February 28, 2005 Miriam Bogler

A Project Manager and Project Repository of the Robotics Program

Program Description

In 1993, MIT has created its first after-school club in Boston. Its goal was to provide inner-city youth with access to technology and new ideas about learning and community. The first time I heard about this club was in 1999 when I read M. Resnick and N. Russ's article[1]: "The Computer Clubhouse – Preparing for a life in a digital world." Highly inspired by what I read, I started envisioning the future of education. The possibilities seemed endless and I could see myself in charge of a similar operation. As I kept repeating this article to better prepare myself for this new role, I stumbled upon an idea that motivated me to create a new application. In the article, the authors describe how club members get inspired and develop their own interests by getting ideas from existing projects "designed to provide participants with a sense of the possible …Many youth begin by mimicking a sample project, then work on variations on the theme, and soon develop their own personal path, stemming from their personal interests." The idea of providing students with built models seemed cumbersome and hard to follow. I started toying with the idea of providing students with a virtual repository of projects that will be created by the student community and provide them with a constant source of project ideas and work strategies. As a FileMaker Pro database developer, I immediately started conceptualizing my idea. The project lasted six months with a few additional months for fine tuning. The outcome is my Robotics Project Management and Project Repository system. This database is the backbone behind my robotics program and helps me conduct a successful after-school club.[2]

Students participating in my robotics classes log into the database with their passwords. A new record is created every time a student logs in for the first time or when a student starts a new project. Students get access to all their projects when they log into the database and a special query enables them to access other students' projects. In addition to its storage capabilities, the database was built to take a student through the entire building process independently. The phases involved in building and programming a robot serve as independent sections and are listed in the project's menu page[3]. In the Design Phase or Phase I, students can launch an external Lego CAD application that enables them to build their robots virtually. Students use this application to experiment with various possibilities and record their creations for future use. The design files become part of the Design section and can be launched at any time by the student. A successful completion of the design phase is followed by the Construction Phase or Phase II. In the Construction Phase, students launch an external application that takes the CAD design file and converts it into construction blueprint steps that the student can view using Windows Explorer. The blueprint files are stored and launched from the Construction section. The Programming Phase or Phase III, as its previous predecessors, is a launching pad for the Robolab© programming application and enables students to program their robots using a graphic-based programming environment that is very easy to use. Students save their programming files and link them to the database. The programs can be viewed and launched from the Programming page at anytime. The Investigation Phase or Phase IV enables students to provide a general overview of their robotics creation, as well as access to a Project Detail Page in which students record investigation details. Students can generate investigation details at any phase of their project. As students encounter construction problems or programming issues related to faulty robot performance, they are encouraged to record those problems with possible or tested solutions. The Project Detail Page provides a sophisticated concept mapping template. Details can be linked to their underlying concepts. Students are encouraged to record new concepts they acquire as they research a certain aspect of their robotic creation. Concepts can be linked to details that require them and become part of the project's concept map. In a similar way, constructopedia notes can be linked to construction details which they help describe. In

[1] Resnick, M and N. Russ. "The Computer Clubhouse: Preparing for life in a digital world". IBM System Journal. 1996. Volume 35, Numbers 3 & 4. February 28, 2005.
http://www.research.ibm.com/journal/sj/353/sectionb/resnick.html
[2] The Youthlearn Initiative at EDC. Created by the Morino Institute.2001-2004. Education Development Center, Inc. February 28, 2005. http://www.youthlearn.org/afterschool/ApolloVision2.htm
[3] Ibid. This page contains screen shots of the database described above.

addition, the student can link external documents (long explanations or related information) or external web sites that provide additional information to any detail or concept. Students are encouraged to identify the categories embedded in each of the problems they try to solve, such as Physics, Math, English, etc. This type of information helps students retrieve details that focus on each of those categories. The Project Detail Page layout is set to present investigation details next to their linked resources presented in a hierarchical manner. The entire page can be printed out as a project's concept map. A couple of tools enable student functionality through all phases of their project creation. The Project Resources tool lets students save web sites or documents of interest as resources that can be later accessed. The program allows storing the resources under their respective categories to facilitate its later retrieval. The Lookup Other Projects tool or query provides a user friendly Project Selector layout that lets students access other projects by Project Name, Creator, or Category.

Strengths:

My experience with this database shows that fourth and fifth grade students are handling it with relative ease. They perform all needed tasks independently and it serves them as an important resource for new project ideas and problem solving strategies. The main strength of this database is in its ability to provide a permanent project repository to help students get a sense of what is possible and to guide them through building and programming their creations from start to finish. A similar environment exists in MOOSE Crossing[4] - a web-based, multi-person, text-based virtual world in which children interact and collaboratively construct the virtual world in which they interact. In "Thinking Like a Tree"[5], Mitchell Resnick points out that MOOSE crossing provides access to the entire collection of its participant students' objects and therefore, "each object created… is fully inspectable and copyable, each object becomes a sample project for everyone else in the community. If a MOOSE Crossing member sees an interesting object, she can "look inside" the object to see computer code underlying the behavior—and perhaps, create a new version of the object with slightly modified code." An additional strength is the ability to map an investigation through its underlying concepts allowing students to follow a chain of reasoning that can improve their thinking skills. A similar project created by a pair of researchers at the Centre for Applied Cognitive Science, is the Computer Supported Intentional Learning Environments (CSILE)[6]. The system is a form of hypermedia that allows notes entered as text, drawings, graphs, and timelines to be retrieved, linked, commented on, rated, and so forth. Using database template learning environments engages students in a variety of critical, creative, and complex thinking, such as evaluating, analyzing, connecting, elaborating, synthesizing, imagining, designing, problem solving, and decision making.

Weaknesses:

The main weaknesses stem from development issues that surfaced after the software was tested in the lab. A more user friendly issue can better serve students and facilitate their interaction with the database. The log-in procedure can be simplified due to confusing log in procedures that are currently in place. Concept mapping is geared towards a junior-high, high school population and does not provide sufficient help for handling this part by younger students. A better help system is required to enable younger students to improve their advanced searching methods.

Recommendation for Use:

I believe that the Project Manager and Project Repository system is a novice version of similar expert tools used in industry. Many corporations employ such methods conducting efficiency studies through access to historical information and a platform for information analysis. Exposing students at a young age to tools that emulate industry can better prepare them for life. I highly recommend the use of similar environments in education.

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[4] Georgia Institute of Technology. "MOOSE Crossing". February 28, 2005. http://www.cc.gatech.edu/elc/moose-crossing/
[5] Resnick, Mitchell. "Thinking Like A Tree". MIT Media Lab. February 28, 2005. http://llk.media.mit.edu/papers/archive/mres/tree.pdf
[6] North Central Regional Educational Laboratory. "Computer Supported Intentional Learning Environment (CSILE). February 28, 2005. http://www.pubs/EdReformStudies/EdTech/csile.html

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