

**Job Title: Consultancy to support analysis about students and teachers allocation systems, Education consultant in the Education Division (RG-T3443)**

**Background:** The Inter-American development Bank works to improve lives in Latin America and the Caribbean. Through financial and technical support for countries working to reduce poverty and inequality, we help improve health and education, and advance infrastructure. Our aim is to achieve development in a sustainable, climate-friendly way. With a history dating back to 1959, today we are the leading source of development financing for Latin America and the Caribbean. We provide loans, grants, and technical assistance; and we conduct extensive research. We maintain a strong commitment to achieving measurable results and the highest standards of increased integrity, transparency, and accountability.

The Social Sector (SCL) is a multidisciplinary team convinced that investing in people is the way to improve lives and overcome the development challenges in Latin America and the Caribbean. Jointly with the countries in the region, the Social Sector formulates public policy solutions to reduce poverty and improve the delivery of education, work, social protection, and health services. The objective is to advance a more productive region, with equal opportunities for men and women, and greater inclusion of the most vulnerable groups.

**The team:** The Education Division supports education systems of Latin America and the Caribbean countries to reach five dimensions that will contribute to making them successful in promoting effective teaching and learning among all children and youth. The IDB's private sector window also finances projects to expand educational opportunities for low income students.

We support Latin American and Caribbean countries to ensure that:

- 1) High expectations guide education services;
- 2) Students entering the system are ready to learn;
- 3) All students have access to effective teachers;
- 4) All schools have adequate resources and are able to use them for learning; and
- 5) All graduates have the necessary skills to succeed in the labor market and contribute to society.

One objective of the Education Division's research is to gather information and to generate empirical evidence on several models of allocation systems and their impact on efficiency and educational equity, in order to influence the implementation of improvements to school allocation systems across the region. This consultancy is part of a set of activities that will enhance the Division's capacity for analytical research in the region. The contractual will produce analytical work to evaluate AI, ML and

behavioral strategies to improve the allocation process of students and teachers. The results of this project will allow the generation of inputs to advise countries in the design of public policy and decision-making associated with allocation systems of students and teachers to schools.

The objective of this consultancy is to provide technical assistance through the collection and analysis of information about the allocation systems in Chile, Ecuador and Peru, and to assist in carrying out evaluations of alternative allocation systems.

**What you'll do:** The selected candidate will...

- Collect and clean databases
- Identify suitable identification strategies to evaluate the impact of each of the information and nudge interventions on the school choices of parents and teachers
- Analyze data and perform econometric analyses, including the implementation of the evaluation strategy, estimation of alternative econometric models and specifications, robustness checks, and analysis of the results
- Carry out a policy analysis based on the results of the impact evaluation and the local context
- Elaborate reports and presentations of main results

Try to explain the role in less than 6 bulletpoints.

deliverables/Payments timeline:

	<b>Deliverable Description</b>	<b>Est. Date of Delivery</b>	<b>% of Payment</b>
<b>#1</b>	<b>All required datasets, including a description of them</b>	<b>TBD</b>	<b>25%</b>
<b>#2</b>	<b>Report with a detailed description of the identification strategies to evaluate the impact of each of the information and nudge interventions on the school choices of parents and teachers, specifying the data that will be used in each case</b>	<b>TDB</b>	<b>25%</b>
<b>#3</b>	<b>Reports and presentations of the main results for each country</b>	<b>TBD</b>	<b>50%</b>

Skills you'll need:

- **Consanguinity:** You have no family members (up to fourth degree of consanguinity and second degree of affinity, including spouse) working at the IDB Group.
- **Education:** Master's degree or equivalent preferred and a minimum two years of relevant professional experience in economic policy, public policy, education policy, political economy, applied economics or equivalent combination of education and experience.
- **Experience: Strong background especially in areas of academic research and education policy.**
  - o Strong research background and analytical abilities especially in areas of economic policy, public policy, education policy, and political economy as demonstrated by academic and other professional achievements are required.
  - o Superior organizational, coordination and logistical skills, with ability to look ahead, address and prioritize a wide range of issues and activities for timely completion; a proven ability to take initiative and work independently, and to work in a dynamic fast-paced work environment.
  - o Proven ability to work effectively in complex, multi-disciplinary and multi-cultural teams; superior inter-personal skills, client-orientation, diplomatic skills, and mature judgment as well as sensitivity to social and cultural issues.
  - o A proven ability to write brief, clear and analytical reports and concise discussion notes and presentations.
- **Languages:** The candidate must have excellent command of English and Spanish.

