

## TC ABSTRACT

### I. Basic Project Data

▪ Country/Region:	REGIONAL/IDB
▪ TC Name:	Artificial Intelligence and Behavioral Insights in Education
▪ TC Number:	RG-T3443
▪ Team Leader/Members:	ELACQUA, GREGORY MICHAEL (SCL/EDU) Team Leader; OLSEN, ANNE SOFIE WESTH (SCL/EDU); MENDEZ VARGAS, CAROLINA PATRICIA (SCL/EDU); JAIMOVICH, ANALIA VERONICA (SCL/EDU); SCANNONE CHAVEZ, RODOLFO ANDRES (SCL/EDU); BLASCO, IVANA (SCL/EDU); BUENADICHA SANCHEZ, CESAR M. (MIF/MSM); SCHADY, NORBERT RUDIGER (SCL/SCL); LOPEZ BOO, FLORENCIA (SCL/SPH); MARTINEZ VON DER FECHT, MATIAS PATRICIO (SCL/EDU); CASTRO DE SOUZA MAROTTA, LUANA (SCL/EDU); MONTALVA, VERONICA SONIA (SCL/EDU); NEGRET GARRIDO, CESAR ANDRES (LEG/SGO)
▪ Taxonomy:	Research and Dissemination
▪ Number and name of operation supported by the TC:	N/A
▪ Date of TC Abstract:	21 Mar 2019
▪ Beneficiary:	Ministry of Education of Chile, Ministry of Education of Ecuador, Ministry of Education of Peru
▪ Executing Agency:	INTER-AMERICAN DEVELOPMENT BANK
▪ IDB funding requested:	\$ 310,180.00
▪ Local counterpart funding:	\$ 0.00
▪ Disbursement period:	30 months
▪ Types of consultants:	Firms
▪ Prepared by Unit:	Education
▪ Unit of Disbursement Responsibility:	Social Sector
▪ TC included in Country Strategy (y/n):	No
▪ TC included in CPD (y/n):	No
▪ Alignment to the Update to the Institutional Strategy 2010-2020:	Productivity and innovation

### II. Objective and Justification

- 2.1 The objective of the project is to incorporate artificial intelligence, machine learning, and behavioral insights to improve the efficiency of educational investments and parent and teacher decision-making in Chile, Ecuador, and Peru. First, we will develop a comprehensive diagnosis of the rules and actual practices determining student and teacher allocation across schools. Second, we will propose improvements to allocation rules and procedures based on our findings in the diagnostic phase, and we will assist governments to develop (or modify) allocation algorithms based on the proposed mechanisms. Third, we will develop Artificial Intelligence (AI) systems for student and teacher allocation. These allocation systems involve the development of platforms for student enrollment and teacher assignment; implementation of dashboard to monitor application process; design of interfaces for virtual assistants (ChatBots/APIs) based on artificial intelligence and machine learning algorithms; implementation of application systems for school (or school district) vacancies. Finally, will conduct an evaluation of the effectiveness of nudges and matching algorithms in improving equity and efficiency in the allocation of teachers and

students across schools. We will also organize activities in the three countries to share the findings.

- 2.2 In several countries in LAC, the assignment of students and teachers to schools is a black box often leads to inequitable and inefficient outcomes. Parents from more disadvantaged backgrounds often have less objective knowledge about schools (Schneider et al., 1998) and are more likely to enroll their child in a low performing school (Elacqua et al., 2006). Moreover, oversubscribed schools can impose high costs on families, who often need to wait in long lines and pay discretionary fees to have access to available vacancies. Likewise, teacher assignment systems often do not provide teachers with enough information on vacancies to make informed decisions. Moreover, more qualified teaching candidates tend to select more advantaged schools, fostering inequality (Bertoni et al., 2018). This may partly be due to a lack of information about disadvantaged schools or biases against them. This lack of transparency in the student and teacher allocation systems is also an important problem for governments to address imbalances in the supply and demand for vacancies.

To address these issues and improve transparency, equity, and efficiency in allocation systems, many school systems around the world have adopted centralized allocation systems (Elacqua et al., 2016). These centralized systems provide a great opportunity to use Artificial Intelligence (AI) and Machine Learning (ML) to improve the allocation process and its outcomes (Agrawal et al., 2018). Major tech companies such as Amazon and Netflix are using AI and ML to build engines that provide customers with personalized recommendations (Gerish, 2019). This project aims to use AI and ML to provide relevant information to parents and teachers about their schooling options. The objective of this TC is to provide support to governments to incorporate AI and behavioral strategies in centralized assignment systems for teachers and students to improve allocation outcomes. Specifically, this TC will finance: (i) the development of back-end technology (database administration and matching algorithms based on assignment mechanisms (Samuelson & Pathak, 2016) for students in Peru and teachers in Ecuador, (ii) the development of front-end technology, that is, the “client-side” interface where teachers (in Ecuador) and families (in Chile and Peru) view available choices and apply for vacancies (Gerish, 2019), and (iii) the design, implementation, and evaluation of AI and behavioral science strategies in the three participating countries to improve allocation outcomes. These activities will be complemented by other TCs in the education division. In Ecuador and Peru, another TC (RG T3008) is being implemented to improve these countries’ administrative data, which are crucial for the back-end technology. In Ecuador, EC-T1385 will support the inclusion of behavioral science to attract teachers to hard-to-staff schools. In Peru, PE-T1368 will incorporate a component on the centralized school admission project. The loan CH-L1081 will also incorporate a new component on the student admission system and will benefit from the evidence generated by this TC. This project is also aligned with the work of RG-T3450: fAIr LAC Responsible AI for efficient and individualized provision of Social Services for all.

