Assessing writing and collaboration in learning: Methodological issues

Philippe Dessus, Ștefan Trăușan-Matu, Sonia Mandin, Traian Rebedea, Virginie Zampa, Mihai Dascalu, Emmanuelle Evl Villiot-Leclercq

Assessing Writing and Collaboration in Learning: Methodological Issues

Philippe Dessus*, Stefan Trausan-Matu**, Sonia Mandin*, Traian Rebedea**, Virginie Zampa***, Mihai Dascalu**, Emmanuelle Villiot-Leclercq****

* LSE, Grenoble University, France ** "Politehnica" University of Bucharest, Romania *** LIDILEM, Grenoble University, France **** IUFM, Grenoble University, France

Philippe.Dessus@upmf-grenoble.fr, Stefan.Trausan@cs.pub.ro, Sonia.Mandin@msh-alpes.fr, trebedea@gmail.com, Virginie.Zampa@gmail.com, mikedascalu@yahoo.com, Emmanuelle.Villiotleclercq@gmail.com

Abstract. We describe the main tasks students usually complete when working in an e-learning platform, across five mean features that have to be taken into account in research efforts (writing-based activities, individual/collective level, knowledge/ pedagogy orientation, feedback, multiple stakeholders account). Ways to analyse and assist these tasks by (semi)-automatic assessments using NLP techniques is eventually discussed.

1 Introduction

Current e-learning platforms allow rich collaborative learning activities that are now very well detailed and documented (Dillenbourg 2002; Kollar et al. 2006). However, the ways to record, study and analyse these activities yield method-ological issues often debated in the literature (Strijbos & Fischer 2007) and theoretical frameworks to tackle these issues are lacking. The learning activities engaged in collaborative e-learning contexts share some specificities. First, they are based on writing. Second, their manifestations are both at individual and collective level. Third, their aim is twofold: at covering (learning) a given know-

ledge domain but also at leading a pedagogy-related activity. Fourth, they require analysis in order to provide an adequate feedback. Fifth and last, the stakeholders to be considered are not only the learners and the teachers, but also the researchers studying the activity. Taking into account all these specificities requires to devise ad hoc methodologies and overcoming research challenges. Strijbos and Fischer (2007) listed five main methodological challenges close to those we shall point out in this paper, the goal of which is to present a comprehensive framework drawn from Bakhtin's work and a set of NLP-based tools that can help analyze learners' tasks according to these five points. The following sections shed light on each of them.

2 Five E-learning Specificities and Task Features

The tasks every learner performs in an e-learning platform share five features.

Writing for learning. Every learner engaged in individual and collaborative learning in a virtual platform performs a set of writing-based activities (e.g., abstract writing, note taking, chatting, writing in forums), which are both evidences for, and products of, learning (Emig 1977). We can integrate the different writing-based learning activities in a comprehensive framework, based on Bakhtin's dialogism theory (Bakhtin 1981). As Koschmann (1999) put it, quoting Bakhtin: "[…] the voices of others become woven into what we say, write and think". We thus can take into account all these activities within a unique framework: everything—written, read or spoken—has a dialogic nature, which is expressed through writing and relates to learning.

Multilevel Tasks: from Individual to Collective. Tasks carried out by students are often separated in two independent ones, individual and collective. As Stahl (2006) puts it, learners engaged in a collaborative task in a e-learning platform have to cope with two *recursive and interrelated* main tasks: first, they are involved in an *individual* knowledge-building process; second, they are publicly engaged in a process of *collaborative* discussions about the notions at hand in the first loop. Bakhtin's ideas of dialogism and inter-animation suit with these intertwined and multiple tasks (inner dialogs and debates).

Two aims: knowledge and pedagogy. The multiple tasks in which students are engaged in e-learning do not share the same goals. The complexity of any learning situation is partly due to the fact that two different and often conflicting aims interact with each other (Shulman 1986): learning a knowledge domain and in parallel being confronted with pedagogy-driven activities. On the side of knowledge, learners are given information they process in order to acquire knowledge. On the side of pedagogy, learners' behavior is directed as 'moves' within the classroom environment and pedagogical methods can be inferred from these moves.

Feedback delivery. In an e-learning context, *students* spend lot of time waiting for feedback from teachers or tutors about their writing, whatever are the goals and levels pursued. They encounter some problems: they stagnate themselves in the writing process; the limited feedback opportunities do not stimulate explorative approaches ("what if-trials"), but force them to hand in mainly completed versions; during writing, it is difficult to self-assess ongoing work and understanding. *Teachers* have a limited overview of the learners' processes, and assessments of students' understanding or collaboration are difficult and time-consuming. Feedback is thus necessary in e-learning contexts and can partly be automated by computer-based procedures.

