COLLABORATIVE LEARNING THROUGH THE PROBLEM SOLVING DESIGN IN THE COMPUTATIONAL ENVIRONMENT – E-TEAM

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INTRODUCTION

With the introduction and spreading of Informatics in the society and in Education, we have come across a technological scenario which presents us with a new logic, a new language, a new way to understand and to place ourselves in the world we live. This new scenario requires a new professional culture from the human being going through an educational process. It has therefore, become necessary to dimension the teachers' education courses again, so as to offer them knowledge and actions which are consistent with the new educational trends, which are determined by the technological advances. In that sense, it can be inferred that we, educators, do not have much choice, that is, the educational choices have already been determined by the presence of technology in the several sectors of our society. Thus, it has become imperative that we engage ourselves in critical reflections about the introduction and spreading of computers in the classroom in order to provide our students with educational environments which are compatible with the technological development. In addition to that, we hope that these reflections can turn into concrete and real actions to contribute to teaching in a way that can live up to society's expectation.

With those perspectives in mind, a project entitled "Computational Environments in the Exploration and Construction of Mathematical Concepts in the Context of Teachers Reflective Education" is being developed at LAPEMMEC/CEMPEM/FE/UNICAMP[1] coordinated by the author. Some results of the research, inserted in the project will be presented in this communication. This research is about the several ways of using technology in the development of mathematical concepts in the classroom, in a critical and reflective way. The objectives are: 1- To offer theoretical-methodological assumptions for reflective and informed education of future teachers in the field of Mathematics Education, regarding the understanding and use of computational environments, thus helping these future teachers to develop a critical view of how technology can be incorporated and used in the context of the classroom to help in the development of mathematical concepts. 2- To offer data and pedagogical-cognitive elements to the design of interactive environments based on computational environments, Simulation, Tutorials, Problem Solving, Programming Language, AVI Constructor (Animation), Internet, among others, appropriate for the development of mathematical concepts. 3- To offer theoretical-methodological data for devising an alternative methodology based on the well informed use of technology by the teachers, thus giving a new dimension to the process of teachers education and to the process of exploration and construction of mathematical concepts.

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[1] http://www.cempem.fae.unicamp.br/lapemmec

The methodology of this research consists of a modality of action research in which the intervention takes place based on the interaction of the researcher and the subjects involved in the research. Such an interaction allows for several ways of communication, which results in a very dynamic approach. It is pointed out that the methodology that is being used with the subjects involved in the research is based on Problem Solving, in the various computational environments: Simulation, Tutorials, Programming Language, AVI Constructor (Animation), Internet, among others.

Problem solving is being seen as a design activity (Miskulin, 1999), in which the formulation and definition of the problem itself are challenging tasks for the subject, that is, s/he constructs hypotheses, suppositions; as s/he devises his/her strategies, s/he relates them to his/her objectives and to the context in which s/he is working. These are problem-situations which contain the subject's own characteristics, without ready solutions and answers, but rather with cognitive processes which take into account guesses and risk taking, that is, abductive thinking as well as deductive and inductive thinking.

The subjects in this research are undergraduate students in Mathematics at UNICAMP, undergraduate students from the College of Education, graduate students of Mathematics Education, elementary and high school teachers, and university professors. In this scientific communication, it will be presented an example of the projects developed by the subjects involved in the research, elaborated on the computational environment E-TEAM, aiming at the development of interactive contexts of collaborative learning.

E-TEAM consists of a computational environment which allows for clear and detailed electronic communication with the convenience of the use of multimedia resources. With the E-TEAM, one can carry out the following procedures: to retrieve graphs on the screen (drawings, pictures, images, graphs in general), to import images JPG, GIF, Bitmaps, texts from other programs (Word, PPT, Excel, etc), to make comments on these objects, and also to record one's voice. All these procedures are carried out at the same time, as if the user were face-to-face with somebody else explaining a certain subject. All this information is compacted and sent to the receiver, by using the e-mail program of your preference. The person who receives the file can open it and edit it and make comments about its objects in an interactive way.

The general objectives of E-TEAM can be described as follows: to create an appropriate educational context for the subjects to use the different kinds of E-TEAM files and to develop abilities to work with different formats of files and to know how to apply them to new situations. The specific objectives of E-TEAM can be described as follows: to make it possible for the subjects of the research: to interact critically with a computational tool; to apply the potentiality of this tool to pedagogical practice and to build knowledge from the interaction with the potentialities and limits that this environment offers, by using the mathematical concepts that can come up during the process of collaborative learning.

RESEARCH METHODOLOGY WITH E-TEAM

Some methodological procedures were used during the development of the research with the computational environment E-Team, such as: the use of

Tutorials, the use of Chat Rooms, aiming at the discussion of important aspects related to the subjects' projects; critical and reflective reading of selected texts related to the theme; research in websites; historical rescue of some aspects of the projects of the subjects; development of collaborative projects on topics related to the subjects' mathematical education, besides the construction of interactive messages in the E-TEAM and the exchange of these messages with other groups, always reflecting upon the mathematical concepts that came up in the individual projects.

SUBJECTS' ACTIVITIES WITH THE E-TEAM

The students were engaged in some activities – mathematical problems and challenges, giving examples of the pedagogical-cognitive possibilities of the computational environment E-TEAM, in the development and exploration of mathematical concepts. The following activity illustrates the pedagogical ability of the E-TEAM to provide an appropriate context to collaborative learning and shared knowledge.

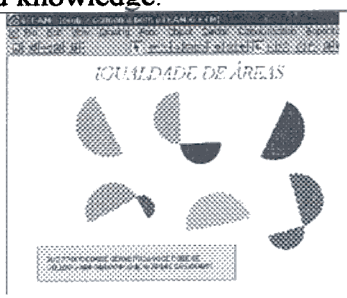

Figure 1 – Activity 1

Figure 2 – Answer to Activity 1

CONCLUSIVE ANALYSIS

The example given aims at making clear the cognitive and pedagogical possibilities of the E-TEAM as a multimedia interactive environment, which provides a favorable context for collaborative learning and shared knowledge, through electronic communication. Thus, the objectives of the research with the computational environment E-TEAM are reached as the development of an interactive educational context makes it possible for the subjects to use the different kinds of E-TEAM files in the development of mathematical problems and challenges. Another aspect emphasized is related to the fact that the subjects have shown that the critical interaction with a computational tool can give them theoretical-methodological data for the application of the pedagogical and computational potentialities of that tool to their pedagogical practice and to the construction of knowledge, which favor and contribute to a new view in Teachers' education consonant with the technological development.

BIBLIOGRAPHY

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