Collaborative Learning and Distributed Experimentation

Open User Scheme

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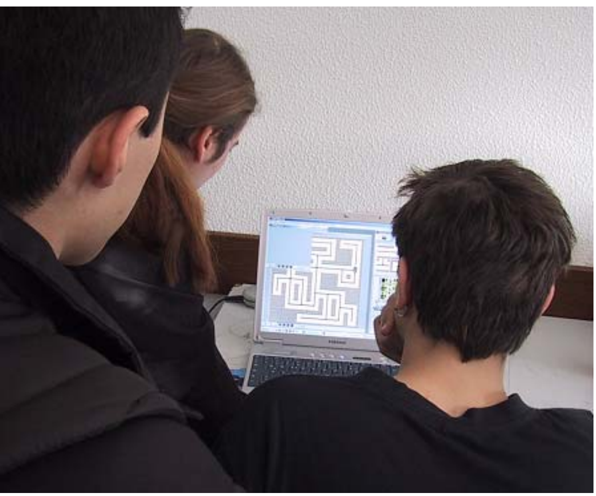
What is COLDEX?

COLDEX aims at developing and using new IT approaches and computational tools to foster scientific experimentation, modelling and simulation in distributed collaborative settings in an inter- cultural (European-Latin American) community of learners. Our efforts will result in the creation of innovative pedagogical scenarios. A common denominator for the learning domain is the study of visual and other perceptual phenomena, including astronomical and seismic measurements, from both a scientific and a subjective experiential perspective. The project will start with local learning communities sharing a rich everyday context. The target groups will range from higher secondary education to academic beginners. Computer-mediated collaboration tools will contribute to forming integrated synchronous / asynchronous access to a "group memory" on different levels.

Chemistry, biodiversity, seismology, astronomy … these are the scientific topics which are combined in the COLDEX project.

Originating from the pedagogical idea of "challenge based learning", we support student groups, from face-to-face groups up to international learning communities. They can have a realistic look inside scientific work. Various "digital experimentation toolkits", so-called DEXTs, containing virtual and physical tools enable open-ended learning activities.



By using a synchronised "learning object repository" (LOR) learners can find people with similar interests. The LOR supports retrieval in a big pool of models and data, re-use of learning objects and building of learning communities between Europe and Latin America.

Technological challenges lie in the ease of use in accessing scientific data and in communicating the learners requests to the remote sites. Among these sites is an observatory with a high quality telescope and a seismic measurement station in Chile.

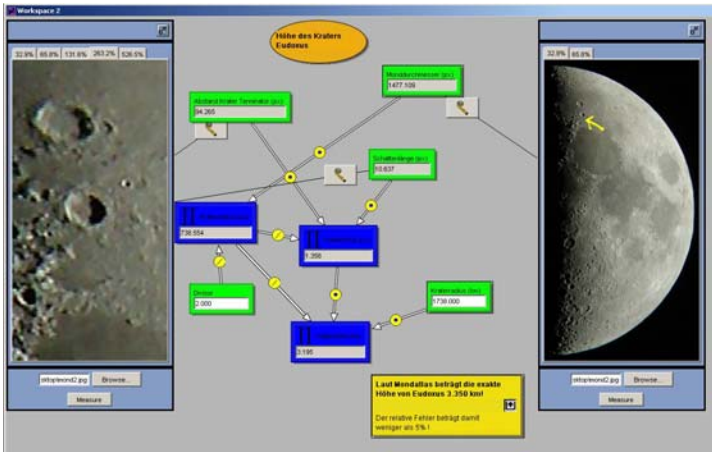
The so-called "construction of realities" includes the setting of real experiments, the provision of virtual scenarios and artefacts that support other types of perceptual experience. "Abstract and conceptual modelling" using formalisms as well as informal sketches is supported through a combination of visual concept mapping tools with more formal representations such as "system dynamics".

Open User Scheme

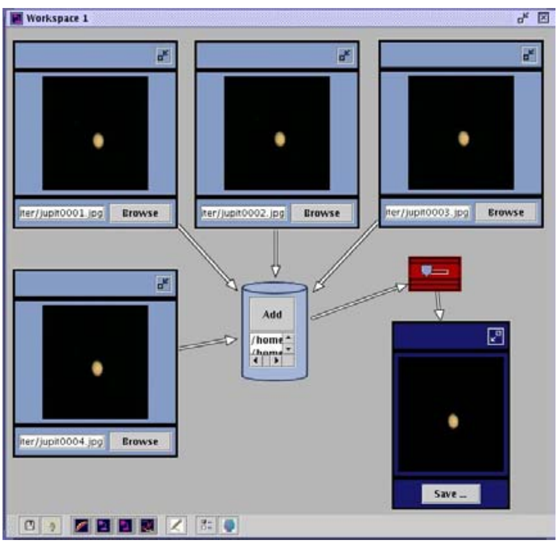
Local learning communities will exchange their ideas and work in an "Open User Scheme". A speciality of COLDEX lies in its origination from a European-Latin American co-operation incentive. COLDEX is in this sense trans-continental and aims at cross-fertilisation of experience and scientific understanding in a multicultural and multi-experiential community.

