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VIRTUAL INTERACTIONS, SHARED TEACHERS' MEANINGS AND GEOMETRIC HYPERTEXTUAL TASKS¹

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Abstract

This paper presents some contributions from a teleinteractive process to the development of mathematics teaching, specifically to reflect on the influence of the communicative dynamics established by e-mail. The research is a longitudinal study aiming to analyse the implications of work dynamics through the Internet carried out in a virtual environment built for the continued learning of geometry in Brazil. The focus on personal reflection and continuous sharing of ideas among the body of educators constituted a relevant fact in an atmosphere where the teachers held a leading role and controlled their own formative process. Besides, virtual dynamics enabled all educators involved to become responsible for collaborative work and to develop various professional actions.

Introduction

The demand for communication autonomy for the teachers' professional development within a virtual community requires a high level of interaction and collaboration among the teachers (Barberà, 2001). Besides co-ordinating the actions and development of the teleinteractive process, the virtual researcher has an important role, namely to think about the types and aims of the proposed task in the formative environment (Llinares et al., 2000). Nevertheless, the responsibility to plan, organise, develop, show and summarise the learning activities with a team effort is a job shared by all the teachers involved in the virtual work dynamics.

Contreras (1997) points out that if the way in which teachers assimilate and understand their work is reduced to putting forward problems that limit themselves to the immediate classroom occurrences, without challenging educational perspectives, in their reflections they can hardly transcend the values and practices of the current school. From this perspective we propose to discuss the contribution to teleinteractive processes of *teacher* versus *researcher* in order to improve the professional development of the mathematics teacher. This contribution bears relevance to the sub-theme 4 of CIEAM54, specifically to reflect on the influence of the communicative dynamics established by e-mail, where the geometrical tasks present a continuous metamorphosis of hypertext, as far as teachers are considered as authors and can be held responsible for the critical conduct of the teleinteractive process.

The research

Our development of an online research framework is part of a greater project for improving teacher training in geometry (for 11-14 year old students) developed since 2000 as a co-operative project by the Federal Rural University of Rio de Janeiro (Brazil) and Barcelona University (Spain). The focus of this research (Bairral, 2002) was written communication in deferred or real time. A group of teachers worked on a 50 hour Internet Course over six months

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using a range of online interactive tools: email, geometric tasks, self-regulation enquiries at the end of each lesson, discussion forum and distributed chats. One semi-structured interview, text writings and videotaped experiences of teachers' classrooms were also used to recognise changes-in-action in geometry. For this, case studies were conducted to: (1) characterise some specific issues in this online activity and (2) propose a model for the critical component of professional knowledge by means of an Internet training experience.

Teachers' teleinteractions, geometrical hypertextual tasks and professional claims

One of the characteristics of our formative virtual environment (Bairral, Giménez and Togashi, 2000) was the proposal of geometrical tasks that, while acknowledging the personal potential and professional experience of teachers, would provide them with material that would enable them to reflect on thought-provoking, updated mathematics educational research. These tasks demand a different positioning and contract of teacher and researcher. Nevertheless, they both share the communication process through the Internet and the kind of interaction established by the individuals' professional needs.

In our virtual environment teachers construct their contributions hypertextually. Hypertexts built by the teachers allow for a non-linear construction of discussion nets. As they are socialized, these nets can be oriented by any member in the formative environment. Hypertextual construction and continuous metamorphosis of messages, issued from formative tasks, favour a flexible, communicative dynamic and a constructive and meaningful teleinteractive process. The interest of the research is in the simplest case of hypertextual dynamics, that is, the continuous production and reconstruction of electronic messages, considering cognitive flexibility, textual non-linearity, access and distribution of information within the net.

Analytical process

For the current study we developed a case study and a semantic analysis of electronic messages exchanged among teachers and a researcher-trainer. We adopted the following criteria for the presentation of data (Bairral, 2002b):

1. The researcher receives the message.
2. He codes it
3. He transfers it to the file "researcher's diary"
4. He analyses the referential content in the message text and identifies the related ideas established by the communicating agent, as well as others who can foster a sequence in the discussion.
5. He contrasts the content of the message with contributions in other communicative spaces in the formative environment
6. He reconstructs the content of the message and returns it to the addressee.