Accounting for stakeholders' viewpoint. E-learning contexts are populated by numerous stakeholders (students, tutors, teachers, researchers) whose tasks may differ, overlap or be contradictory to each other. These tasks can also strongly interfere with the kind of tool used for analysing a given learning situation. Since most of the tools aiming at analysing collaborative software are devised for research purposes, they are more difficult to be used by other stakeholders.

3 NLP-Based Tools

Web-based services using NLP techniques can take into account the five features of e-learning situations presented above:

(1) detection of relations between utterances can be processed to reveal the voices engaged in writing or dialog;

(2) account for both the individual and collective level of knowledge acquisition;

(3) sensitivity to both knowledge (cognitive models) and 'moves' (dynamic situations) (Dessus et al. 2005; Wolfe et al. 1998);

(4) possibility to deliver just-in-time feedback allowing self-paced learning;

(5) deliver generic feedback to account for all the stakeholders' categories.

Let us now present two instances of web-based services designed from this viewpoint. *Pensum* supports learners at an *individual level* in the automatic assessment of their essays (summaries, syntheses). *Pensum* analyses how well learners understand course texts through their textual productions. It provides different kinds of feedback (see Figure 1) all based on LSA (Latent Semantic Analysis, Landauer & Dumais 1997) on two important features influencing writing quality: topic coverage (semantic links between sentences source texts and synthesis) and inter-sentence coherence.

PolyCAFe (Chat & forum Analysis and Feedback system, Trausan-Matu & Rebedea 2010) functions at a *collective level* using an NLP pipe (stemming, POS tagging, chunking, etc.), advanced pattern matching, social network analysis and LSA for detecting discussion topics, threads and inter-animation in chat logs.

Feedback (textual and graphical) is generated emphasizing collaboration degree, discussed topics and evaluation of the participant's contribution (see Figure 2).
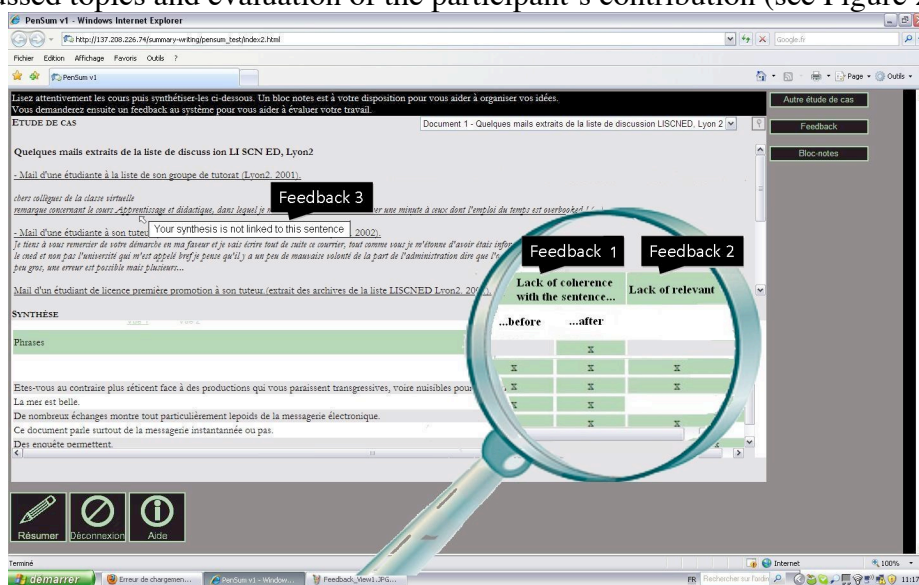

