new interaction analysis model was developed using a grounded theory building approach which involved analysis of the interactions that occurred in a global online debate conducted through computer conferencing. The online debate took place during the week of June 5–11, 1995, and formed part of ICDE95 Online, a virtual pre-conference to the XVI World Conference of the International Council on Distance Education (ICDE) held in Birmingham, England. The debate design invited the 554 list subscribers to participate on either the affirmative or the negative side of a statement presented by the debate leaders: "No Interaction, No Education," representing the assertion that true distance education is impossible without provision for interaction. The debate transcript is archived in the World Wide Web at (http://www.ualberta.ca/~tanderso/icde95/interaction_www/).

An important first step in attacking the above mentioned questions was to define what is meant by "interaction." The model developed by France Henri (1992) has been influential in content analysis, but Henri refers to "interactive" content as being parts of messages which specifically refer to or link to other messages within the conference. The authors believe this kind of analysis merely describes the pattern of connection among messages, and not the entire gestalt to which the messages contribute. Generally speaking all the messages in a conference are linked; all respond to each other and to the emerging totality of constructed knowledge, regardless of whether a message can be identified as responding to another

specific message or group of messages. The term "interaction" should more properly be applied to the entire pattern of interconnected messages. An apt metaphor for this process is the creation of a patchwork quilt: as the pattern of the quilt is built up by assembling small blocks of bright colored fabric, so the contributions of individual participants fit together to form a unified pattern, the whole of which constitutes the interaction of the conference. So understood, interaction is the process through which negotiation of meaning and co-creation of knowledge occurs in a constructivist learning environment.

A second problem was to define a unit of analysis for use in examining the transcripts. Henri (1992) and others have suggested dividing messages into 'units of meaning' because a message may contain more than one idea. The authors experimented with analysis of the debate transcript by cutting it up into units of meaning (sometimes one statement and at other times, one or two paragraphs in a message), but ultimately concluded that cutting up a message into units did not capture the essence of meaning expressed in that message. We are all capable of holding multiple considerations, or threads of argument, in mind as we examine a subject, a fact which Henri's practice of breaking messages into "meaning units" may actually obscure; we must not without realizing it begin to view discussion artificially divided into strands of argument as a fair representation of the participants' interaction or any individual participant's learning process. We therefore decided to use the entire message as the unit of analysis.

Based on our definition of interaction as the essential process of assembling the contributions of participants into a coherent pattern in the co-creation of knowledge we proceeded to analyze the entire debate transcript for the: 1) type of cognitive activity performed by participants (questioning, clarifying, negotiating, synthesizing, etc.), 2) types of arguments advanced throughout the debate, 3) resources brought in by participants for use in exploring their differences and negotiating new meanings, such as reports of personal experience, literature citations, and data collected, and 4) evidence of changes in understanding or the creation of new personal constructions of knowledge as a result of interactions within the group. It rapidly became evident that such an analysis would involve a rather arbitrary division into phases of what in reality is a gradual evolution. However, this seemed unavoidable. Also unavoidable is a degree of subjectivity in doing this type of analysis, as researchers are clearly influenced by their own conceptual frameworks and cultural knowledge.

The analysis model developed by the authors to describe the process of knowledge creation within a computer conference is shown in Table 1. A more detailed discussion of this model, its theoretical framework, and its application to the analysis of the debate, with relevant examples, is in Gunawardena, Lowe, and Anderson (1997).

One could reasonably divide the social construction of knowledge into more, or fewer, phases than described above. It is also the case that all these steps do not always occur. In particular, where there is little conflict among the ideas held by the participants at the outset, negotiation tends to be largely unspoken; participants accept each others' statements or examples as consistent with what the group members already know or believe and the discussion may never advance out of phase one. It is also possible for conflict to occur and not reach the stage of resolution; participants may take away differing meanings, though perhaps arrived at or refined by the encounter. Moreover, Operations which we have placed in different stages of the process may actually occur at the same time. Different individuals,

Table 1: Interaction Analysis Model for Examining Social Construction of Knowledge in Computer Conferencing

Phase I: Sharing/Comparing of Information. Stage one operations include:	
A. A statement of observation or opinion	[PhI/A]
B. A statement of agreement from one or more other participants	[PhI/B]
C. Corroborating examples provided by one or more participants	[PhI/C]
D. Asking and answering questions to clarify details of statements	[PhI/D]
E. Definition, description or identification of a problem	[PhI/E]
Phase II: The Discovery and Exploration of Dissonance or Inconsistency Among Ideas, Concepts or Statements. (This is the operation at the group level of what Festinger [1957] calls cognitive dissonance, defined as an inconsistency between a new observation and the learner's existing framework of knowledge and thinking skills.) Operations which occur at this stage include:	
A. Identifying and stating areas of disagreement	[Ph2/A]
B. Asking and answering questions to clarify the source and extent of disagreement	[Ph2/B]
C. Restating the participant's position, and possibly advancing arguments or considerations in its support by references to the participant's experience, literature, formal data collected, or proposal of relevant metaphor or analogy to illustrate point of view.	[Ph2/C]
Phase III: Negotiation of Meaning/Co-Construction of Knowledge	
A. Negotiation or clarification of the meaning of terms	[PhIII/A]
B. Negotiation of the relative weight to be assigned to types of argument	[PhIII/B]
C. Identification of areas of agreement or overlap among conflicting concepts	[PhIII/C]
D. Proposal and negotiation of new statements embodying compromise, co-construction	[PhIII/D]
E. Proposal of integrating or accommodating metaphors or analogies	[PhIII/E]
Phase IV: Testing and Modification of Proposed Synthesis or Co-Construction	
A. Testing the proposed synthesis against "received fact" as shared by the participants and/or their culture	[PhIV/A]
B. Testing against existing cognitive schema	[PhIV/B]
C. Testing against personal experience	[PhIV/C]
D. Testing against formal data collected	[PhIV/D]
E. Testing against contradictory testimony in the literature	[PhIV/E]
Phase V: Agreement Statement(s)/Applications of Newly-Constructed Meaning	
A. Summarization of agreement(s)	[PhV/A]
B. Applications of new knowledge	[PhV/B]
C. Metacognitive statements by the participants illustrating their understanding that their knowledge or ways of thinking (cognitive schema) have changed as a result of the conference interaction.	[PhV/C]