Astronomy scenario

The astronomy scenario is about space objects like the moon or planets of our own solar system. Images taken with one of the project's telescopes are used for calculating and image processing. The students can have access to real telescope data and in some experiments control them remotely.



The calculation of the height of moon craters is realised with a graph representation using moon images (*zoom, left, and moon with marked crater and the terminator as border between light and shadow side, right*) for measurement of the required distances

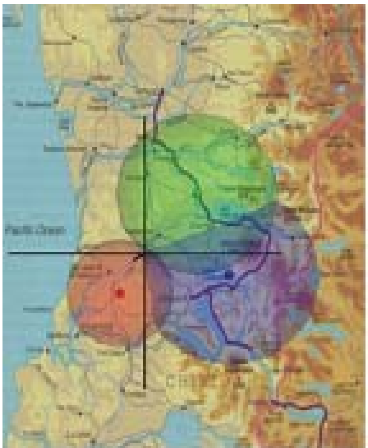


Several telescoped images are fed into the students' processing model to improve the quality of the resulting image (*down right*)

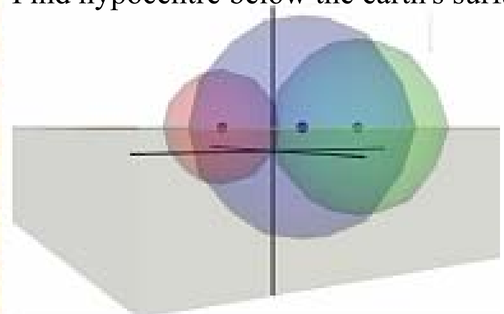
Seismology scenario

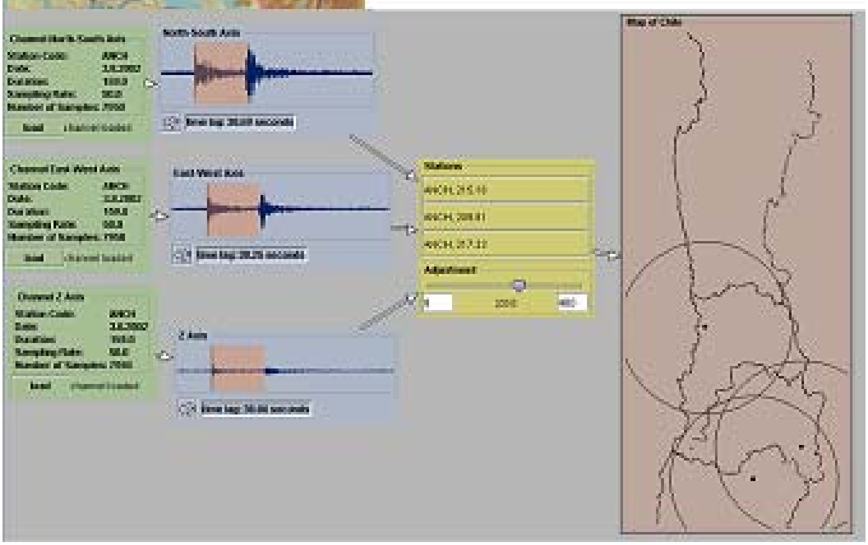
The seismology scenario is about investigation of geological phenomena, namely detecting epi- and hypocentre of earthquakes using real seismographic data. Within this scenario sharing the data sources between different learning groups is an obvious collaborative approach.

