

Making geometry on a virtual environment: a proposal of continuous distance education for teachers

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Tele-ambiente¹ is an environment composed of a virtual site linked to applications that favor the cooperative work, in which the interaction among participants is mediated by tele-conference resources (image, sound, text and mail) plus an efficient protocol of real-time file and software sharing among the the working group participants (for instance student-student and teacher-student).

The final goal is to develop a distance learning tool for middle-school mathematics teachers in-service professional development in the state of Ceará, Brazil. The course focus on selected topics on geometry, using software as resources for teaching geometry and enfasize problem solving instead of algorithms and proofs. The aim is to develop teachers' conceptual understanding about geometrical topics and at the same time to provide them with tools for planning their classes using internet and educational software.

The present work discusses a pilot experience for implementing this environment. We are currently developing materials for the course. In a previous study conducted in classroom, we observed how teacher interventions could be reduced. In this work we report on findings with a group of pre-service elementary school teachers at the Universidade Federal do Ceará. We first describe the virtual environment called Tele-ambiente.

The Tele-ambiente's Structure

Tele-ambiente is a learning environment composed of a tool, called TELE, and a group of activities that can be used by this tool in real time. We assumed two premises for initiallying implementing TELE. The first was to adopt patterns established by organisms such as ITU (International Telecommunications Union) and IETF (Internet Engineering Task Forces); the second was to adopt the Internet as the basic infrastructural environment.

TELE was implemented using the ActiveX controls, a Microsoft™ NetMeeting product. The interface was developed using a group of parameters to control the interface objects presented to users. The features of NetMeeting are supported by industry patterns designated by the International Telecommunications Union (ITU), the Internet Engineering Task Forces (IETF) and other normatization agencies. NetMeeting allows ITU H 232 for audio and video-conference, ITU T.120 for the multi-point conference, and IETF LDAP for directory services.

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Pedagogical structure of the courses

Tele-Cabri it is a distance course conducted in Grénoble by IMAG, of the Joseph Fourier university, for hospitalized children. We choose to adapt it for a group of in-service public schools teachers in Fortaleza, Ceará, Brazil. The teachers usually have insufficient content knowledge in mathematics and geometry.

Initially, we have students' machines linked to an internet server which has already properly learning situations stored and scheduled, an virtual tutor agent, interventional objects and historical of the sessions. These items are integrated in the Tele-ambiente environment allowing sharing of Cabri-geometre software, and oral, visual and written communication.

To explain them, begin why commenting the term tutor it is used. Pavel (1997) says that Balacheff prefers to use this term because it differentiates the teaching through TeleCabri from a simple tutorial program tutorial containing all the answers rigidly structured. In a certain way, TeleCabri works as a program tutorial because it possesses an virtual tutor agent that generates problem-solving situations, intervening in students' difficulties through an analysis of didactic engineering accomplished a priori in possible ways to solve the subject, taking in consideration, still, possible mistakes and the student's difficulties.

When identifying the students' difficulty, the virtual tutor has two roads to proceed: it makes an automatic intervention, running over the intervention objects, or it falls back upon the human tutor. The human tutor's importance resides in the fact that not all the students' difficulties can be solved in an automatic way. In the Tele-ambiente database, we set up the virtual tutor, the interventional objects with the situations problems and texts and images with explanatory and illustrative routes.

To structure the course, we will select part of the official curriculum for the geometry teaching demanded for 5a and 8a grades of the Brazilian middle school teaching. We will create the activities with Cabri-géomètreto allow active construction of the geometrical concepts. We also intend to use other available resources in the Internet for not limiting ourselves to one only application. We intend to use with teachers a methodology that stimulates thinking, so that they can learn how to propose problem solving situations that contribute in an active way to constructing students' knowledge. It is also our objective to prepare the teacher to accomplish the analysis of children's answers.