All along the teleinteractive process there were different types of messages exchanged among the teachers and the researcher. Therefore, the development of reflective metacognitive skills was affected differently for each of the participants involved professionally. In this study we are presenting the analysis corresponding to the messages that had a content related to the carrying out of a proposed task (see Appendix). Each message was coded as follows:

Carla1 (F1) May 4 (04/05)	
Ca1	First message from Carla (Ca) ³
T1	Researcher's first message (T)
Ca1 (T1)	Ca sends a message responding to and negotiating meaning from the referential content by identifying and interpreting T1
04/05	Mailing date of message

Here is, by way of an example, a part of a collaborative teleinteractive e-mailed sequence between researcher and teacher Carla.

Unit 3 (task, researcher-trainer 1): **27th April 2001**

Please, observe the teacher, Miguel's, justification in his statement:

"Usually the manual uses the co-ordinates (1) to put the point, a shape on the plane or in three dimensional space in relation to static elements so as (2) to study lineal transformations of one figure". How do the figures validate Miguel's reasoning? Suggest one question, about the shown figures, that would lead to reach the aims presented by Miguel. Develop that with your students and tell us.

Ca1 (Trainer 1) **4th May**

I don't understand the question "to study transformations of one figure". Is it to observe figures at several points?

Trainer 2 (Ca 1) **4th May**

What kind of transformations can we make in one figure? For instance, the aim that Miguel is referring to in the activity uses the Cartesian plane to study symmetry, similarity, rotation, shifting, etc. Does it make sense?

[...]

Ca7 (T1, T2, T4) analyses and answers T's interventions and questions. Carla introduces the possibility of using **homotethy**, and triangles inscribed in a circle. She relates those ideas to the proposed task. But she remains unhappy about herself.

[...]

Ca9 (Ca2, Ca7) seems happy with this teleinteraction and proposes for the first time an idea to work with linear transformation using shadows (a theme already discussed in previous course unit 5)

[...]

Trainer 10 (Ca 14) praises Carla's creativity and sends her back an e-mail message with his comments on Carla's analysis of her student's work.

[...]

Ca 15 (T10) **22nd August 2001**

From the doubt expressed by the teacher in carrying out the task, both instructor and teacher established, basically through an exchange of electronic messages, a long teleinteractive process. In this specific task, we registered 9 occurrences of the researcher to respond to the 15 remarks made by the teacher. The contents of the occurrences were interrelated, complemented and reconstructed hypertextually from the interests and comprehension of the communicating agent. Besides allowing for attention to the knowledge of the teacher and the personal time needed in her reflective process, the communicative dynamics of the virtual environment enabled the participants to carry out and integrate other tasks, and to socialise with all the different members in the various communicative settings. That is, it favoured the development of classroom activities along with the discussion among all the members of the environment. This process of sharing professional meanings, with attention to both individuals and the collective

³ Pseudonym

body, at different moments in the life of the teacher, is a peculiarity of the teleinteractive dynamics and favours the professional development of all the teleinteracting agents involved.

Conclusions

In our case, work through Internet and the teleinteractive process which was established and developed from formative tasks or hypertextual transformation given or demanded, consciously or unconsciously, by the teleinteracting teachers, made it possible to integrate metacognitive teleinteractions. These have been continuously built, supported or rebuilt based on theoretical and practical characteristics of each specific teaching context. Of course, the teacher's available time to devote to the course work, the development of possibilities in her class, the integration with other tasks during the course, and the possibility of discussion with the researcher and the virtual collective teaching staff in other communicative spaces were important factors in the process of professional development. This is a crucial trait of the virtual environment.

The virtual environment allowed for increasingly complex, constant feedback activation of the cognitive processes of the teachers involved. Teachers had a chance to reflect on what they had done and were currently doing, what happened, difficulties and necessary arrangements, as well as future changes, in their own time and with regard to their own reflective needs. In this process, the role and influence of the virtual researcher is, unmistakably, very important for the continuity of the process control (individual and collective), asking questions, contrasting points of view, helping the teachers in their difficulties, organising and requisitioning, socialising information, answering personal and collective messages, motivating, suggesting, studying, researching, etc. In addition to these educational actions, the researcher had to act in response to the teachers' requirements. That is, in spite of the fact that the task was proposed by the researcher, it was the teacher who, even if unconsciously, led the discussion, by reflecting and questioning, usually related to her needs through the unfolding of the task, while the researcher offered support to the individual /collective development. Obviously, he or she has also been learning all along.

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Unit 3 – Relations on Space

Please, observe the teacher, Miguel's, justification in his statement:

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