

## TECHNICAL COOPERATION PROFILE

MAY 6, 2008

### I. BASIC PROJECT DATA

**Country:** Regional

**Program name:** Technology enhanced learning by means of cognitive tutoring systems for secondary education in Latin America

**Program number:** RS-T1359

**Team members:** Aimee Verdisco (SCL/EDU), Project Team Leader; Juan Carlos Navarro (SCL/SCT), Claudia Cox (SCL/EDU); Juan Carlos Pérez-Segnini (LEG/SGO)

**Date of request:** April 4, 2008

**Beneficiary:** Regional

**Executing agency:** *Pontificia Universidad Católica de Chile* (PUC-Chile)

**Financing plan:**

IDB (KPK):	US\$500,000
Local:	US\$240,000
Total:	US\$740,000

**Technical responsibility:** See paragraph 7.2

**Included in Board approved TC Program:** Yes

**Tentative dates:** President's Approval May 2008

### II. BACKGROUND AND PROBLEM STATEMENT

- 2.1 Over the past decade, several initiatives to improve computer literacy have been introduced in Latin America with varying degrees of success. In general, the focus of these initiatives has been two-fold, providing both basic technology infrastructure and computer literacy. This current operation builds on the experience gained to date, shifting the focus of activities from the provision of basic computer skills including accessing the Internet, to technologies designed to enhance how students learn.
- 2.2 The specific ICT educational technology –cognitive tutoring– integrates technology with pedagogy to promote system-wide change. Cognitive tutoring follows a self-paced approach, allowing students to sequentially tackle progressively more difficult tasks and freeing up teacher time to work with slower students and on more difficult problems. It is a computer-based, interactive technology that tracks students in real time as they solve problems, provides feedback, and hints when errors/questions are made in key points. Thus, an innovative feature of this technology is that it provides diagnostic data that identify obstacles to learning and possible training interventions to facilitate problem solving. It also can be tied to other multimedia educational materials such as games and simulations.

- 2.3 Cognitive tutoring has shown considerable potential, and some evidence presented to date suggests that it has proven effective in improving mathematics education. Specific math tutors have been used in large school systems (secondary level) in the United States, including Los Angeles and Chicago, as well as in rural schools; more than 300,000 secondary school students have benefited from such interventions. A critical lesson learned from these experiences is that cognitive tutoring requires extensive and constant support from the teaching staff and/or parents, absent which the technology may not produce the desired results within the expected timeframe.
- 2.4 Building from these experiences and incorporating the lessons they present, this operation seeks an important innovation: the application of cognitive tutors at secondary schools throughout Latin America, fully supported by training and supervision in schools. The method offers considerable potential to improve learning in mathematics at the secondary level, long deemed to be among the weakest areas of the curricula throughout the Region.

### **III. PROGRAM OBJECTIVE AND DESCRIPTION**

#### **A. Objectives**

- 3.1 The overall objective of this operation is to improve the quality of secondary education in mathematics in the region through the application of technology enhanced learning activities. More specifically, this operation will provide new mechanisms for improving efficiency in the teaching-learning process in the short-term, producing a more sustained pipeline of students interested in pursuing scientific disciplines at the university level over the medium term, and in the longer term, better placing the region to compete in an ever more globalized world.

#### **B. Description**

- 3.2 Three main components are envisioned: (i) the introduction of technology enhanced learning opportunities in math; (ii) the creation of local learning communities and a repository of technology-enhanced learning materials for mathematics; and (iii) assessment and evaluation. Activities will be implemented in upper secondary schools in five countries (Chile, Ecuador, Mexico, Colombia, and El Salvador).

#### **C. Components**

- 3.3 **Component 1. Introduction of technology enhanced learning opportunities in math** (US\$450,000). This component focuses on technologies designed to enhance how students learn versus technologies that provide basic skills for using computers or accessing the Internet. The main line of activity and innovation in this component will be the adaptation and use of cognitive tutoring systems. More specifically, this component will support the development of 30 modules for first year mathematics and parts of the upper secondary cycle. The content of each of these modules will be internationally referenced and normed internally to each

country's curriculum. Concrete activities to be carried out include the following: (i) revision of curricula and assessment of teaching strategies used in mathematics in each country; (ii) development of cognitive tutoring modules and supporting documentation; (iii) adjustment of cognitive tutoring modules to specific school contexts; and (iv) specialized teacher and staff training. An estimated 1,000 students per country will be the direct beneficiaries of these activities.

