TC Document

I. Basic Information for TC

▪ Country/Region:	PERU
▪ TC Name:	New Technologies to Improve Equity and Efficiency in Teacher Assignment in Peru
▪ TC Number:	PE-T1447
▪ Team Leader/Members:	Elacqua, Gregory Michael (SCL/EDU) Team Leader; Mendez Vargas, Carolina Patricia (SCL/EDU) Alternate Team Leader; Blasco, Ivana (SCL/EDU); Casco, Mario A. (ITE/IPS); Castro De Souza Marotta, Luana (SCL/EDU); Colqui Segama, Sally Jasmin (CAN/CPE); Cossi Fernandes, Joao Paulo (SCL/EDU); Holguin Madrinan, Alejandra (SCL/SCL); Jorquera Armijo, Pablo Manuel (SCL/EDU); Perez Nunez, Graciela (SCL/EDU); Vila Saint-Etienne, Sara (LEG/SGO)
▪ Taxonomy:	Client Support
▪ Operation Supported by the TC:	.
▪ Date of TC Abstract authorization:	24 Mar 2021.
▪ Beneficiary:	Peruvian Ministry of Education and the teachers who will apply to the Peruvian teacher hiring process in 2021
▪ Executing Agency and contact name:	Inter-American Development Bank
▪ Donors providing funding:	Japan Special Fund(JSF)
▪ IDB Funding Requested:	US$500,000.00
▪ Local counterpart funding, if any:	US$56,000.00 (In-Kind)
▪ Disbursement period (which includes Execution period):	36 months (36 months execution period)
▪ Required start date:	August 25th, 2021
▪ Types of consultants:	Firms and individual consultants
▪ Prepared by Unit:	SCL/EDU-Education
▪ Unit of Disbursement Responsibility:	SCL/EDU-Education
▪ TC included in Country Strategy (y/n):	Yes
▪ TC included in CPD (y/n):	No
▪ Alignment to the Update to the Institutional Strategy 2010-2020:	Diversity; Gender equality; Institutional capacity and rule of law; Productivity and innovation; Social inclusion and equality

II. Objectives and Justification of the TC

2.1 The COVID-19 pandemic is likely to generate significant learning losses and widen socioeconomic learning gaps in Latin America and the Caribbean (BID, 2021). In a region historically affected by unequal access to quality education, the economic and health crisis of the pandemic will increase these inequalities as many children, especially the vulnerable, have not been able to access education due to lack of distance learning systems, digital infrastructure, and teachers' digital capabilities. To mitigate the negative impact on learning, it will be fundamental to identify, train, select, and allocate good teachers (BID, 2018).

2.2 Having an effective teacher can dramatically improve students' educational and long-term outcomes (Araujo et al., 2016; Chetty et al., 2014; Hanushek and Rivkin, 2012). Recent experimental evidence in Ecuador shows that the impact of effective teachers is significantly larger for disadvantaged students (e.g., Cerrando Brechas, 2018).

However, teacher allocation in Latin America and the Caribbean (LAC) is unequal. Empirical evidence shows that high-performing teachers tend to be assigned to more advantaged students (Bertoni et al., 2018; Rosa, 2019). Moreover, disadvantaged students are more likely to experience the adverse effects of teacher shortages and turnover related to unequal teacher distributions across schools (Lankford et al., 2002; Boyd et al., 2005; Kalogrides et al., 2013; Ronfeldt et al., 2013; Hanushek et al., 2016).

2.3 In several LAC countries, the assignment of teachers to schools is also inefficient and not transparent. Only government officials know how the "black box" of the system works, and teacher assignment systems often do not provide teachers with enough information on the available vacancies to allow them to make informed decisions. 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). Moreover, lack of information about vacancies also creates imbalances in supply and demand for teaching staff. For example, in Peru, more than one quarter of vacancies remain unfilled after the teacher selection process and most of these vacancies are in disadvantaged schools.