#### **Core and Technical Competencies:**

#### **Opportunity Summary:**

- Type of contract: Product and External Services (PEC), Lump Sum
- Length of contract: 40 DAYS over a period INSERT NUMBER OF 6 months
- Starting date: TBD
- Location: TBD
- Responsible person: Gregory Elacqua, Principal Education Economist, SCL/EDU
- Requirements: You must be a citizen of one of the IDB's 48 member countries and have no family members currently working at the IDB Group.

**Our culture:** Our people are committed and passionate about improving lives in Latin-America and the Caribbean, and they get to do what they love in a diverse, collaborative and stimulating work environment. **We are the first Latin American and Caribbean development institution to be awarded the EDGE certification, recognizing our strong commitment to gender equality.** As an employee you can be part of internal resource groups that connect our diverse community around common interests.

**We encourage women, afro-descendants, people of indigenous origins, and persons with disabilities to apply.**

**About us:** At the IDB, we're committed to improving lives. Since 1959, we've been a leading source of long-term financing for economic, social, and institutional development in Latin America and the Caribbean. We do more than lending though. We partner with our 48-member countries to provide Latin America and the Caribbean with cutting-edge research about relevant development issues, policy advice to inform their decisions, and technical assistance to improve on the planning and execution of projects. For this, we need people who not only have the right skills, but also are passionate about improving lives.

**Our team in Human Resources carefully reviews all applications.**

**Countries: Chile, Ecuador, and Perú**

***Technical Cooperation: RG-T3443***

***Artificial Intelligence and Behavioral Insights in Education***

## **1. Background and Justification**

- 1.1.** In several countries in Latin America and the Caribbean (LAC), the assignment of students to schools is a black box for parents and governments and often leads to inequitable and inefficient outcomes. Parents are responsible for gathering information about schools and choosing which schools to apply to or enroll their children in. Parents from more disadvantaged backgrounds often have less objective knowledge about schools than higher-income parents (Schneider et al., 1998; Bell, 2009; Bosetti, 2004) and are less likely to choose an alternative to the neighborhood school for their children (Teske and Schneider, 2001) and more likely to enroll their child in a low performing school than more advantaged parents (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 (El Comercio, 26 de octubre de 2010). This lack of transparency in the student allocation system is also an important problem for governments to address imbalances in the supply and demand for vacancies.
- 1.2.** Likewise, the assignment of teachers to schools in several LAC countries, either with centralized or decentralized systems, is also a black box for teachers and governments. Teacher assignment systems often do not provide teachers with enough information on vacancies to make informed decisions. Moreover, these systems could do more to address inequities. In many education systems, more qualified teaching candidates have higher priority in choosing a vacancy and tend to select more advantaged schools, fostering inequality (Bertoni et al., 2018; Boyd et al., 2005; Cabezas et al., 2011; Jackson, 2009). This may partly be due to a lack of information about disadvantaged schools or biases against them (Elacqua et al., 2019). Moreover, lack of information may also lead to imbalances in supply and demand, because some schools may attract disproportionately more teaching candidates than others. Also, teachers are more likely to be dissatisfied with their assigned school if they do not have enough information about their options, which can impact their effectiveness in the classroom (Jackson, 2012). In these systems, governments are missing relevant information on, for example, which schools are the most and least popular among teacher candidates. In many cases, this information is not easily obtained because governments lack a proper information system where teachers, schools, and students can be connected through unique identifiers. However, this type of information on teacher and student allocation is crucial to design policies that improve the efficiency and equity of the system.
- 1.3.** To address these issues and improve transparency, equity, and efficiency in allocation systems, many school systems around the world have adopted centralized allocation systems, in which the application process for vacancies and the assignment of teachers and students to schools are realized at the central level, by the central government (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; Frank et al., 2017). This project aims to use AI and ML to provide relevant information to parents and teachers about their schooling options. Experimental evidence demonstrates that providing information influences parental choice (Corcoran et al., 2018; Gallegos et al., 2012; Hastings and Weinstein, 2008). Moreover, AI can be paired with behavioral insights to improve the outcomes of the allocation systems. Behavioral strategies have been proven to be effective in several policy realms such as weight loss (Patrick et al., 2009), smoking cessation (Rodgers et al., 2005), and philanthropical donations (Thaler and Sunstein, 2008). In education, texting has been successfully used to encourage parent involvement (Bergman 2014; York and Loeb, 2014; Bettinger et al., 2018) and to improve school governance (Asim and Dee, 2016). Recent experimental evidence in Rio de Janeiro also suggests that behavioral strategies can be effective to attract teachers to hard-to-staff schools (Elacqua et al., 2019). In the context of student and teacher allocation, drawing on techniques used by companies such as Netflix, AI and behavioral strategies can be used to nudge parents and teachers to consider other relevant options in their choice set, making the assignment of students and teachers more transparent, equitable, and efficient and improving match quality and satisfaction. The use of AI and ML in allocation systems remains largely unexplored. The United States, for example, has experimented with introducing nudges to student allocation platforms to improve their school choice (Glazerman et al., 2018). However, these nudges could be combined with AI and ML techniques to optimize allocation outcomes.

