Interactive Educational Multimedia, Number 10 (April 2005), pp.50-60
http://www.ub.edu/multimedia/iem

Investigating knowledge building dialogues in networked communities of practice. A collaborative learning endeavor across cultures

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Abstract

We have analyzed data from two online courses, designed to promote collaborative online learning, and in the contexts of two different cultures. Ongoing assessment (self, group, instructor) that actively engages students within the course (as opposed to instructor assessment at the end) is a central feature for achieving collaborative knowledge building in online dialog. Careful articulation and deployment of assessment criteria is a design feature that promotes meta-awareness, which, in turn, together with student-centeredness and operationalization of student experiences in the design of the curriculum, enhances student participation, motivation and ownership in the dialog. From eight years of experience with online dialog and two quite different implementations we offer a set of design principles, having a sound theoretical basis, that enhance the quality and quantity of online knowledge building. Our analysis suggests that the characteristics of the discussion threads emerging under these design criteria give evidence of true collaborative learning.

Introduction

In a previous paper (Sorensen and Takle, 2002), we describe an experimental design for investigating the impact of implementing theoretically based principles in the design of collaborative online learning. We also promoted the concept that in all teaching and learning contexts it is important to consider the theoretical perspectives and assumptions underlying the pedagogic-didactic designs and that the implemented designs had elements that could be assessed. Agreement between instructional goals (the implementation) and elements that are assessed helps ensure that progress toward learning is assessed on the basis of established sound design principles.

We have implemented our theoretical design principles to several empirical web-based educational contexts across disciplines, pedagogical cultures and national borders and have collected a large amount of data informing us about 1) the impact of implementing pedagogically conscious and theoretically based design principles, 2) the impact of students' meta-awareness of instructional expectations, 3) the importance of coherence and harmony between the instructional goals and didactic methods that are implemented on the web and the indicators of learning that are actually assessed (Takle et al., 2001; Sorensen, 2003a).

In this paper we meta-analyze and compare two such design implementations. The two implementations differ significantly in terms of discipline, language, and pedagogical-cultural tradition, but demonstrate strong reifications (Wenger, 1998) of shared experience. We want to look for "common identifiable" characteristics which - regardless of discipline, language, learning tradition and culture - are evident in the behavior of the learner as signs indicating that learning has occurred and deeper understanding has developed. In our analysis we are not concerned with the learners' possible accumulation of facts, scores (e.g. on a quiz), etc. We use a single outcome – learner behavior - as a guiding principle to "analyze the analyses". Our main meta-analytical focus is to identify indicators and signs of learning in terms of learner behavior as the type of attitude and behavior that any professional recognizes as common to the discipline. As a result, the main instructional objective for educators may not be to try to have students "learn history", but rather trying to have students "learn to be historians".

Theoretical perspective

We briefly outline the set of criteria, which we assert are signs of quality in a web-based collaborative knowledge building process.

Criteria of Collaborative Knowledge Building

In the principles of collaborative learning, the process of learning is viewed to be a fundamentally social phenomenon, regardless of the varying theoretical emphasis in each single approach (Dillenbourg et al. 1995). Several other learning theories confirm this view (Wenger, 1998).

The process of knowledge building (KB) in collaborative learning, first explored by Harasim (1989), involves mutual exploration of issues, mutual examination of arguments, agreements and disagreements, mutual questioning of positions, dynamic interaction and weaving of ideas (Harasim 1989; Kaye 1992; Sorensen 1997). Mason (1993) finds this view to be in agreement with the communicative potential of the online environment, although she also points out the weaknesses of the online dialogue being that it quite often never reaches synthesis or closure.

If a set of learning objectives includes establishment and engagement in CKB, relevant methods of assessment must incorporate an assertion of the quality of a CKB dialogue. This implies the need to more concretely stimulate a dialogue and, once dialogue appears, designers and instructors need to ensure that it actually evolves into a shared knowledge building process. Instructional designers and instructors need to stimulate the diverging CKB

dialogue, at a meta-level, to ensure that convergence and synthesis are achieved. This indicates a need for process-oriented assessment methods.