2.4 A better understanding of the school characteristics valued by prospective teachers can help in the design of effective policies that attract them to work in hard-to-staff-schools. Evidence shows that Peruvian applicants to teacher positions prefer larger schools located in low-poverty districts, with Spanish language instruction, one teacher per classroom, and with access to basic services. Further, females and high-performing teachers are less likely to apply to disadvantaged schools that compensate with wage bonuses. As a result, remote and rural schools often end up with less qualified teachers that do not fulfill the minimum requirements (Bertoni et al., 2020).

2.5 To address these issues and improve equity, transparency, and efficiency in teacher allocation, many school systems around the world have adopted online centralized allocation systems (Elacqua et al., 2016). These centralized systems provide a unique opportunity to use new technologies such as 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 teachers about their schooling option s. Moreover, AI can be paired with behavioral insights to improve the outcomes of the allocation systems. Recent experimental evidence in Peru and Ecuador also suggests that behavioral strategies can be effective at attracting teachers to hard-to-staff schools (Ajzenman et al., 2019a; Ajzenman et al., 2019b). In fact, results of an experimental evaluation of a low-cost nation-wide government program in Peru implemented by the Division of Education at IDB, designed to reduce the sorting of candidates in the teacher selection process, show that low-cost behavioral strategies can enhance the supply and quality of professionals willing to teach in high-need and rural areas (Ajzenman et al., 2020). Thus, AI and behavioral strategies can be used to nudge teachers to consider other relevant options in their choice set, making the assignment of teachers more transparent, equitable, and efficient and improving match quality and satisfaction.

2.6 The general objective of this project is to strengthen the centralized teacher allocation system in Peru. This TC will finance: (i) assessments and improvements in the mechanisms for teacher assignment; and (ii) improvements in the front-end technology used to assign teachers including (a) further exploration of behavioral strategies to motivate teachers to work in more disadvantaged schools; (b) introduction of changes in the teacher assignment platform to enhance user experience to increase transparency and efficiency in teacher assignment; and (c)

introduction of new technologies, such as artificial intelligence and machine learning, to improve equity and efficiency in the allocation process and increase teacher satisfaction with their final allocation.

2.7 While our preliminary findings in Peru suggest that behavioral techniques can improve efficiency and equity in teacher allocation, though with significant room for improvement, our work also shows that unsatisfactory user experience with the online platforms create barriers for effective teacher assignment. For example, in Peru, while some teachers could not visualize the available vacancies, others could not find the monetary incentives offered for different types of schools (ex. rural, bilingual, etc.). This type of situation may produce suboptimal choices that could generate inefficiencies in teacher allocation. Therefore, we propose to strengthen the user experience aspect of the platform.

2.8 The resources of this TC will also allow us to expand our agenda on centralized teacher assignments. In our conversations with different LAC policy makers, we observe a strong interest and need to address inequities and inefficiencies in teacher assignment. In this TC, we aim to use the lessons learned from our work in Peru with future technical assistance and policy dialogue with other school systems in the region.

2.9 Finally, this project is aligned with the three priority areas within the IDB and the Social Sector: (i) investment in human capital, as teachers are the most influential schooling input to improve learning; (ii) improving productivity through digitalization, as we focus on harnessing technology to improve efficiency and equity in teacher allocation and improving teacher user experience on the platform, by introducing more efficient matching allocation methods; and (iii) focusing on rural and vulnerable areas. The objective of using techniques from behavioral economics to attract higher performing teachers to rural and vulnerable schools, where currently there is a shortage of qualified teachers, these interventions have the potential to reduce inequities and narrow the socioeconomic and urban-rural learning gaps.

2.10 **Expected Results**. This project aims to increase Peruvian government' adoption of more efficient back-end teacher assignment rules and more innovative front-end technology such as AI, ML, and behavioral strategies as tools to improve user experience and promote more transparency efficiency and equity in centralized assignment systems for teachers.

