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Technology-based Collaborative Learning in Every Day School Practices: Research Directions of Learning Technology & Educational Engineering Laboratory

Angelique Dimitracopoulou[1], George Fesakis[2], Argiro Petrou[3], Stelios Orfanos[3], Irene Ioannidou[3]
[1]Associate Professor, [2]Researcher, [3]Phd Student,
Learning Technology & Educational Engineering (LTEE) Laboratory,
University of Aegean, GR-85100, Rhodes, Greece
{adimitr; gfesakis; petrou; stelios; ioan}@rhodes.aegean.gr

ABSTRACT
Four main directions of research was implemented by the Learning Technology and Educational Engineering (LTEE) Laboratory, in order to investigate aspects of technology based learning environments & collaborative learning, for young children, secondary education students, students with special needs as well as teachers support and teachers' education approaches.

ΛΕΞΕΙΣ ΚΛΕΙΔΙΑ: *Scientific modeling, collaborative learning, cooperative learning, inquiry learning, conceptual change, tools supporting metacognition, interaction analysis tools for teachers, adults education, distributed cognition, activity theory*

RELATED RESEARCH DIRECTIONS

Several kinds of scientific activity have been developed by LTEE laboratory during the last five years in order to explore the exploitation of ICT in implementation of constructivist teaching principles and cope with Computer Supported Collaborative Learning and the conceptual change problem.

Collaborative Learning related research in LTEE laboratory, was implemented in four different directions:

(i) Design and application of a collaborative modelling environment and learning activities for secondary education, in different subject matters.
   (a) Identification of design principles and features that support students(12-17 years old) and teachers, in synchronous computer mediated collaboration [Dimitracopoulou & Komis, 2004]. Realistic animations, cognitive tools appropriate for young students, and metacognitive support was central in order to support conceptual change.
   (b) Conceptual change in sciences using appropriate modelling activities (Physics, chemistry, environmental education), in small group of students [14-16 years old] There is empirical evidence that modellingspace helps students in the understanding of formal scientific concepts. [Orfanos & Dimitracopoulou, 2003].
   (c) Exploring the conditions for synchronous collaborative learning in everyday school practices [Fesakis, Petrou, Dimitracopoulou 2004]. Comparison of three different

settings: ome, oxe, xxx. … gives insights on collaboration quality, points of view of students and teachers…

(d) Teachers role, strategies and tactics in order to support students. Diagnosis is a really hard activity for teachers, and if they have the opportunity to apply it, at least to a certain degree, we consider it is significant both for teaching and learning

(ii) Conceive technology based learning activities using mobile technology for learning & conceptual change related to the development of intuitions of space concepts as well as the development of cognitive skills and actions concerning map reading, navigation, and construction by young students [5-7 years old]. The design rationale of the proposed learning activities is around the idea of "*Signifié- Signifiant Collaborative Play*" Script that apply on the assumption that the cognitive operation of an individual for instance to read a map (2D symbolic representation) and use it to 'move' in the real space (3D natural space), could be distributed over two group of individuals communicating each other while working in one of the two representational mode. The objective is to incite children to *decenter* (from their own perspective, as well as from specific representational media), and to develop '*empathy*' (considering that another may have a different point of view [Ioannidou & Dimitracopoulou, 2003a, 2003b). The analysis of learning mechanisms and effects was based on the analysis of cognitive processes during intra-group interactions as well as inter-group interactions involving relations and interactions among individuals and artifacts, and b) on the pre- and post-test analysis which ensures learning related to maps without using technological mobile tools.

(iii) Cooperative and collaborative learning, using web based tools, for students (12-15 years old) with special needs. Conceptual change in communication and collaboration skills, during computer science courses [Petrou, Dimitracopoulou 2004]. Changes in group formation…. Every day collaboration possibilities of these children, ….

