We are pleased to inform you that the Program Committee of SITE 2008--Society for Information Technology & Teacher Education International Conference, after rigorous peer review, has decided to accept your submission for presentation.

SITE 2008 will be held in Las Vegas, Nevada, USA, March 3-7, 2008.

Collaborative Learning in Asynchronous Online Discussion

Miloud Benayed
IUFM d’Alsace (Teacher Training Institute of Alsace)
141 avenue de Colmar. Strasbourg 67100. France
miloud.benayed@alsace.iufm.fr

Alain Verreman
University of Franche-comté. STGI Belfort-Montbéliard. Laseldi.
4 place Tharradin. Montbéliard 25200. France
alain.verreman@ifrance.com

Abstract: Some high school teachers use online forum with their students to solve an enigma in which the resolution aims to build a course for future classes. The question whether student contributions to the forum are interactions leading to knowledge building is addressed. For this, several analytical frameworks are discussed and one will be chosen and modified because it describes the dynamic of exchanges. The analysis of student communications reveals that collective online discussion develops knowledge differently for every student. In fact we show three different dynamics. Students play different roles: some bring elements to the solution without taking a position, others have a sufficiently deep reflection arguing and synthesizing the discussion. The communicating styles are also different: some students control the discussion more than they contribute to it, others develop relations between the elements of discussion and move knowledge building forward.
Collaborative Learning in Asynchronous Online Discussion

Asynchronous online discussion opens new avenues in the traditional educational system. It allows teachers to transform independent student work into a collaborative distance project for the whole class. This paper focuses on a grade 11 class which used asynchronous online discussions for one of its subjects. One week before the class, the students have to solve an enigma in an online forum after looking for information on the web. The discussion is then reused in the classroom to develop learning instead of receiving it passively. This practice is inspired from the social constructive perspective of learning (Vygotsky 1978) as a complex human activity in a community gathering material and human learners, teachers and environment. Knowledge emerges through exchanges during the activities of problem resolution. In fact collective problem resolution implies decentralization and a reconsideration of one’s point of view, thanks to the phenomenon of arguing between learners (Baker 2003).

To study how exchanges in the forum lead to the problem solution through arguing, proposing solution elements, summarizing and guiding the reflexion, a content analysis of the forum transcripts is a technique used in the studies dealing with this question (Henri 1992, Hara et al. 2000, Fietkau et al. 2003, Weinberger et al. 2006).

Analysis framework

Content analysis frameworks of asynchronous online discussion found in literature are of two types:

The first one considers the forum transcripts as a static text to segment into categories following a learning perspective. For instance, the work of Henri (1992) modified by Hara et al. (2000) categorizes messages by using Bloom’s taxonomy (1956) to study cognitive skills. Hara et al. (2000) also draw a visual representation of the exchanges per week but they do not combine it with the qualitative analysis. Following Gunawardena’s framework analysis (1997), Schellens et al. (2007) categorize forum transcripts into five levels of knowledge building: (1) sharing and comparing information, (2) identifying areas of disagreement, (3) negotiating meaning and co-construction of knowledge, (4) evaluation and modification of new schemas that result from co-construction, and (5) reaching and stating agreement and application of co-constructed knowledge. While the first category gathers more than 95% of the contributions the four others get less than 5%, so one hardly finds real collaboration when interactions are so coded. Weinberger et al. (2006) use a multilevel framework taking into account the multiple dimensions of the collaboration processes such as participation, epistemic, argumentative, and social mode. While using several points of view, Weinberger’s analysis is still missing the dynamics of the problem resolution. All these works do not take at the same time dynamic and qualitative analysis.

The second type of framework analysis considers both the discourse dynamics and its qualitative analysis. Adapting the work of Fisch (1994) inspired by Bales (1950, 1977), Beck and Fisch (2000) analyze decision-making processes in three categories: task-oriented interaction forms, procedural interactions and social-emotional interaction forms. This framework was developed by Fietkau et al. (2003) providing more pertinent analysis criteria and easy to manipulate. Because it includes the three levels: content, interrelations and process of problem solving, this is a multilevel framework like Weinberger’s. With these categories, the coder considers emotional and social moments, shows how students create a working method which is adapted to the subject, distinguishes positive and negative contributions to the problem solution, brings together different students arguments and shows (inter)relations between the students, so the dynamics of the knowledge building in the group can be described.

Based on Fietkau’s framework contributions can be classed into the following categories:
1- GC-guiding the content: inquiry, valuation or proposal on the problem resolution
2- GP-guiding the procedure, the method chosen by the group
3- CC-contribution to the contents, that distinguishes:
   SR: summary$result of the discussion, seen under the angle of the contents
   SP: contribution to the problem solution that can be:
      MRp: related to a person (Move in Relation to a person) in positive or in negative: + or –
      MRc: related to the contents (Move in Relation to a content) in + or in -
4- emotional. We code + when the author creates a positive climate, and - to a negative climate.