## **2. Objectives**

- 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. Specifically:
  - 2.1.1. For the Chilean and Peruvian systems, a diagnostic study of how the current system of allocation of students work. For the Ecuadorian system study of how the current system of allocation of teachers work.
  - 2.1.2. For the student allocation systems of Chile and Peru, and for the teacher allocation system of Ecuador, examine and simulate how the systems would work under different allocation rules.
  - 2.1.3. Provide technical assistance in the development of back-end technology for the student and teacher's assignment systems in Ecuador and the student's assignment system in Peru. Likewise, provide technical assistance in the development of front-end technology for the student's assignment system in Chile and Peru, and for the teacher's assignment system in Ecuador.
  - 2.1.4. Conduct an impact evaluation of the front-end technology based on AI and behavioral science strategies to improve student and teacher allocation outcomes.
  - 2.1.5. Give relevant policy recommendations that are based on evidence and the specificities of each local context.

## **3. Scope of Services**

- 3.1.** The project is focused on two processes of the school system: (I) Teacher allocation process; (II) Student enrollment process. We will develop products and services that can be classified into three components: (i) Diagnosis of current allocation mechanisms; (ii) Development of back-end and front-end technology for centralized allocation systems; (iii) Evaluation.
- 3.2.** Product 1 – Diagnosis of current allocation mechanisms for students and teachers: The firm will produce a detailed diagnosis of the results of the current teacher assignment system in Ecuador and for the student assignment systems in Chile and Peru. This diagnosis will include: (i) an analysis of the rules and actual practices determining student and teacher allocation across schools; (ii) study the school supply and population density to define local educational markets; and, (iii) depending upon availability of resources, a survey to better understand family and teacher's preferences.
- 3.3.** Product 2 – Analyses of alternative allocation systems – literature review and simulations: The firm will conduct a literature review to identify effective nudges and informational interventions for the student allocation system in Chile and Peru, and for the teacher allocation system in Ecuador. The firm will also conduct simulations to make a comparison of the allocation results under the current system and under a strategy-proof matching algorithm (using datasets of previous allocation processes). These simulations will be performed for the student allocation system in Peru and for the teacher allocation system in Ecuador.
- 3.4.** Product 3 – Technical support in the development of back-end and front-end technologies in the teacher and student assignment systems: The back-end stage includes the development of a platform and changes to the allocation algorithms for the teacher allocation system in Ecuador and the student allocation system in Peru. The front-end stage focuses on improvements in the interface of allocation system including design and implementation of alerts and nudges for the student allocation system of Chile and Peru, and for the teacher allocation system in Ecuador. The front-end will include a survey to assess the satisfaction of applicants with the process.
- 3.5.** Product 4 – Evaluation of the effectiveness of the front-end technology for centralized allocation system of teachers and students: Based on the area that the government chooses to implement the back-end and front-end technologies, the firm will conduct an impact evaluation of the effectiveness of AI and nudges in improving equity and efficiency in the allocation of teachers (Ecuador) and students (Chile and Peru) across schools. The results will be a key input for a policy analysis that will be performed for each country.

#### **4. Key Activities**

- 4.1.** Activities for Product 1 – Diagnosis of current allocation mechanisms for students and teachers:
  - 4.1.1. Analysis of the current allocation rules.
  - 4.1.2. Collection of administrative data for analysis of previous processes.
  - 4.1.3. Analysis of the data to identify main issues with the systems and assess their transparency, efficiency, and equity.