**3.4 Component 2. Creation of local learning communities and repository of technology-enhanced learning materials for mathematics (US\$10,000).** This component seeks to increase the capacity of mathematics teachers to use new forms of ICT technology to motivate students to pursue scientifically oriented careers. To do so, it will create local learning communities within and between the schools, thus stimulating the exchange of experiences and best practices. Through these activities, a repository of best practices will be created and used to promote knowledge exchange among teachers. In addition, the learning community setting will be used to collect, maintain and analyze basic project data, and to support decision-making at the school and/or ministry level. This activity is expected to directly benefit teachers and students in at least four schools per country (an estimated 4,000 beneficiaries per country).

**3.5 Component 3. Assessment and evaluation (US\$30,000).** This component will assess project-induced changes in schools, teacher practices and student performance in mathematics. It will support the creation of an assessment tool for capturing and evaluating change through both qualitative and quantitative measures. In the specific case of student performance, this tool will incorporate a quasi-experimental design. In this way, the data collected through this component will serve to evaluate changes at the school level as well as the overall effect of the project across countries.

#### IV. COST AND FINANCING

**4.1** The total cost of the Technical Cooperation (TC) is US\$740,000. Of the total amount, US\$500,000 will be charged against the resources of the Korean Partnership Fund for Technology and Innovation (KPK) and US\$240,000 will be local contribution in kind.

**Table IV-1**  
**Detailed budget US\$**

	<b>IDB</b>	<b>PUC</b>	<b>TOTAL</b>
<b>Component 1. Introduction of TEL opportunities in mathematics</b>	<b>450,000</b>	<b>180,000</b>	<b>630,000</b>
Activity 1. Revision of curricula and assessment of teaching strategies	30,000	30,000	<b>60,000</b>
Activity 2. Development of cognitive tutoring modules and documentation	245,000	30,000	<b>275,000</b>
Activity 3. Adjustment of cognitive tutoring modules to specific school contexts	45,000	-	<b>45,000</b>
Activity 4. Specialized teacher and staff training	130,000	120,000	<b>250,000</b>
<b>Component 2. Creation of local learning communities for mathematics</b>	<b>10,000</b>	<b>60,000</b>	<b>70,000</b>
<b>Component 3. Assessment and evaluation</b>	<b>30,000</b>	-	<b>30,000</b>
<b>Contingencies</b>	<b>10,000</b>	-	<b>10,000</b>
<b>TOTAL</b>	<b><u>500,000</u></b>	<b><u>240,000</u></b>	<b><u>740,000</u></b>

## V. EXECUTING AGENCY AND EXECUTION STRUCTURE

- 5.1 This operation will be executed by the *Pontificia Universidad Católica de Chile* (PUC-Chile). PUC-Chile will be responsible for all aspects of project management, including the administration of resources, the contracting of specialized consulting services in accordance with IDB Policies for the Contracting of Consultant Services (GN-2350-7), the coordination of activities, and reports to the Bank. The execution period will be 18 months and the disbursement period will be 24 months.

## VI. MAJOR ISSUES

- 6.1 There are no major issues associated with this project.

## VII. ACTION PLAN

- 7.1 The preparation of this project is being supported by the RELATED Network. The RELATED Network is a consortium of six universities from six different countries, which has been in operation for more than seven years throughout the Region.<sup>1</sup> Each of the secondary schools to be served by this TC has established partnerships with their respective RELATED member. These partnerships will allow for the timely implementation of key activities at the country level. In addition, an executive committee formed by key representatives of RELATED will oversee project activities.
- 7.2 Technical responsibilities will be shared between SCL/EDU, CCB/CCH, and RELATED, all of which will collaborate on the preparation of the Plan of Operations and all corresponding terms of reference.

## VIII. ENVIRONMENTAL AND SOCIAL STRATEGY

- 8.1 The TC was reviewed by the Environmental and Social Impact Review Committee (ESR) on January 18, 2008; the TC does not involve investments in infrastructure or equipment and no negative environmental or social effects were identified. The Safeguard Screening Form's category for this project is "C".

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Vo. Bo. \_\_\_\_\_  
Marcelo Cabrol, Chief SCL/EDU

*(Original signed)*

Approved: \_\_\_\_\_  
Kei Kawabata  
Manager SCL/SCL

*(Original signed)*

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Carlos Hurtado  
General Manager CSC/CSC

<sup>1</sup> *Pontificia Universidad Católica de Chile* (PUC), Chile; *Universidad Autónoma de Bucaramanga* (UNAB), Colombia; *Escuela Superior Politécnica del Litoral* (ESPOL), Ecuador; *Escuela Superior de Economía y Negocios* (ESEN), El Salvador; *Instituto Tecnológico y de Estudios Superiores de Monterrey* (ITESM), Mexico; and *Carnegie Mellon University* (CMU), USA.