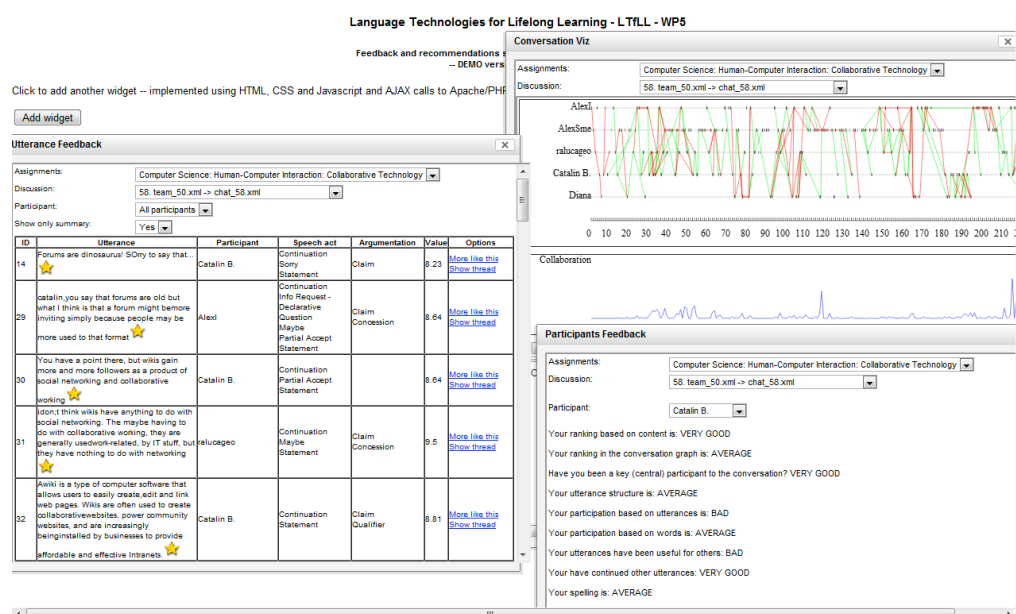Figure 1. The different pieces of feedback delivered by *Pensum*.

Figure 2. *PolyCAFe* main interface.

4 Conclusion and Future Work

We presented a theoretical framework in which five main learning tasks occurring in e-learning collaborative platforms, as well as two web-services fitting with

these tasks. Our services (1) are focused on writing activities; (2) are both on individual and collective levels (3) can embed pedagogical facets through the use of widgets; (3) propose high-level and automated feedback; (5) can be used by different stakeholders. Further work is planned to cross the results of these tools to uncover patterns of efficient individual or collaborative forms of writing.

5 Acknowledgments

6 References

Bakhtin, M.M. (1981): *The dialogic imagination: Four essays*, The University of Texas Press, Austin.

Dessus, P., Allègre, E., and Maurice, J.-J. (2005): 'L'enseignement en tant que supervision d'un environnement dynamique', *Ann. Rech. Sci. Educ.*, pp. 149-162.

Dillenbourg, P. (2002): 'Over-scripting CSCL: The risks of blending collaborative learning with instructional design', in P.A. Kirschner (Ed.): *Three worlds of CSCL, can we support CSCL?*, Open Universiteit Nederland, Heerlen, pp. 61-91.

Emig, J. (1977): 'Writing as a mode of learning', *College Composition & Comm.*, vol. 28, n° 2, pp. 122-128.

Kollar, I., Fischer, F., and Hesse, F.W. (2006): 'Collaboration scripts - A conceptual analysis', *Educ. Psychol. Rev.*, vol. 18, n° 2, pp. 159–185.

Koschmann, T. (1999): 'Toward a dialogic theory of learning: Bakhtin's contribution to understanding learning in settings of collaboration', in C. Hoadley, and J. Roschelle (Eds.): *Computer Support for Collaborative Learning (CSCL'99)*, Mahwah, Palo Alto.

Landauer, T.K., and Dumais, S.T. (1997): 'A solution to Plato's problem: the Latent Semantic Analysis theory of acquisition, induction and representation of knowledge', *Psychol. Rev.*, vol. 104, n° 2, pp. 211-240.

Shulman, L.S. (1986): 'Those who understand: Knowledge growth in teaching', *Educ. Researcher*, vol. 15, n° 2, pp. 4-14.

Stahl, G. (2006): *Group cognition. Computer support for building collaborative knowledge*, MIT Press, Cambridge.

Strijbos, J.-W., and Fischer, F. (2007): 'Methodological challenges for collaborative learning research', *Learn. Instr.*, vol. 17, n° 4, pp. 389–393.

Trausan-Matu, S., and Rebedea, T. (2010): 'A polyphonic model and system for inter-animation analysis in chat conversations with multiple participants', in A. Gelbukh (Ed.): *Computational Linguistics and Intelligent Text Processing (CICLing 2010)*, Springer, New York, pp. 354–363.

Wolfe, M.B.W., Schreiner, M.E., Rehder, B., Laham, D., Foltz, P., Kintsch, W., and Landauer, T.K. (1998): 'Learning from text: Matching readers and texts by Latent Semantic Analysis', *Discourse Processes*, vol. 25, n° 2-3, pp. 309-336.