Collaborative Learning in Asynchronous Online Discussion

When a student takes into account what another student wrote he leaves his own point of view, accepting or refuting an argument. Guidance is also a phenomenon both social and cognitive: a student proposes a solution method that will be accepted or not. The interventions that follow indicate whether guidance is accepted or not - it is an implicit relation between contents (Henri 1992). This also means that the coder must take into account what has been stated above.

Fietkau’s categories describe the three levels of collaboration (Bardram 1998) which are: co-ordination where only predetermined actions are realized, co-operation where people take into account what others say or do and co-construction where together people construct a solution of a problem. Bardram’s model is dynamic; there are continuous transitions between this levels concerning respectively the means and on the object of working.

<table>
<thead>
<tr>
<th>Co-construction</th>
<th>Co-operation</th>
<th>Co-ordination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflection on the Object of Work</td>
<td>Implementation Stabilizing the Object of Work</td>
<td>Reflection on the Means of Work</td>
</tr>
<tr>
<td></td>
<td>Routinization Stabilizing the Means of Work</td>
<td></td>
</tr>
</tbody>
</table>

The discussion on the strategy to solve a problem (category GP) is related to the means of the work in Bardram’s model. The strategy also helps participants to coordinate their work. The co-construction level is reached where participants give elements of solution related to another contribution (SP with MRc) or to another person (SP with MRp). The category “Guiding the content” (GC) and Summary/Result are important in order to help participants in the co-construction level. The cooperation level concerns contributions to the solution taking into account the preceding contributions without referring to it. Therefore it is difficult for researchers to verify if the cooperation level is reached. However they can hypothesize if it is the contributions, which push forward the resolution. Emotional aspects are intertwined with cognitive aspects and improve or weaken collaboration. For this, the coder will mark alongside the problem resolution. At the end, he gets a good picture of the learning collective work at each level and he can assess whether there was real collaboration, i.e. co-construction of knowledge.

Analysis

The online discussion studied is related to an 11th grade geology course. A week before a course on the “solar system” the teacher asked his 26 students to collectively solve this enigma:

« We must search for a witness of the solar system’s origin. It has been seen between Mars and Jupiter, and its description is the following: formless and of variable sizes (from a few km to 1000 km in diameter). Thanks for unmasking it and making it speak. »

The teacher believes that this task has learning potential because the problem’s solution is not immediate and is only accessible to students through research on the web. The students have to post one message at least or to comment another one. This was the only requirement for this first forum.

Data sources

The forum transcripts were selected for this study and the participants were coded E1, E2, etc. following their entry order in the forum. When the same student intervenes several times, he is noted (1), (2), etc. The teacher was interviewed after the course based on the online discussion in the forum.

Participation
In this paper we observe 13 students who sent 28 messages during a period of five days in the forum. Four students contributed from 3 to 6 messages each and accumulated 19 messages. The other students contributed once to the forum. The 319 visits to the forum confirm what the teacher said: “some students were observant-readers”. Later the teacher reached 100% of participation in this class. The advantage of this first forum is that students didn’t develop any strategy. So we see a natural authentic approach.

Phases

Applying Fietkau’s framework analysis gives four phases to the enigma resolution with many revisits because of the individual rhythm of each student. Sometimes, it is difficult to follow the thread of contributions to the problem solution. For instance, some intervenings take into account the precedent contributions to generate some elements of solution and this logic must be understood by the others in order to make progress on the problem. The intervening can also use the preceding statements unconsciously; in fact “the dialogic character is often hidden to the participants” (Fietkau, 2003).

First phase: disagreement on the task (9 messages)

In this part, the students were confronted with the results of their researches of witnesses of the solar system. Student E1 started a solution E1(1) to the problem which was rejected (MRc-) by the following contribution E2(1). This student guided contents (GC) by proposing his statement to validation in order to make move forward discussion. E2 intervenes a second time E2(2) to compare his solution to the first rejected solution E1(1): “there are several witnesses but the asteroid Ceres is the tallest so it’s the solution”. Both E3 and E9 rallied (MRc+) to this solution; in return, E1 contests this solution (MRc-) that began the consensus: “personally I do not see why this asteroid has more to teach than the other”. This disagreement on the task was in fact induced by the statement of the enigma: “…we must search for a witness…” so a unique solution was defended.

The teacher intervened then to give an indication:
“well, I’ll give you another clue...the witness is not alone, there are several...some of you have unmasked them but no one made him speak!”

The solution of the first part of the enigma is now not subject to debate. A contribution E2(3) brings complete information (Summary/Result) and guides (GC) the class towards the second part of the task.