- 4.1.4. Analysis to define and identify education markets using population census data and geocoded data of students.
- 4.1.5. Elaboration of reports and presenting main results.
- 4.2.** Activities for Product 2 – Analyses of alternative allocation systems; literature review and simulations:
  - 4.2.1. Collection of administrative data for analysis of previous processes.
  - 4.2.2. Feasibility analysis for the definition of priorities.
  - 4.2.3. Adapt different matching algorithms to the local context.
  - 4.2.4. Analyses and simulations of the current algorithm and a strategy-proof algorithm using data of previous processes.
  - 4.2.5. Elaboration of reports and presenting main results.
- 4.3.** Activities for Product 3 – Technical support in the development of back-end and front-end technologies in the teacher and student assignment systems:
  - 4.3.1. Support in the creation of an information platform that supports applicants by providing them with relevant information using AI and Machine Learning. The platform will also include nudges to persuade teachers to choose hard-to-staff schools and families to choose less demanded schools that are similar to their first option.
  - 4.3.2. Support in the design and implementation of a chatbot technology that suggests how to strengthen the application.
  - 4.3.3. Support in the design and implementation of a system of alerts, using AI and Machine Learning, when applicants apply to popular schools and face the risk of not being accepted.
  - 4.3.4. Support in the design and implementation of personalized recommendations to be sent by text messages.
- 4.4.** Activities for Product 4 – Evaluation of the effectiveness of the front-end technology for centralized allocation system of teachers and students
  - 4.4.1. Collection and cleaning of databases.
  - 4.4.2. Implementation of the evaluation strategy, estimation of alternative econometric models and specifications, robustness checks, and analysis of the results.
  - 4.4.3. Policy analysis based on the results of the impact evaluation and the local context.
  - 4.4.4. Elaboration of reports and presentation of main results.

## **5. Expected Outcome and Deliverables**

- 5.1.** The deliverables will be requested and processed through a work order and will include reports, presentations, databases, do-files, and codes. With each work order, the firm will be expected to create a work plan that includes a start and end date, outline key processes needed to complete the work, and identify stakeholders, especially government counterparts, that will be



contacted to complete the work.

## **6. Project Schedule and Milestones**

- 6.1.** Work plan including proposals for the design of the evaluation strategy to identify causal effects: Within **one month** of signing the contract
- 6.2.** Product 1: Diagnosis of current allocation mechanisms for students and teachers: Within **7 months** of signing the contract
- 6.3.** Product 2: Analyses of alternative allocation systems; literature review and simulations: Within **7 months** of signing the contract
- 6.4.** Product 3: Technical support in the development of back-end and front-end technologies in the teacher and student assignment systems: Within **19 months** of signing the contract
- 6.5.** Product 4: Evaluation of the effectiveness of the front-end technology for centralized allocation system of teachers and students: Within **31 months** of signing the contract

## **7. Reporting Requirements**

- 7.1.** The firm will be required to provide biweekly written updates on the progress of the work in addition to the report milestones specified in section 6.
- 7.2.** All materials produced during and for this consultancy will:
  - 7.2.1. Be delivered in electronic copies.
  - 7.2.2. Be owned by the IDB (copyright), including the right to produce, distribute, disseminate and publish, notwithstanding the termination of the consultancy (except for the engagement content).

## **8. Acceptance Criteria**

- 8.1.** The firm is expected to deliver high-quality products that will be evaluated by the supervisors of the project for quality assurance. It is also expected the firm has the necessary infrastructure to fully comply with the activities proposed.

## **9. Other Requirements**

- 9.1.** The firm will provide technical support with the maintenance of the platform if required up to two years after the finalization of the contract.

## 10. Supervision and Reporting

**10.1.** The responsible for this project will be Gregory Elacqua, Principal Education Economist (SCL/EDU), Analía Jaimovic, Specialist of the Division of Education (SCL/EDU), Florencia Lopez, Specialist of the Division of Health (SCL/EDU), Carolina Mendez, Specialist of the Division of Education (SCL/EDU), Anne Sofie Olsen, Specialist of the Division of Education (SCL/EDU), and Norbert Schady, Principal Economist of the Social Sector (SCL/SCL). The firm will participate in meetings with the IDB team to plan and report on progress (the meetings will be weekly during critical periods of the consultancy).

## 11. Schedule of Payments

**11.1.** Payment terms will be based on the following table

<b>Payment Schedule</b>	
<b><i>Deliverable</i></b>	<b>%</b>
1. <i>Work Plan including proposals for the design of the evaluation strategy to identify causal effects</i>	10%
2. <i>Product 1: Diagnosis of current allocation mechanisms for students</i>	25%
3. <i>Product 2: Analyses of alternative allocation systems: literature review and simulations</i>	25%
4. <i>Product 3: Technical support in the development of back-end and front-end technologies in the teacher and student assignment systems</i>	10%
5. <i>Product 4: Evaluation of the effectiveness of the front-end technology for centralized allocation system of teachers and students</i>	30%
<b>TOTAL</b>	100%