In view of the generally recognized difficulties in fostering online student dialogue that converges (e.g., synthesizing) rather than diverges (noted by Mason, 1993), Stahl (1999) suggests a set of factors that characterize quality in the KB process: brainstorming, articulation, reacting, organizing, analyzing and generalizing. These characteristics, however, focus on the quality of isolated comments. But viewing CKB as a language game (Sorensen & Takle, 2002b) also requires a perspective that recognizes the connective qualities of dialogue, i.e., a more process-oriented set of criteria. Therefore, we add the following list of criteria of quality, all of which imply a higher degree of focus on the "glue" of a collaborative dialogue (Sorensen, 2003): comments that request clarification, add new knowledge, provide relevant associations, organize and promote argumentation, synthesize previous points of view and point in new directions, conclusions and visions. Implementing these learning quality criteria of collaborative KB requires a corresponding meta-functional pedagogy or instruction that facilitates and motivates collaborative dialog. In this paper we assume that a person who adapts an attitude and behavior common to a professional in a particular discipline has learned something about that discipline.

Reflective Dialogue as a Pre-requisite to Involved Dialogue

Collis (1997) has focused on the design and nature of the collaborative activities implemented in the learning process, and others on the quality and nature of the virtual environment and the evolvement of electronic inter-human dialogue (Scardamalia & Bereiter 1996; Sorensen 1993). Alternative studies have concluded the social aspect of a group process to be an essential motivator for collaboration in online learning (Harasim 1993; Cornell & Martin 1997).

Considerable research has been directed towards the role and meta-communicative behavior of the instructor (Feenberg 1989). Contrary to the physical world in which involvement precedes reflection (Heidegger 1986), the virtual universe provides a context and an "ontology" in which reflection may be said to precede involvement (Sorensen, 2003a). Assuming this new dialogical paradigm, and this primary position of reflection and meta-communication, it is very conceivable, from the perspective of collaborative interaction and dialogue in Web-based learning, that also the task of scaffolding learning processes that aim at supporting both interaction and (self) reflection, must move at a meta-level to create awareness of the function in a dialogue of a contributed comment.

Course Designs and Assessment Models

In this section we provide descriptions of the two course designs that, together with the results and research findings presented in section 4, form the basis for our meta-analysis in this paper.

Course on Global Change (GC)

The Global Change course is a physical science course for senior undergraduates and beginning graduate students at Iowa State University in the USA. The goal of any physical science course is to use facts, laws (fundamental laws of physics, chemistry, biology, etc.), and tools (mathematics, statistics, computers, visualization, animation, simulation) to develop understanding about the natural world. The internet provides a marvelous additional tool to facilitate the development of understanding on global change issues. Figure 1 demonstrates how the internet provides the learner with not only an interface to the traditional facts, laws,

and tools used in the physical sciences but also a medium within which to develop collaborative knowledge-building dialog that facilitates the development of understanding. Within this framework the role of the instructor is to ensure availability to the facts, laws, and tools, but more importantly to develop a meta-communication with learners to promote and monitor intensive use of knowledge-building activities in support of creating new understanding.

Students in GC use online dialog to demonstrate use of knowledge-building skills. The course is divided into three sequential blocks of five weeks each. During each block each student is required to post six comments. They are required to chose, in advance of submitting an online comment, the knowledge-building skill they intend to use the their posting. Comments show up color-coded in the threaded dialog to reveal the knowledge-building skill selected by the author. Evaluation of student performance is based partially on participation in the dialog as demonstrated by (a) submitting the required minimum number of postings (6 per block), responding to other students' comments (3 per block), and eliciting responses from other students (3 per block). Evaluation also is based on how effectively the students have engaged the specific knowledge-building skills they declare to have used in their postings.