Second phase: change of procedure (6 messages)

“How do we let the witness speak ?”: E1 begins by a guiding procedure (GP) for the second part of the task: “… to assert that they are witnesses of the formation of the universe we must be sure that the matters that they are composed of are dated from this epoch. In other words, a referential”. This procedure is questioned by E10 and was rejected (MRc-) by E2: “the spectral observances infrareds permit the classification of the asteroids in three groups: (…) I don’t see how the chemical composition helps here…. “. This conflict of method is dissolved in the discussion; E1 will continue in the following silently using his procedure.

Both E3 and E13 bring solutions (SP) that have no direct link with the discussion. The first puts into question his proper proposition (MRc-): “Ceres is not the tallest” in the first phase and asks several questions on the asteroids. Only E13 intervening kept the attention of E2 insofar moving forward the theory (MRc+): « …these clouds asteroids are not all that remains of a tall planet …». This brings about a new phase of discussion, not foreseen by the task.

Third phase: A false useful track to the discussion (6 messages)

A deep discussion was engaged between E1 (3 times), E2 (1 time) and E3 (1 time) on the fact of why asteroids could not regroup to form a planet. The last student contributes to the discussion and regularly inserts elements to impose his solution. This case is different from collective resolution based on parallel solutions. This discussion permits participants to eliminate “bad” hypothesis. The solution was found but must be validated by the others.
Fourth phase: Some staggered interventions (5 messages)

Two interventions have been posted by E2 to the account of two students that have had technical difficulties while accessing the forum. The student E4 posted 3 messages that contain the complete solution to the problem (first and second phase).

Last phase: synthesis (2 messages)

On the last day before closing the forum, the teacher congratulates students: “…Bravo for your research, you have all the information, do a summary of the essential ideas before class… but beware not all is correct in what you said…”. That is the confirmation that the students, apart from E6 and E9 who intervene after this claim, have reached a consensus on the solution.

Observance of the teacher

The teacher interviewed insisted on the quality of the achieved learning regarding the different degrees of the students, to which the academic institution can not foresee. For instance, appropriation of technology, improvement in social ability, learning appropriate etiquette on the Internet, the perspicacity in the search for and in choosing the information. Those who did not express themselves much in class found the forum to be the opportunity to do so. If that becomes consistent, then the forum brought something of importance to the teaching process.

Results

Knowledge gained from interactions

The analysis permitted distinction between:

- the process of learning from the forum, that is typically achieved by an individual resolution supported by the group (each contributes to the discussion, but students will continue arguing by sharing contributions, until others can confirm the validity of the proposal) and

- the process of group work in the forum, that is typically accomplished by a collective attempt aimed at the accomplishment of a task and reaching a common goal (this request balances the few useful elements with the non pertinent arguments)

- some contributions raised from individual proposals apparently do not take other contributions into account and are not unified on the explicitly given solutions at the end of the forum. These contributions are rejected or ignored by the group because they do not push forward the problem’s resolution, or because they do not come at the right time.

Vicarious learning

We established that some students played the role of an expert for the other contributors and that the vicarious effect accelerated the understanding of the work method and of the content. The high number of visits to the forum proves that students who do not participate were interested in the contributions of their fellow students. In other words, even if there is no visible interaction, learning can still take place, as in the model of observational learning (Bandura 1977).

Cognitive conflict and collaboration

The progress towards knowledge is not linear. There were a few conflicts surrounding the group strategy, i.e. the procedure towards the solution of the problem, but more particularly on the direction of the content. The
search for a solution can not move forward quickly unless students know that their attempt is followed by the others and the teacher who knows where it is going. That was the case in the observed forum.

Discussion

An experience of computer supported collaborative learning with a group of 16 years old students in France has shown that this learning form is not an illusion. The analysis of the contributions to the discussion about an enigma has been achieved through a multilevel framework, inspired by Fietkau et al. (2003). It was possible to show the dynamic of the students’ exchanges on the forum, including emotional exchanges, moves in relation and the slow building of the knowledge through facts and arguments. Sure, the learning object must be reinforced in class, it has to be trained and memorized. By using a multilevel coding system we choose a compromise between a deep analysis of all items and the necessity of manipulating them so that it's possible to illustrate the learning process. Fietkau’s framework allows the demonstration of the interaction dynamics as in this illustrative case.

In conclusion, we can assert with care, that the collaborative resolution of a problem in an online discussion could lead students to gain introductory knowledge on a subject before learning in the classroom. It was clear that together young students spontaneously built their knowledge. The obtained results are similar to those of non-educational contexts and open possibilities of using them for educational purposes.

Following researches aim to find an answer to the question : Is the framework working as well for analyzing exchanges in consensus building or in other forms of collaborative learning ?
References