for example, may be proceeding at different rates through the process and may be giving inputs which belong to a stage through which most participants have already passed. It is also possible to find messages which straddle the divisions between phases, including within a single message, units of meaning which could be assigned to different phases. However, we believe the same objections could be raised to any possible division; the outline in Table 1 has at least the virtue of relative simplicity.

In using the model, one may simply read through the transcript, marking each message in turn with the letter and number of the phase to which it belongs, and noting the phase ultimately reached by the conference. Further information can be gleaned by noting the number of messages occurring in each phase as the conference proceeds.

The authors at first hypothesized that a rough judgment of the quality of a computer conference could be based on the degree to which the conference proceeded through all five of the steps, and an assessment of an individual's learning could be based on the degree to which that individual remained active through all phases of the conference, the individual's knowledge development paralleling the co-creation of meaning within the group. More recent work, however, (e.g., Anderson and Kanuka, 1998) has brought forth the point that participants often express satisfaction with conferences, and state the belief that they have learned from the conferences, even when the conferences do not progress beyond phase two in the model above. There is also ample evidence in the literature that individuals feel they profit from conferences even when they do not actively contribute to them—that is, by "lurking," or silently taking in the contributions of others.

The authors propose that this may point up an unexpected value of the model: it may serve to illuminate the connection between the individual's construction of knowledge and the construction of knowledge within the group. This is an area of some confusion, even in the terminology used to describe the two phenomena: the term "constructivism" is used variously to describe either individual or group knowledge creation, with a term such as "social"—sometimes appended to distinguish that construction which occurs at the level of the group.

The authors are now exploring whether in fact the operations they have assigned to phases three through five are more characteristic of the creation of "new" knowledge at the level of the group, or the assignment of meaning to phenomena for which the group does not yet have a common understanding. This would be consistent with the type of conference in which the model was originally developed: The online debate was designed as an adult professional development experience and participants were either practicing professionals in the field of distance education or graduate students conducting research in the field. The participants could be described as a group of professionals of roughly equal stature coming together to contribute their knowledge, negotiate meaning, and come to an understanding about an important issue in the theory and practice of distance education—an issue regarding which there is presently no commonly-held set of principles or meanings within the group. Therefore, the interaction that occurred among the participants could be described as a collaborative construction of "new" knowledge through social negotiation, or a constructivist learning experience at the group level. The authors were surprised and impressed, in studying the debate, to recognize the strength of the pull within the group toward compromise and resolution, or construction of a common body of knowledge

regarding the debate topic, despite the debate format which was designed to keep the sides apart.

If the later phases of the model identify knowledge creation and meaning negotiation which are more likely to occur at the group level, it also appears that activity at levels one and two of the model reflects individuals' creation of their own understandings of the group's body of knowledge (sometimes referred to as their "appropriations" of the group knowledge). If this is so, phases one and two serve as the opportunity for the individual to "transform" knowledge previously acquired by stating it in his or her own terms, and to test his or her statement of understanding against the shared standards of the group. A measure of learning by accretion—of assembling additional instances of a principle which is already understood—or elaboration also takes place at this level.

The relationship between individual and group knowledge construction, and the degree to which conferences may serve as opportunities for "cognitive apprenticeship," in which new cognitive schema are modeled by other participants, are both important questions in advancing our knowledge of fundamental learning processes. The analysis of computer conference transcripts is a tool of exceptional promise in investigating such questions, and the authors therefore hope that further use of their transcript analysis model will prove fruitful.

References

Anderson, T. & Kanuka, H. (1997). Evaluating the workplace center on-line forum: Knowledge construction and learning communities. Unpublished research report. Office of the Learning Technologies, Human Resources Development Canada, Ottowa, Canada.

Festinger, L. (1957). A Theory of Cognitive Dissonance. Evanston, Illinois: Row, Peterson.

Gunawardena, C., Lowe, C. & Anderson, T. (1997). Analysis of a Global Online Debate and the Development of an Interaction Analysis Model for Examining Social Construction of Knowledge in Computer Conferencing. Journal of Educational Computing Research, Vol. 17, No. 4.

Henri, F. (1992). Computer conferencing and content analysis. In Kaye, A. (Ed.) Collaborative learning through computer conferencing: The Najaden papers. Berlin: Springer-Verlag.

Hiltz, S. (1990) Evaluating the Virtual Classroom. In Harasim, L. (Ed.) *Online education*. New York: Praeger.

Levin, J., Kim, H. & Riel, M. (1990). Analyzing instructional interactions on electronic message networks. In Harasim, L. (Ed.) *Online education*. New York: Praeger.

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