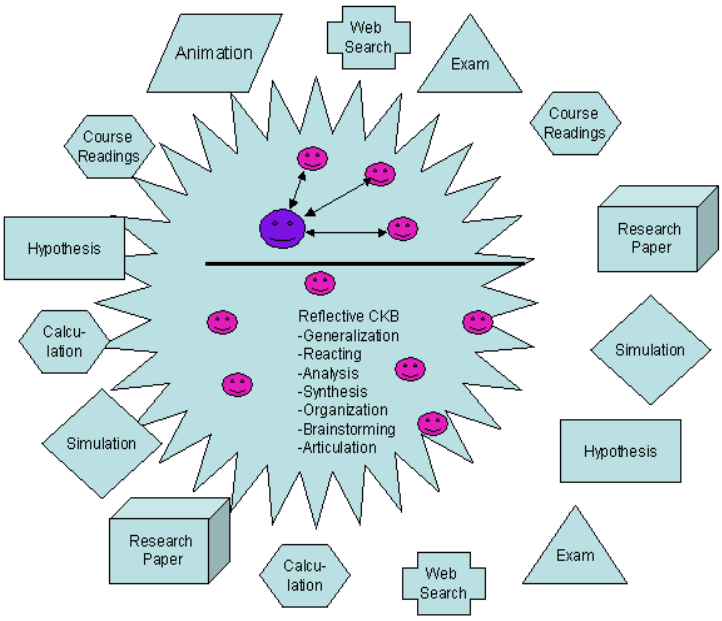

Figure 1: Pedagogical design concept for GC: Learning – and developing understanding – through online CKB dialogue. Learners-to-learners interaction, and teacher-learner meta-interaction

A two-stage assessment carried out at the end of each block. First, students assess their own success and effectiveness in using the stated and defined knowledge-building skills. Then the instructor evaluates the student self assessment to either affirm or correct the students' perceptions of their own level of critical thinking. A meta-assessment by the instructor after blocks 2 and 3 allows for comparison of student performance (and response to instructor evaluation of self assessment) in the previous assessment cycles. This is a very effective means of showing the student how their own meta-reflection has evolved and how this contributes to learning.

Course on "Online Learning" (MIL)

The course on "Online Learning" lasted 5 weeks. It was divided into periods of reading and preparation (two weeks) and debate (3 weeks). Goals of the course are that the participants through engaging in collaborative knowledge building acquire 1) insight in the issues of quality in design and delivery of online learning, 2) meta-reflection on and understanding of the implication of teacher-learner roles, 3) meta-reflection on and understanding of the reflective, interactive, and structuring potential of net-based learning processes, and 4) a self-reflective experience of one exemplary model (their own course "Online Learning").

The design of the course was based on PANEL, a process oriented model for design of participation in collaborative knowledge building processes on the net (Sorensen, 2003a). The main pedagogical ideas assumed in the model were the establishment of: a student-centered, open process in which knowledge resources enter dynamically from outside via the participants as well as through the teacher(s). This process should be driven and motivated by the participants and their individual knowledge (the latter is an important factor in adult education, where each participant are "experts" in their individual working contexts). It also assumes a dynamic interchange between teacher and learner roles and provides a rough indication of how much of the teacher contribution evolves at a meta-communicative level (Figure 2): participants, in the two-week preparation period read literature according to three themes within the course subject, online learning. The themes corresponded to the names of the three discussion fora in the succeeding period of discussion.

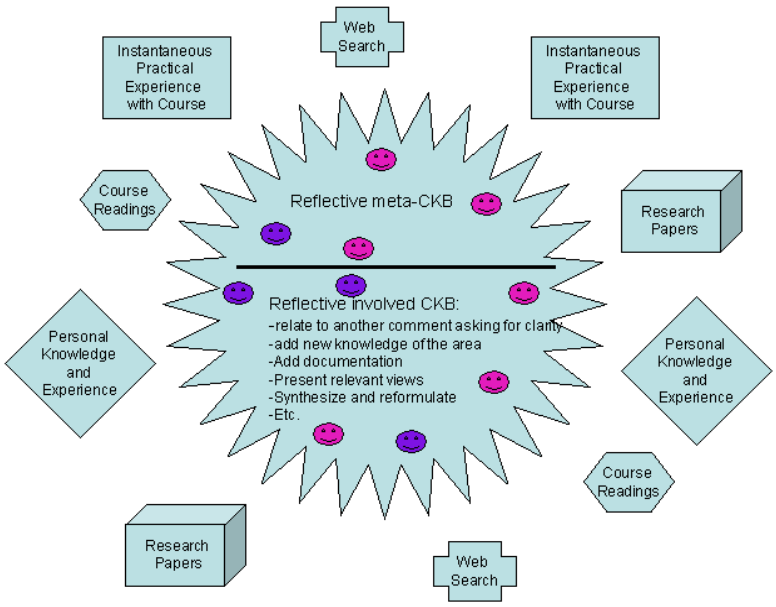

Figure 2: Pedagogical design concept for MIL: Learning – and developing understanding – through online CKB dialogue. Involved teacher-to-learners and learners-to-learners interaction, and teacher-to-learners and learners-to-learners meta-interaction

