From facts to theories: a case study

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Introduction

We live in a knowledge society that requires a continuous knowledge advancement as essential for social progress. Consequentially the primary task of education should be sustaining students in this knowledge-creating process.

Knowledge building, as defined by Bereiter and Scardamalia (2003), is the production and continual improvement of ideas of value to a community. The goal is the continuing process of idea creation, development and improvement to increase the cultural capital of a society. When applied to education, this method means directing students' efforts toward ideas improvement in such a way that ideas will be available to the community in a form that allows discussing, interconnecting and revising them. In this way, students will be fully engaged in the process of knowledge creation.

Within this approach relevant is the distinction between "*Design Mode*" and "*Belief Mode*" (Scardamalia & Bereiter, 2003), that is the difference between the way we deal with information and ideas. In "Belief Mode" we use informations as true beliefs. Education in schools is conducted almost completely in this mode. While, in "Design Mode" we use informations to support our creative knowledge work and the ideas are used as objects of creation, development, assembly into larger wholes, and application.

Internet can play an important role in this process; can support the collaboration both at a distance and face to face and therefore may offer new opportunities for the whole knowledge building process.

Aim and contest

The aim of this paper is to apply Bereiter and Scardamalia's (2008) suggestions concerning the knowledge building process to an online discussion carried out by university students. Bereiter and Scardamalia make a fundamental distinction between "facts" and "theories", where the latter present a higher level of understanding than facts, because they explain facts and allow a deeper understanding of them. Therefore the authors propose to segment the knowledge building process into three levels: a) facts; b) simple theories c) complex theories. Are these levels recognizable into a web-forum discussion carried out by university students? What is that makes the discussion evolving from one level to the next one? Are these levels able to fully describe the process of knowledge building in such context?

The discussion we analyzed took place during an advanced university course on E-learning that lasted 6 weeks. The whole course was segmented in weekly units during which a specific topic related to E-learning was proposed. The course was offered in a blended mode, with a week online discussion and 2-hours offline discussion each week. The discussed topic we analyze here was about "Digital identity". Ten students (3 of them males) aged around 23, posted in a week 72 notes in total.

The online discussion was modeled around the Progressive Inquiry Model (PIM) (Muukkonen, Hakkarainen & Lakkala, 1999), therefore students discussed by: a) setting up a research question, b) reading the educational material proposed by the teacher, c) extrapolating from this material relevant information to answer to the research question, d) discussing the different material read and their own points of view, e) agreeing on an answer to their research question.

Method

To achieve these aims, we used the three levels defined by Scardamalia and Bereiter (Facts, Simple Theories, Complex Theories) as categories, then we assigned to each note one or more categories. In fact, the content of each note could refer to more than one category; therefore we segmented the

note in as many parts as the categories we could recognize in it. After all the notes were analyzed, segmented and categorized we counted the frequency and the percentage each category appears.
Two researchers first analyzed together the 10% of the corpus to get tuned about the meaning of the categories and how to segment the notes. Then, they individually assigned the categories to the remaining notes. Later they compared the categories assigned and it was found an agreement of 85%. The conflictual cases were discussed until a common decision was always reached.

Results

The category "facts and information" was assigned to the 38% of the cases, "simple theories" appeared in the 40% of the cases and only the 25% could be considered as "complex theories".
This result suggests that while the passage from "facts" to "simple theory" occurred quite easily, more hardly the discussion went from "simple theory" to "complex theory". This latter is a higher level not easy to be reached and a specific scaffold may be needed to help shaping the discussion as a knowledge building process. Moreover, students did not have much time to discuss about the topic (one week), and this could be a further explanation about the unsuccessful achievement of the highest level.
In order to understand how the discussion shifts from one level to the next one, we observed in detail when this occurred. We found a type of intervention as able to sustain such passage and we called it "transaction comment". This type of intervention seems to be able to sustain the development of the discussion toward a higher level of knowledge building.
The "transaction comment" has a specific feature: it does not strictly refer to the content of the discussion but it seems to be a discourse strategy, with the clear purpose to trigger interactions between students. For example students, in their notes, after expressing their ideas, may ask questions or opinions from their peers (i.e. *what do you think about this?*) with the intention to have feedback, to obtain their alliance or collaboration. The "transaction comments" usually are able to push other participants to comment and contribute to the general discussion and, at the same time, they seem to support also self-reflection from the author of the transaction comment. Often such comments unveil the intention to support the development and improvement of the ideas proposed.
We found the category of "transaction comments" in: a) 44% of the passages from 'facts and information' to 'simple theories'; b) 18% of the passages from 'simple theories' level to 'complex theories'.
In the following we will report a few examples of passages from the first level (Facts and information) to the next one. Also the transaction comment we think caused the shift will be reported.

Excerpt 1. Example of moving from facts and information to simple theories

Text in the note	**Category assigned**
Re-reading the chapter of the text-book from the corse on Communication I found that also in this perspective it is interesting to reckon about on line identity construction (AriannaScaramuzzi | 2005-12-08)	Facts and information
What do you guys think about building identity on line? Do you see it as more free or fake, not corresponding to how we actually are? (AriannaScaramuzzi | 2005-12-08)	Transaction Comment
I think the identity we build in the net will never be IDENTICAL to the one we have off line! (psicoivan83 | 2005-12-09)	Simple theory

The transaction comment reveals the student deliberately wants to involve the others in the knowledge building process; this helps them to develop the discussion and support the shift from one level to the next one.
This result highlights the social nature of the discussion; in fact, the knowledge building process takes place within the dialectic exchange between students and it is based on the mutual support they give each other during the discussion. The transaction comments represent an help and a scaffold explicitly offered and requested by the students, aimed at stimulating the improvement of ideas.
This type of results can provide useful information for teachers and students for improving their discursive practices and to support the knowledge building process.

Future developments

From the results we gathered with our study we can assume the more actors interact, the more the knowledge building process can be developed because this process is strongly rooted into a social dimension. When participants ask someone else opinion it is important to be within a knowledge building community. Many dimensions can impact such process. We found here as essential the ability to support transaction by actively involving the audience but we suspect other dimension can influence the knowledge building process; for instance the time allotted to the discussion.
What if students would have more time to discuss? Would this support the achievement of a deeper level in the discussion?
In future analysis we will investigate in which way the “time factor” could influence knowledge building by comparing courses with a different time schedule.