### **III. Description of Activities and Outputs**

- 3.1 Component I – Diagnosis of current allocation mechanisms. This component will produce a detailed diagnosis of the results of current student assignment in Chile and Peru and for teacher assignment in Ecuador to inform the development of back and front-end technology and AI and behavioral interventions to improve allocation outcomes to be developed in Component II. The diagnosis will include: (i) an analysis of the rules and actual practices determining student and teacher allocation across schools (for example, whether families have choice across all schools or within a catchment area, what information is available to families, whether there are mechanisms to attract teachers to hard-to-staff schools, etc), (ii) a quantitative analysis

using administrative and georeferenced data to describe the allocation outcomes of the rules in terms of efficiency and equity (for example, whether there are certain schools/areas that are oversubscribed, whether or not certified teachers apply to disadvantaged schools, etc), and (iii) interviews and focus groups to better understand the reasons behind families' and teachers' choices within the current systems.

- 3.2 **Component II – Development of back-end and front-end technology for centralized allocation systems.** This component will: (i) assist the governments of Peru and Ecuador in the development and piloting of allocation algorithms for students and teachers (back-end), and (ii) assist governments in the development and piloting of front-end technology for student allocation (Chile and Peru), and for teacher allocation (Ecuador). The back-end stage may include changes to the allocation algorithms (for example, changing priorities or allow students and teachers to list more preferred schools) and/or changes to more general regulations (for example, introduce more school choice to students). The front-end stage focuses on improvements in the interface of allocation systems. More specifically, this component will include: (a) the design and implementation of a pilot platform for student applications in Peru, (b) the design and implementation of interfaces for virtual assistants (through ChatBots/APIs or integrated into the base user platforms) informed by AI for student and teacher allocation; and (iii) design and implement nudges through the virtual assistants to improve match quality and equity in student and teacher allocation across schools. In this phase, the IDB will work with governments to tackle any implementation challenge that might emerge. One of these challenges is the quality of the country's administrative data, which are crucial for the allocation system's back-end. Another challenge is the implementation of these systems in places with poor internet connectivity.
- 3.3 **Component III – Evaluation and dissemination.** This component will fund (i) an evaluation of the effectiveness of matching algorithms, AI and nudges in improving equity and efficiency in the allocation of teachers and students across schools, (ii) one workshop in each country to share the results, and (iii) a regional seminar to disseminate results and showcase the use of artificial intelligence and behavioral science techniques to improve transparency, efficiency, and equity in student and teacher allocation systems.
- 3.4 **Component I: Component 1.** Diagnosis of allocation mechanisms
- 3.5 **Component II: Component 2.** Implementation of back-end and front-end
- 3.6 **Component III: Component 3.** Evaluation and dissemination

#### **IV. Budget**

**Indicative Budget**

<b>Activity/Component</b>	<b>IDB/Fund Funding</b>	<b>Counterpart Funding</b>	<b>Total Funding</b>
Component 1	\$ 80,000.00	\$ 0.00	\$ 80,000.00
Component 2	\$ 200,000.00	\$ 0.00	\$ 200,000.00
Component 3	\$ 30,180.00	\$ 0.00	\$ 30,180.00

#### **V. Executing Agency and Execution Structure**

- 5.1 The project will be Bank executed.
- 5.2 The execution by the Bank is justified for two main reasons. First, the Education Division at IDB has experience carrying out successful behavioral interventions in education in Brazil (RG-T2997 and RG-T1339) and Haiti (HA-T1223). SCL has also formed a Behavior Economics Working Group that has supported training activities for

some of the team members and provided technical support for some of the education division's interventions. Second, the Education Division has a dense network of individuals and EdTech organizations that specialize in applying AI and behavioral strategies in public policy. Finally, the interventions financed through this TC are highly innovative pilots that could be of great interest to other countries in the region. Thus, ensuring that the Bank is involved in the design and implementation process will increase the probability of replicability in other countries.

## **VI. Project Risks and Issues**

- 6.1 This project is aligned with IDB's fAIr, which is a platform to harness the power of Artificial Intelligence for social impact in Latin America and the Caribbean (LAC). This project aims to increase governments' adoption of AI as a tool to promote more transparency in allocation mechanisms and potentially reduce corruption and manipulation of student and teacher assignment. These intelligent systems are also a powerful tool to promoting more equitable and efficient alternatives for teachers and students while maintaining their freedom through the offer of choices.
- 6.2 Governments may be concerned that parents and teachers are being persuaded by the government to make decisions that may not be in their interest. Experiences from similar platforms in school districts in the United States and recent RCTs conducted by the Bank in Brazil, show that these concerns can be overcome through close collaboration with the governments and clear communication to all stakeholders of the objectives of the student and teacher assignment systems. This risk will be mitigated through frequent missions, technical assistance, and a strong team dedicated to the project. The specific nudges to be developed and the specific goods to maximize will be determined in close collaboration with each government, attending to local needs.

## **VII. Environmental and Social Classification**

- 7.1 The ESG classification for this operation is "undefined".