



Media Lab Europe Limited.

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Project:

Biosphera

Student:

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Research Problems:

With the Biosphera Project we want to focus on a specific field of study: Science Education, in other words how to let a scientific point of view and philosophy become part of the children's background. In doing this, we want to move from the classic Pedagogical domain to Constructivism.

To do this, we would like to provide children a micro-world in which the first rule is to try-it for yourself. In this sense, everything in the system must support the free exploration of the child and support him in the play/path/work of discovery.

Although this project seems to have a very specified target, the problems that we are trying to explore are not as narrow. The construction of this kind of world imply to put together a very wide range of disciplines: Biology, Chemistry, Physics, Ecology, Informatics, Electronics, Mechanical Engineering and above all Pedagogy and Psychology that are the basement of our study.

The first set of research questions are:

1. **Science Education:** how to help children to conceptualize the ecosystems balance, plant metabolism, material regenerations, etc.
2. **Symbolic manipulations** in the children: how children understand the concept of moisture, pressure, percent of chemicals into the air, etc. And how they correlate the changes between these elements.
3. Path between **virtual world** and real life: how children relate an action in the computer domain to an action on the real domain of the biosphere.
4. The **visual display** of quantitative information in children's view: how it is possible to visually explain the changes in the Biosphera.

What we want to investigate more deeply is the interactions between the real object of the Biosphera (with real plants, real air, real water, etc.) with the virtual representation of its status on the display of the computer, and how the children can obtain the maximum understandable interaction of these two media.

Approach:

We are building the Biosphera: Plexiglas Buckminster Dome of 1 meter of diameter. This space is constantly monitored by environmental sensors that detect some physical, chemical and biological factors like pressure, temperature, humidity, light. With the sensor we have included into the dome some actuators able to change the factors listed above.

The command centre of this system is the computer by which children can monitor and perform actions on the system.

Children can perform biological experiments in the sphere, for example, growing plants, improving crops, avoiding pollution or greenhouse effect, see the differences between two plants exposed to different environmental conditions, etc.

The system is complete flexible and designed to be a platform for experiments. We want to provide children with an experiment kit that is composed of all the pieces needed to build the sphere, plus other mini-objects useful for invent other



experiments. In fact, everything on this set is designed as a brick, to be part of a more complex system. The balance between complexity and simplicity is one of the research goals we want to achieve.

The software interface fits the users needs of complexity or simplicity by providing progressive details and information on the users needs and interests.

Also the visual display of the quantitative information presents another research question: how can we improve the children's understanding of what's going on into the space they have built? How is it possible to visualize invisible quantities like oxygen or carbon monoxide? These are question still unsolved.

Progress & Deliverables:

As the project is just started (September 2001) and we are still building and designing the hardware and the software interface. Also, in this period of time we are researching the technical literature in this area to find good ideas to start with and to constitute the basis of the theoretical approach to this matter.

Goal for next Semester:

We are planning to have our first workshop in December 2001.

Prior to the first official publication of this work at the Extreme Interfaces event on the 28th of January 2001, we would like to complete the first prototype to start a testing and designing process that will last for all the process of this project.

Link to project Web Page:

<http://biosphera.mle.ie/> (internal site)

Notes :

The internet site is part of the whole project, and thus is still in the design process.