The participants were asked to distribute a set of roles among the members of their online group (on average consisting of 4 participants). The roles were supposed to form, support and guide their later discussion and to give the participants a concrete point of departure in the discussion. Some were presenters, some were moderators, etc. The description of the roles

was clarified in the assignment. Both teacher and students agreed on committing themselves to attending the virtual learning space for a minimum of five times a week over the three weeks of debate. In the debate period each of the groups were asked to present a commonly agreed problem related to the literature. They were asked to initiate, conduct and wrap up the succeeding online plenum discussion that evolved from the problem of their group. In parallel with the discussions, the participants and the teacher were engaged in meta-reflections and meta-communication in a meta-forum, to reflect and discuss the experiences and processes of the participants, as they evolved. The participants were graded on both quantity and quality of their contributions using a process-oriented assessment model, PAA (Sorensen, 2003a), underlining the following set of assessment criteria. Quantitative requirements included submitting at least 5 comments, give a certain number of comments to others' contributions and a certain number of new initiatives, elicit a certain number of responses from others. Qualitative requirements included questions asking for clarity, comments that add new knowledge to the discussion, comments that provide relevant associations, comments that organize and promote argumentation, comments that synthesize previous points of view and point to new directions, conclusions and visions. The idea was, through the PAA model and its requirements, to stimulate participation in discussion, ability to listen to others, and contributions with relevant views.

Analysis

From the preceding section it is evident that the courses we described represent two quite different disciplines, developed under two quite different learning traditions at universities on different continents, and developed based in different languages and cultures (Danish and English). The common thread between these courses is their intensive use of the internet as a medium for promoting collaborative learning.

We previously reported a preliminary analysis of the dialog from GC (Sorensen and Takle, 2002a) in which we concluded that by explaining the characteristics of a knowledge-building process, and by grading student discussion on the basis of their reflected use of these characteristics, students will measurably increase their use of these characteristics. By extension, we conclude that learning therefore occurs since use of these characteristics is judged to be evidence of such. The rationale behind the analysis was an acknowledgement of the need in primarily reflective virtual environments (as described in section 3) for communicatively providing meta-awareness in relation to expected communicative actions (as described in section 2).

In this section, we summarize our previous findings (Sorensen, 2002a), extend our analysis to the MIL course (Sorensen, 2003a), and then present a meta-analysis of the two courses taken together. Specifically we look to our meta-analysis in search of an answer to the following question:

> *Are there common identifiable characteristics, regardless of discipline, language, learning tradition, or culture and evident in the behavior of the learner, that learning has been achieved or that understanding has been developed?*

Analysis of GC

For the purpose of our analysis we have categorized the analyzed comments in the online dialogues according to the knowledge building quality requirements presented by Stahl (1999), see section 2. A level of quality (1-10) was subjectively assigned to each comment. The mean quality went from 4.4 to 3.2 to 5.3 from 1995 to 1997 to 2000, respectively. In 1995 a preponderance entries were questions, whereas in 1997 there were more reactions to other students. In 2000, more student comments were characterized as articulation.

From these results, we draw the following tentative conclusions. In 1995, with no requirements on volume or quality of writing, students used the electronic dialogue for asking questions. The questions did not seem "forced" since their postings had essentially no bearing on how they were evaluated in the course. For 1997, the overall quality of the postings went down. There seemed to be more "forced" responses. More questions were of a rhetorical nature, rather than seeming to originate out of curiosity about the subject matter. We attribute this to a sense of urgency on the part of students to meet the volume obligations of the evaluation scheme. The increase in quality from 1997 to 2000 suggests that students responded to the demands for higher quality of writing by meeting the requirements of the KB process. A notable difference in the 2000 discussion as compared to previous years was the reduction in the "social" or "chat" nature of the comments. But at the same time, the number of comments increased. Comments were much more like individual essays and less spontaneous.

Perhaps the largest difference over the change in dialogue requirements was in the length of each entry. In 1995 the average length of the 10 entries was 88 words and in 1997 the average was 93 words. In 2000, however, the average soared to over 250 words. And the quality of the grammar of each posting increased markedly as well. This likely is attributable to the fact that students wrote their postings as essays in word processors on their own computers, subjected them to spell checking, and reviewed the grammar before cutting and pasting them into the course web-site. This increased quality and quantity came at the expense of spontaneity and "social" content.