(iv) Cooperative and collaborative learning for adults. Programs of teachers' education in ICTs in Education that is based on a mixed programs of face to face seminars and distance learning programs, for teachers education and support. The research contains,…. Al the platform, the program, etc, It is based on theoretical foundations for Communities of Practices,… It focus on the means and tools that could allow teachers to collaborate and cooperate in order to learn and change on the level of "staseis". [Hlapanis, Bratitsis, Dimitracopoulou 2003]

MAIN ASSUMPTIONS AND THEORETICAL FRAMEWORKS

The theoretical framework is mainly based on issues from:

(A) Cognitive psychology, science and mathematics education, where: (i) science learning is characterised by misconceptions [Driver, 1978; DiSessa, 1982; Viennot, 1979] (ii) a first step of conceptual change is the emergence of these misconceptions from the part of the students and the diagnosis of them by the teacher [Vosniadou, 2001] (iii) the role of explanation in conceptual learning is significant [Chi et all 1979], (iv) the social confrontation of the (pre)scientific' knowledge is claimed by epistemology, (v) there is a need to facilitate 'metaconceptual awareness, & metacognitive support [Vosniadou, 1994; 2000].

(B) Computer Support for Collaborative Learning (CSCL) field research, which gives indices that under appropriate conditions synchronous computer mediated collaboration could incite explicitation, argumentation and explanation triggering, comparing to the typical class situations of school problem solving (where, students solve problems alone, expressing only the final product, e.g. a series of equations and a series of algebraic manipulations).

(C) The consideration of the school community, their practices, their rules and their conditions: school program, needs of teachers, typical course topics, etc. A continues effort

was to implement innovative approaches in typical school or professional conditions, taking into account the current conditions and intervening factors, in order to support learning activities' participants.

The Design Rationale of the computer mediated collaborative setting among collocated students, is related to student and teachers expectations:

- *Regarding students*: To increase the possibilities of *explicitation, argumentation* and *explanation* triggering, in comparison to individual activity or collaborative side-by-side activity, that is usually applied in class.To increase the possibilities for decentering.
- *Regarding teachers*: To provide tools and means for a detailed diagnosis of students' conceptual understanding and difficulties on specific activities processes (e.g. modelling, exploration). To provide tools for social awareness

The application of the proposed collaborative setting is intended to support learning through three complementary approaches: (a) Structuring the collaborative activity process in order to favour the emergence of productive interactions, (b) Supporting students to self-regulate their activity, (c) Monitoring students' interactions, by the teacher (on the fly, or afterwards).

The proposed approach determines some significant application conditions: (a) The selection of critical instances of this setting application related to every day courses (e.g. conceptual understanding, strategies for inquiry or modelling), (b) The application of appropriate structured script that involves: individual work, synchronous computer mediated activity, face to face activity, and social activity with the whole class, (c) The existence of appropriate interactions' analysis tools, that support students in a metacognitive level, (d) The existence of interactions' analysis tools appropriate to support teachers in a diagnosis level as well as in a teaching strategies self-regulation level.

One significant aspect to be discussed during the workshop is the theoretical frameworks on the conceptual change process (distributed cognition, activity theory, …xxxxx).

OPEN QUESTIONS AND FUTURE DIRECTIONS

As far as the conceptual change is concerned the research interest of the laboratory is focused in the mechanism that relates the self-regulation, to social negotiation and to finally learning of concepts during computer based collaboration. Furthermore there are currently some relevant and rather component research interests that are formally attended in the framework of research projects. More specifically questions concerning the collaboration analysis tools supporting students as well as teachers are examined in the ICALTS project. In addition design and representation of general purpose collaborative learning scripts is aimed, (in the framework of MOSIL project) is explores also collaborative learning activities using mobile technologies that are promising to overcome some of the limitations of the computer room based activities and enable a more integrated mode of technology exploitation. Finally RECOIL project will permit the synthesis of ideas and approaches for inquiry collaborative learning from three relevant European projects, namely CoLab, VITEN, and ModellingSpace. RECOIL has as explicit goal the support of diffusion of computer supported collaborative inquiry learning (CSCIL) to the European school practice. This goal rises questions about the integration of CSCIL to the curriculum, the teachers needs etc that are going to be formally examined, using distance learning approaches for teachers continues education and support.

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