TC ABSTRACT

I. Basic Project Data

▪ Country/Region:	PARAGUAY/CSC - Southern Cone
▪ TC Name:	Supporting the development of 21st century skills through coding education
▪ TC Number:	PR-T1245
▪ Team Leader/Members:	MATEO-BERGANZA DIAZ, MARIA MERCEDES (SCL/EDU) Team Leader; LEE, CHANGHA (SCL/EDU); RECALDE OVELAR, DIEGO FERNANDO (CSC/CPR); CAYCEDO DUQUE, JUANITA (SCL/EDU); SCANNONE CHAVEZ, RODOLFO ANDRES (SCL/EDU); SANMARTIN BAEZ, ALVARO LUIS (LEG/SGO)
▪ Taxonomy:	Client Support
▪ Number and name of operation supported by the TC:	N/A
▪ Date of TC Abstract:	02 Jul 2018
▪ Beneficiary:	Ministry of Education and Science of Paraguay (MEC)
▪ Executing Agency:	INTER-AMERICAN DEVELOPMENT BANK
▪ IDB funding requested:	$ 950,000.00
▪ Local counterpart funding:	$ 100,000.00 (In Kind)
▪ Disbursement period:	36 months
▪ Types of consultants:	Individuals; Firms
▪ Prepared by Unit:	Education
▪ Unit of Disbursement Responsibility:	Country Office Paraguay
▪ TC included in Country Strategy (y/n): ▪ TC included in CPD (y/n):	No No
▪ Alignment to the Update to the Institutional Strategy 2010-2020:	Social inclusion and equality

II. Objective and Justification

2.1 This TC aims to support Paraguayan youth to develop 21st century skills, such as creativity, computational thinking and problem-solving skills, through coding education. The specific objectives of the TC are to: (i) support the implementation of the pilot coding education in selected primary schools; (ii) build capacity of teachers to deliver coding classes; (iii) analyze the effects of coding education on student learning and development of 21st century skills; and (iv) support the development of a public policy on ICT education by contributing to create a shared vision among key stakeholders, and disseminate the results of the project.

2.2 In today's society in which information and communication technology (ICT) pervades virtually every aspect of our life and work, digital literacy plays a vital role in defining a student's ability to thrive both during and beyond school. Students unable to navigate through the complex digital world will no longer be able to fully participate in the rapidly changing economic, social and cultural landscape (OECD 2015). In particular, coding/programming education can create new opportunities for youth by equipping them with the knowledge and skills necessary for the information age, commonly referred to as the 21st century skills, such as creativity, computational thinking and problem-solving skills.

2.3 Many countries around the world are undertaking various activities to promote coding education with multiple motivations, including: (i) advancement of 21st century skills to ensure that students are adequately equipped with the skills and competencies highly demanded in the future; (ii) workforce development to secure a pipeline of ICT talents

crucial for national economic competitiveness given the increasing need for programming and coding skills even in non-ICT professions (e.g. research, marketing, medicine) in the onset of the fourth industrial revolution; and (iii) improvement of instructional practice to better engage students and enhance learning through shifting towards constructivism, informed by Seymour Papert and the "maker learning" movement. Increasing number of countries, including Korea, Finland, the United Kingdom, India and Poland, are taking a step further and are adopting coding education in their formal education systems to ensure that every student has the opportunity to access coding education and to promote equity and quality of coding education in their countries.

2.4 In fact, a growing body of research suggests that effective use of technology can significantly enhance the learning process by enabling real-time monitoring and personalized instruction, and increasing student motivation and participation (Ortiz & Cristia 2014) and improve learning outcomes (Muralidharan, Singh & Ganimian 2017). Studies analyzing the effects of Scratch, an interactive coding program, suggest that it helped students to develop mathematical concepts (Calder 2010) and improve reading comprehension skills (Papatga & Ersoy 2016). Research also suggests that coding education can naturally engage students as students learn by doing through the hands-on, constructivist learning approach and as students are more likely to find the concepts and skills relevant to their daily and future lives. Given these positive effects, introducing coding education to Paraguay has the potential to improve student engagement and educational outcomes.

2.5 The TC will build on the progress made by recent educational policies and cooperation projects and support the implementation of pilot coding classes in selected primary schools. The recent school-day extension provides the time and space necessary to introduce coding education to the formal education system. Through the IDB Project to Support Extended School Days (PR-L1097), 1,200 primary schools will be increasing the amount of time that pupils (aged 6-11) spend in school each day from four to eight hours. 100 schools selected from these schools will participate in the TC, and coding classes can be provided during the extended school hours to complement basic education.

III. Description of Activities and Outputs

3.1 This TC will finance the following three components: (i) implementation of pilot coding classes in selected primary schools; (ii) impact evaluation of the effects of pilot classes on student learning and development of 21st century skills; and (iii) knowledge sharing, policy design, and dissemination of results.

