Work in Progress - First Steps in Developing Computational Awareness and Interest in College Studies in Inner-City High School Students

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Abstract - FI13 is an initiative between the School of Engineering, University of Buenos Aires, and 13 de Julio High School (Buenos Aires), whose main interest is to focus on technology education as a starting point for social integration. It will study the impact of a “technology project” on the aspiration levels of children and adolescents from a group of inner-city schools of Buenos Aires, and the relationships among university, high school, and elementary school. One of its sub-goals is the development of what can be seen as “computational awareness” in high school students. In this paper we report the first steps in the development of this computational awareness through four modules: “Introduction to Programming” (using Java), “Web Design and Local Area Networks”, “Visual Basic programming”, and “Introduction to Databases”.

Index Terms – Computational awareness, inner-city schools, K12 – University relationship.

INTRODUCTION

Inner-city schools’ population is usually skeptical about the possibilities that await them in the future, so education must play a major role in reversing this skepticism. The students must be aware of the possibilities that arise when they are educated. In particular, they must be aware that job opportunities are closely related to the educational level achieved.

This population usually feels that university is a very distant and unachievable place, although their school is only a few blocks away from college.

There are projects aimed to prepare students for University careers such as Gateway in New York [1]. Gateway partnership with universities, museums, hospitals, research laboratories, corporations, and other institutions aims to bring together scientists, physicians, and other professionals to collaborate closely with high school students and teachers.

Several professional associations, such as the IEEE, AADECA (Argentine Control Association), ANTORCHAS Foundation and some private corporations such as YPF co-sponsor a project aimed to open the doors of the School of Engineering of the University of Buenos Aires to the 13 de Julio High School students, so that they can use the labs and classrooms, and be taught by University professors, as if they were regular students. Their teachers also join these classes, as a way to participate in the project, and also because they want to improve their existing computational skills and acquire new ones. In this way, the University makes an effective contribution to the generation of human capital.

This is not the first project of this kind in which the School of Engineering and the 13 de Julio Institute work together: some years ago the same actors participated in a project that consisted on the automation and Internet connection of a solar energy facility. The solar panel was oriented and controlled automatically by a control system composed by Programmable Logic Controllers (PLC’s) and Supervision software (see [2]). That project won the educational innovation 2001 prize granted by YPF and ANTORCHAS Foundations of Argentina, while the current project won the educational innovation 2004 prize granted by YPF Foundation.

In this paper we only report the initial steps in the development of the computer module of the whole project, which can be seen in [3].

STUDENTS’ PROFILE

Sixty percent of the 13 de Julio’s students receive a grant due to their economical hardship. Twenty percent of them lack of their male parent and forty percent of the parents hold precarious jobs. Some of them come from homeless places and in several cases the school has to act as their guardian and as a recipient of the welfare grant.

Students involved in this project are in 11th, 12th, and 13th grade (technical higher education in Buenos Aires goes from 8th to 13th grade), with most of them in 11th grade. Also their teachers actively participate in the classes. Participating students are required to extend their school day a minimum of two extra hours per week. They have activities both at their school and at the School of Engineering building.

Once this group is prepared, they will work with the elementary school teachers in the area. In this way a knowledge network will be constructed in the area, with high
school students actively supporting the spread of knowledge (see [3] for a detailed description of the whole project).

**Computational Awareness**

The first stage of the project was designed in order for the students to achieve certain computational awareness.

For this stage we selected a battery of basic topics in order to set an initial platform for the development of software applications related with electronics and communications. The offering of the initial courses is the following:

- Introduction to algorithm design using Java,
- Web design and local area networks,
- Visual Basic programming, and
- Introduction to database systems.

**I. Introduction to Algorithm Design Using Java**

Java was chosen as the programming language of the first course because it introduces Object Oriented concepts in a smoother way than other OO programming languages such as C++ do, and also because it will enable them to develop web based applications. The course follows the Bailey & Bailey book [4], where a graphic package is used to introduce algorithmic concepts. As Argentine high school students, in general, cannot read textbooks written in English, handouts and lecture notes were prepared following along the lines of the selected textbook.

**II. Web Design and Local Area Networks**

Web page design and programming is widely known as a high motivating activity for teenagers. We decided to use this motivation to teach them how to go a step further than WYSIWYG editors. We used the first four meetings to introduce students in networking, addressing social and ethical issues such as author responsibilities, accessibility, proper credit attribution, cultural differences and any browser coding.

As an example we showed students the how to use the Webxact Watchfire validator [5]. After explaining (and translating into Spanish) Webxact results, we motivated students to learn how to use raw HTML coding. We chose Nvu [6] as the design tool because it allows a hybrid approach switching back and forth from a WYSIWYG environment to raw HTML or to a document structure format. Our project is to join the Java Programming and the Web Design group in a team activity this year.

**III. Visual Basic Programming**

Visual Basic is well known by the 13 de Julio High School teachers, so they asked us to teach this language to the students in order for them to be able to develop programs that control electronic devices. This course will be taught during the current semester.

**IV. Introduction to Database Systems**

This will be the last course in the computational module of the project. Its goal is to present the basic topics of relational database design and implementation. It is scheduled for next semester.

**Conclusions**

We want to prepare students to continue learning sciences after they complete their secondary school, setting them in a path to lifelong science learning [7].

In the project we integrate researchers, professors, high school teachers, and college and high school students to work together in the solution of real technological problems. In this stage high school students and teachers got acquainted with the university environment, as a first step towards the main goal. This environment will be the same that will receive them if they decide to continue their education at the School of Engineering. Fears that they and their families may feel towards academic institutions vanish, and a different attitude towards their own possibilities with respect to college education and research arises.

**References**

http://www.gateway.cuny.edu