Seismographs in Chile



Find hypocentre below the earth's surface

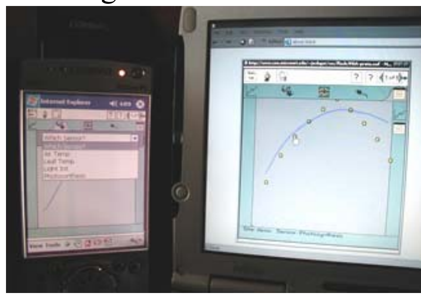


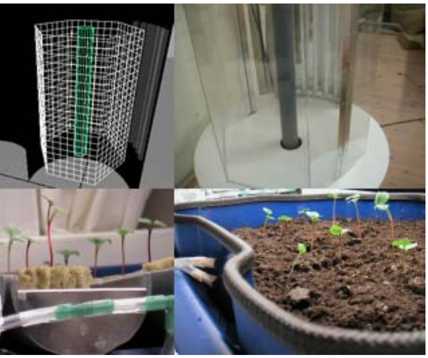


Calculate epicentre from real data in a collaborative environment

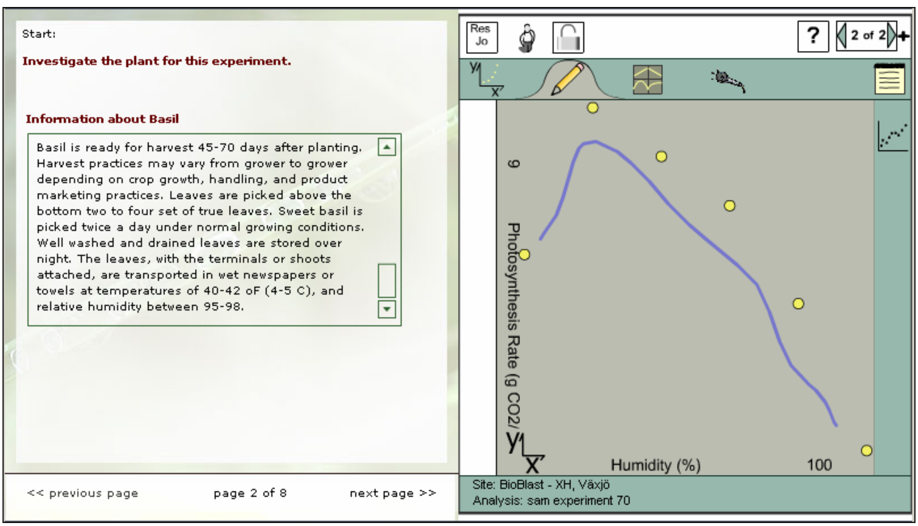
Space planting scenario

Within the biodiversity scenario, students will learn about how specific characteristics of the environment can affect the growth of plants and how growing plants is a critical aspect of sustaining human life in space. Using simulation tools (*beLife, top right*), scientific inquiry tools (*inquiry tool, right and below*) and

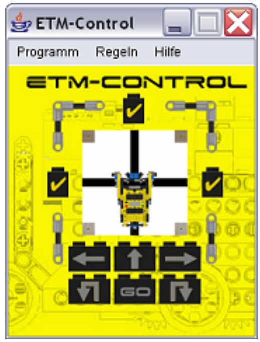




physical plant growth chambers (*bioTube, on the left*), students will run experiments to observe the effects of changing environment factors like CO_2, temperature and humidity. Optimizing growth conditions and understanding the role of plants in an engineered advanced life support system are the key aspects of this scenario.

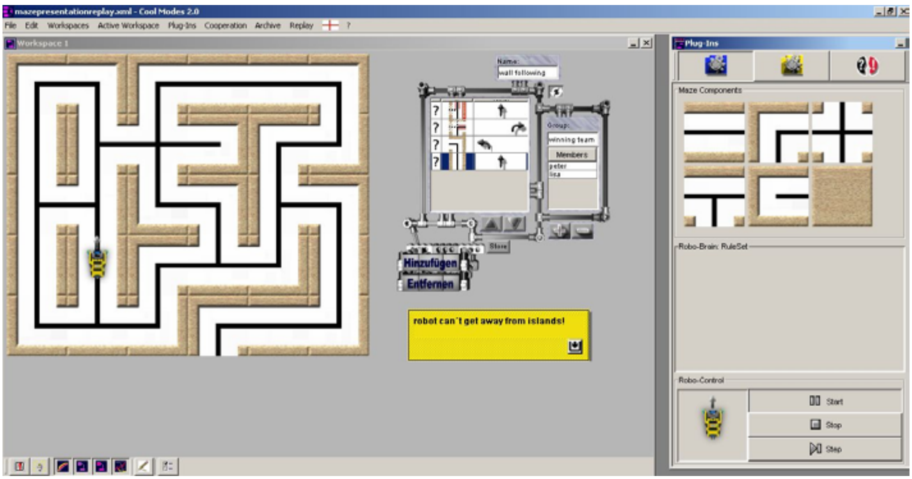


Robot in a maze - Maze scenario

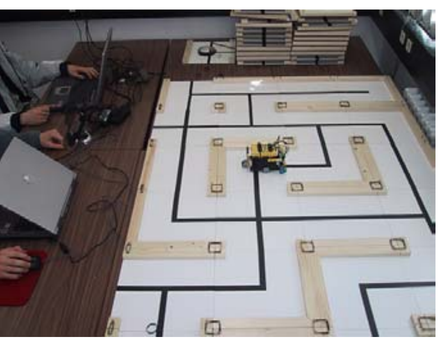


The maze scenario is about helping a robot escape from a maze. Two aspects are important here, developing rules which determine the behaviour of the robot in a certain situation, and constructing mazes which are not solvable with existing rule sets.

PDA software for ruling the Lego Mindstorms robot in specific situations (*Escape-The-Maze-Control, right*)



Modelling Environment (*Cool Modes, above*) with maze, robot and rule set. On the right the single components for the maze construction can be fetched



A wooden maze (*physical part of the scenario, left*) which is built with low-cost components and usage of Lego RoboLab http://www.coldex.info

Project partners

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