3.2 Component 1: Pilot program for coding education in Paraguay. The TC will finance the preparation for and application of pilot coding classes in selected primary schools in Paraguay. In preparation for the classes, the TC will finance the development of culturally-relevant learning materials for coding education, teacher and tutor (8th graders in the same schools) training workshops to equip teachers with the necessary pedagogic skills and knowledge of the digital tools to effectively guide their students. Approximately 2000 first grade students, 100 first grade teachers, 500 tutors (8th graders) across 100 schools in Paraguay will participate and benefit from the current TC.

3.3 Component 2: Impact evaluation of the pilot program. The project will finance an experimental design of the pilot and impact evaluation of the pilot program. To ensure that statistical inferences can be made from the results, participating schools will be selected randomly among the 1,200 schools implementing the extended school day program (through the IDB loan PR-L1094). In schools where there is more than one class of the first grade, the treatment class will also be randomly selected. Once the selection of 100 treatment schools/classes is complete, additional 100 schools/classes

will be chosen as a control group. The collection of the baseline and data processing will take place at the beginning of school year and the application of evaluation instruments will take place during the last months of the school year. The evaluation aims to measure the effects of pilot coding classes on student learning (mathematical skills) and student's development of 21st century skills (creativity, computational thinking, and problem-solving skills), and compare the results between treatment and control groups. Alongside the impact evaluation, the project implementation process will be closely monitored and evaluated to ensure intended outcomes of the program. The study will generate useful evidence for decision-making for future scaling up and expansion of the program.

3.4 Component 3: Knowledge sharing, policy design, and dissemination of results. As part of the knowledge sharing activities, the TC will finance an international conference in Paraguay on ICT education, that introduces and discusses how different countries around the world have incorporated ICT in their education systems (Korea, Uruguay, etc.). In addition to the pilot program, this activity will serve as the basis for the development of a blueprint and volumetric analysis of ICT education in Paraguay and the specific ICT education model chosen by the Paraguayan authorities will serve as the reference point for a future scale-up in the country. Findings from these activities and the pilot program will be shared and disseminated through workshops, reports, newsletters, blogs, etc.

3.5 **Component I: Component 1: Pilot program for coding education in Paraguay. .** The TC will finance the preparation for and application of pilot coding classes in selected primary schools in Paraguay.

3.6 **Component II: Component 2: Impact evaluation of the pilot program .** The project will finance an experimental design of the pilot and impact evaluation of the pilot program.

3.7 **Component III: Component 3: Knowledge sharing, policy design, and dissemination of results.** The TC will finance the knowledge sharing activities such as the international conference on ICT education in Paraguay, a policy design of ICT education in Paraguay for a future scale up, and the dissemination of results.

IV. Budget

Indicative Budget

Activity/Component	IDB/Fund Funding	Counterpart Funding	Total Funding
Component 1: Pilot program for coding education in Paraguay.	$ 600,000.00	$ 50,000.00	$ 650,000.00
Component 2: Impact evaluation of the pilot program	$ 150,000.00	$ 0.00	$ 150,000.00
Component 3: Knowledge sharing, policy design, and dissemination of results	$ 200,000.00	$ 50,000.00	$ 250,000.00

V. Executing Agency and Execution Structure

5.1 The TC builds on existing technical cooperation to improve the quality of education in Paraguay. To ensure linkages with the overarching initiative, and in accordance with a request from the Ministry of Education and Science (MEC), this TC will be executed by the IDB. According to TC guidelines (GN-2629-1), this is justified by the fact that complying with internal requirements would delay the execution of the TC, jeopardizing the achievement of its objectives. All disbursements will be executed through the

Bank's systems and will require approval from SCL/EDU. The Bank will contract individual consultants, consulting firms and non-consulting services in accordance with Bank's current procurement policies and procedures (GN-2303-20). The TC will be executed over a period of 30 months and disbursed over a period of 36 months as of the date of approval.

5.2 SK Telecom and KERIS will be partners for the implementation of the current TC. SK Telecom is globally recognized for Albert Coding Robots and coding software programs and its already-established network and experience in LAC will ensure smooth implementation and deliver results. KERIS (Korea Education and Research Information Service) is a national research institute focused on the ICT education as well as the use of ICT in the education system in Korea. Its technical expertise and the lessons learned from the implementation of ICT education in Korea are paramount to the success of this TC and will be transmitted through multiple channels such as teacher/tutor workshops and various knowledge sharing activities.

VI. Project Risks and Issues

6.1 Risks to achieving the objectives of this TC include: (i) the lack of sustainability of the program, and (ii) a weak institutional buy-in at different levels for the implementation of this intervention and a future scale up. The following establishments mitigate the potential risks to the limited achievement of this intervention: (i) the Extended School Days program (PR-L1097), which is part of the national education policy and offers space and time for coding education to be introduced and continued; (ii) the strong commitment of the Paraguayan government to incorporate ICT in education, as demonstrated through the fund allocated for the establishment of technology in the classrooms (approx. USD 145 million, the largest component in the National Public Investment and Development Fund, FONACIDE).

VII. Environmental and Social Classification

7.1 The ESG classification for this operation is "C".