The acquisition of Science Competencies through ICT real-time experiments.

COMBLAB

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Summary: COMBLAB is a Comenius project (2011-2014) that is providing research based teaching materials to promote scientific competencies using sensors and real time experiments.

The project also provides research based teacher training modules to enhance science competencies in students using real time experiments (sensors, data loggers, probes and MBL, microcomputer based laboratories). Collaboration among groups of teachers is enhanced, and synergies with educational authorities are promoted.

The target audience of COMBLAB are secondary and highschool science students, teachers, teacher trainers, researchers and educational authorities.

A new research based framework that takes advantage of real time experiments has been obtained. Using it, 33 context guided, inquiry based activities have been designed. Local versions of the activities have been obtained and implemented with more than 1000 secondary and highschool students in five countries (2012-2013). The analysis of student’s learning outcomes and motivation has allowed us to obtain the final versions of the activities.

A research based teaching module has been obtained and piloted with 31 in service and 3 pre-service teachers in Spain and Finland, respectively (April-May 2014). The final version of the course will be available in local languages for teachers.

What are real time experiments?
- Caption of data using sensors
- Graphs can be obtained at real time
- Also called: Data logger, probe ware
- Microcomputer-based laboratory (MBL)
- Sensor-interface-computer

What does research say about students’ learning with real time experiments?
- High order learning skills can be enhanced using MBL. (Aksela, 2005)
- It improves understanding of graphs (Woldron & Tokay, 1987; McDermott et al., 1987; Brasel, 1987; Testa et al., 2002).
- Research-based frameworks for MBL activities have been proposed (Pintil et al., 2010; Tortosa, 2012).
- A new research-based framework for MBL activities promotes in students the design of experiments and the interpretation of results has been designed and validated with 865 students in five countries: 9 out of 10 students say that they understand the objectives of the activities and that MBL helps them (Tortosa et al., 2013, 2014)

The specific needs that COMBLAB addresses

Teachers: some do not know how efficient way.
Students: low achievement of scientific competencies
Classroom: Short time of data capture, it leaves time that can be used for competitive activities

COMBLAB has contacted with other communities and has been included in Scientix (www.scientix.eu) and Stencil (www.stencil-science.eu) websites.

Local educational authorities of the participating countries have been contacted.

COMBLAB Conference: ISE 2014 Helsinki. 11-12 October
Researchers- teachers from different countries share their experiences.
Webshops on COMBLAB activities are offered
Educational authorities participate in a panel discussion on the topic: "Implementing New Innovations of Science Education into the Science Classroom: Example of ICT Enhanced Inquiry."
http://www.helsinki.fi/lima/ise/2014/

COMBLAB Conference: ISSE 2014 Krakow


COMBLAB is a Comenius project that has been founded by the European Commission for the promotion of the exchange of good practices in education in order to enhance the teaching and learning of science and technology in the European Union.

Combining forces: practitioners and researchers

Students’ answers (n=865)
1. The instructions were clear to me
2. I needed my teacher’s help to understand the activity
Students say that they understand activities but they need their teacher’s help

Scaffolding teachers: actions
- Local groups of teachers-researchers have been established. COMBLAB activities have been implemented with their students (Catalonia, Austria, Czech republic, Finland, and Slovakia)
- COMBLAB activities have been introduced at a Master for future teachers (Barcelona and Helsinki)
- In-service teachers’ training course, piloted April 2014, Barcelona, Helsinki).
- In-service teachers’ training course (Prague, October 2014)

COMBLAB COMpetency
MBL LABoratory

Teachers are the key piece

Teachers say that they understand the activity and MBL helps them.

Lessons learned:
- It is possible to enhance the change of teaching practice if teachers feel scaffolded
- Good and experienced Science teachers want to improve their teaching practices according to the new available tools. Teachers and researchers must share the process of innovation.
- Our society needs to integrate Science competencies as tools to survive. Giving our students good research based teaching materials will promote this integration.
- Comblab aims to contribute to this process

 Networks Established: synergies with all stakeholders

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