In 2002 we increased the required number of comments from 15 to 18 and added a requirement that 3 of these comments be social comments. Compared to the previous year, the number of posts per student went up by 31% (compared to an increase in the requirement by 20%) and the length of post went up by 11%. Despite the fact that social comments tend to be quite short, we conclude that at least part of the increases in number and length of comments is attributable to the more intense use of social comments

Analysis of MIL

The 3 weeks of debate generated an enormous amount of engaged participation in CKB (532 contributions, some of which were of the size of half a webpage). It was a quite exciting and, indeed, very interesting activity to follow and participate in the CKB processes. Viewed from a teacher perspective, the discussions turned out to be of very good quality (for qualitative criteria in the PAA evaluation model, see Sorensen, 2003a). However, it would not be correct to say that the activity reduced the amount of work of the teacher. On the contrary, while it was very interesting to follow the discussions, it was a quite demanding job to read, relate to and comment on so many reflective and often very long comments. The discussions were truly student-centered and student-governed in that they produced an enormous amount of relevant collaboratively developed initiatives and perspectives. The motivation of the

participants was very high and demonstrated an engagement in the discussions far beyond the minimum requirements in terms of quantity. The teacher occupied a role in the discussions equal to the students. Only in the meta-forum, the teacher shifted between the role as a participant and the role as "the expert".

The evaluating comments from the participants documented that, in general, the course had been perceived as a positive experience. Some participants initially found it to be a stressing experience due to the large amount of comments and difficulties in maintaining an overview, but others expressed the contrasting view that it had been an exiting and stimulating experience to have been engaged in and sharing an explosion of dynamic CKB. A smaller part of the participants expressed some frustration that the course did not have the more traditional roles of a teacher and a student.

Meta-Analysis

In pondering the analyses of our separate experiments in courses in two widely disparate disciplines we were able to extract a common thread that we assert represents evidence that learning had occurred. In both courses, by the end of the term, the instructors came to realize that interactions with students had evolved to a higher plane. In the case of Global Change, the instructor, by the end of the third assessment cycle was no longer diagnosing shortcomings of the use of knowledge-building skills. Rather, he found the content of the comments so interesting scientifically that the responses were more like conversing with a professional colleague than correcting a student.

Likewise, in the MIL, the instructor, toward the end, was more often engaged with learners on the use of role playing - strengths, weaknesses, improvements, etc. In both cases instructors had the sense that they were interacting with learners more as peers than students. *We therefore conclude that a sign of learning achievement is whether the learner has demonstrated tangible evidence of the level of thinking, dialoging, analyzing, and interpreting commonly used by a professional in the discipline.* We assert that the answer to our previously posed question is "yes" and that this behavior constitutes evidence that learning has been achieved or that understanding has been developed, and furthermore, this behavior should be evident regardless of discipline, language, learning tradition, or culture.

Recommended design principles

From our experience we recommend implementation of structures and incentives that (1) stimulate "participation" and "engagement", (2) focus on the KB process, (3) denote an open concept, (4) focus on the learners – not teachers, (5) draw on participant experiences, (6) operationalize participant experiences, (7) create participant "ownership", (8) equal out teacher and learner roles, (9) represent, in principle, a lifelong model, and (10) invite assessment of process.

A design element common to both courses discussed here is the key role of multiple opportunities for self reflection by learners during the course. This allows instructor and student multiple opportunities to "step outside themselves" and stand together to view the landscape of activities that has occurred over the evaluation period. This detached view of the process raises the assessment away from the tangle of personalities and perceived views on quality of intellect. Rather, both stand together to objectively evaluate a piece of writing against a performance standard. Multiple opportunities are required because for some students it takes two or three such opportunities to achieve the levels of detachment and objectivity that are essential to acquire the meta-view and hence understand the learning process.

Discussion and future research

Our future research will focus on more detailed analysis of dialog threads and collections of threads in an attempt to better understand linkages among comments and how to use this understanding to promote collaboration. We also intend to understand a little more closely the implications of diverse pedagogical cultures and explore the concept of behavior of a professional as a means of measuring learning. The two ongoing courses we are using as a laboratory provide contrasting opportunities spanning both sciences and humanities and their pedagogical cultures and therefore will continue to provide the data for future analyses.

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