



Assays for Cystic Fibrosis and Visual Learning

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Microphysiometry: An Assay for the Correction of Cystic Fibrosis - Cystic fibrosis is the most common inherited disorder affecting people of European ancestry. It is estimated to occur in 1 per 2,000 live births and known to be recessive--i.e., only persons inheriting a defective gene from both parents will manifest the disease. In addition to defective chloride ion transport, cystic fibrosis (CF)-associated mutations in the CFTR channel have also been reported to lead to changes in other channels, secretions, and pH. In our laboratory the application of a new silicon chip-based biosensor technology (microphysiometry) to cystic fibrosis research has revealed previously undetectable pH malfunctions associated with CF. We are using microphysiometry to develop a sensitive diagnostic assay for cells which display pH changes characteristic of CF cells. We are also using this assay to study the mechanism by which CFTR influences pH regulation. Investigating pH characteristics might elucidate novel effects of CFTR malfunction, and may have even greater value in developing a simple and reliable assay for CF cells. Screening assays are needed in the development of drug and gene therapies for CF. A very sensitive assay that can differentiate responses of CF cells from cells that have been 'corrected' by gene or drug delivery would be invaluable. *This research project is supported by a grant from the Cystic Fibrosis Foundation.*



C-TOOLS: Concept Mapping Tools for Online Learning - Expert-level thinking depends on a web of mental connections developed over a lifetime of education and experience (Bruner, 1960). Yet, in an attempt to turn college science students into experts, instructors often just focus on passive transmission of large amounts of "content" in a short time period and then test students to see if they "got it" (NRC, 1999). In response, students tend to focus on practical ways to succeed in their courses and thus often adopt strategies like memorization or rote learning (Ausubel, 1963; Novak & Gowin, 1984). Visual models such as concept maps may help instructors teach expert thinking as well as assess domains of student understanding. In our own learning as scientists, we frequently use visual models (Casti, 1990). The value of knowledge scaffolding tools such as concept maps is that they reveal student understanding about the direct relationships and organization among many concepts. The C-TOOLS project is developing and validating a new assessment tool, the Concept Connector, consisting of a web-based, concept mapping Java applet with automatic scoring. The Concept Connector tool is being designed to enable students in large introductory science classes at the university level to visualize their thinking online and receive immediate formative feedback. The Concept Connector's flexible scoring system, based on tested scoring schemes as well as instructor input, has enabled automatic and immediate online scoring of concept map homework. *This research project is supported by grant DUE 0206924 from the National Science Foundation.*

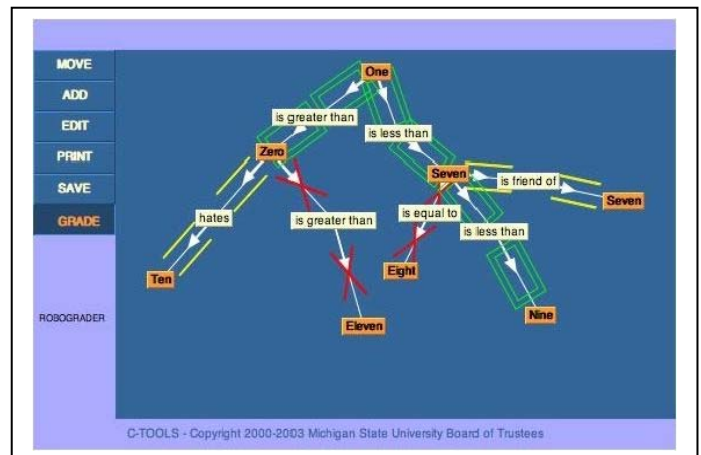


FIGURE 1. Our laboratory is using a new silicon chip-based biosensor technology (microphysiometry) to develop sensitive diagnostic assays for cells which display pH changes characteristic of the disease cystic fibrosis.

FIGURE 2. Visual models such as concept maps may help instructors teach expert thinking as well as assess domains of student understanding. The C-TOOLS project is developing and validating a new assessment tool, the Concept Connector, consisting of a web-based, concept mapping Java applet with automatic scoring.