2.11 **Strategic Alignment:** The TC is consistent with the Bank's Update to the Institutional Strategy (UIS) 2020-2023 (AB-3190-2), and it is directly aligned with the "Social Inclusion and Equality" developmental challenge as it aims to allocate qualified teachers to vulnerable schools. The TC is also consistent with indicators of the Corporate Results Framework (GN-2727-12), such as Productivity and Innovation and Social Inclusion and Equality, as it pursues to implement new technologies to assign teachers to schools that improve equity, efficiency, and transparency in the school system. Besides, the project is aligned with the goals and result matrix of the Skills Sector Framework Document (GN-3012) and Early Childhood Development Sector Framework Document (GN-2966-2). This project is also aligned with IDB's fAIr LAC, which is a platform to harness the power of Artificial Intelligence for social impact in LAC. Regarding the Country Strategy for Peru (2017-2021) (GN-2889), the TC is consistent with it as it supports the Bank's strategic objective of improving public management of social services by strengthen the centralized teacher allocation system in Peru. Moreover, the TC is consistent with the National Strategy on Digital Technology in Basic Education of Peru 2016-2021 that emphasizes the importance of experimentation, evaluation and using data to guide public policy decision-making, and that aims to develop teachers' digital competencies.

III. Description of activities

3.1 **Component I: Diagnosis of current allocation mechanisms and technological platforms (US$100,000.00).** This component will produce: (i) a diagnosis of the mechanisms in teacher assignment in Peru, including a teacher survey, and a qualitative and quantitative analysis of how the system works; and (ii) a diagnosis of the platforms used to allocate teachers in Peru (including an Infrastructure Assessments and a stakeholder analysis). These studies will inform the recommendations for the back end and front-end technology we will provide to the Ministry of Education, including behavioral interventions, user experience and AI and ML to improve allocation outcomes to be developed in Component II.

3.2 **Component II: Technical Assistance to teacher allocation platforms (US$356,000.00).** This component will assist the government in the development and piloting of allocation algorithms (back-end), and front-end technology for teachers in Peru. Component II will be used to hire consulting firms to implement digital solutions, e.g., improve user experience, introduce matching algorithms, behavioral interventions, and AI to strengthen the current platform and/or develop a new platform to improve efficiency and equity in the Peruvian teacher allocation system. After the COVID-19 pandemic outbreak there is increasing evidence of the gaps in teachers' digital competencies, so this component will also fund the design and execution of a change management plan to effectively help all stakeholders to adapt to the platform and other sources. More specifically, this component will include: (a) the technical support in the design and implementation of a package of software to be introduced in the teacher allocation platform; (b) the technical support in the design and implementation of pilots within the existing platform (or new platform) to test the proposed software and allocation changes; (c) the technical support in the design and implementation of informational campaigns that explain teachers how to use the platform so they can increase their matching options; and (d) the technical support in the design and implementation of a change management plan to enhance teachers digital competencies (use of the Ministry's web page, several digital platforms and other free source tools and search engines).

3.3 **Component III: Evaluation and dissemination (US$100,000.00).** This component will fund: (i) a causal evaluation of the impact of AI and nudges in improving equity and efficiency of teacher allocation, and the impact of the campaigns to enhance teachers' digital competencies; and (ii) two seminars (in Lima and Washington DC) to disseminate the findings and best practices to policymakers in LAC, teachers, private sector leaders, researchers, and practitioners. We plan to collaborate with practitioners in Japan on the design and implementation of the interventions. We will also work with the communication team at the Japanese embassies in the United States and in Peru to disseminate the outcomes of the TC. After each seminar, we will share all the documents produced by this TC and establish commitments among the stakeholders.

3.4 The total cost of this TC will be US$556,000.00 and will be financed with a contribution of US$500,000.00 from resources of the JSF[1] and a contribution (in-kind) of US$56,000.00 from the local counterpart. The in-kind funding consists in the Peruvian Ministry of Education's technical staff that will implement the changes required to the

[1] JSF has communicated the eligibility of this project on April 26th, 2021.

existing teacher allocation platform (design and platform development). The budget for the project is the following:

Indicative Budget

Activity/Component	IDB / JSF Funding	Counterpart Funding	Total Funding
Diagnosis of current allocation mechanisms and technological platforms.	US$100,000.00	US$0	US$100,000.00
Technical Assistance to teacher allocation platforms.	US$300,000.00	US$56,000.00	US$356,000.00
Evaluation and dissemination.	US$100,000.00	US$0	US$100,000.00
Total	**US$500,000.00**	US$56,000.00	**US$556,000.00**

3.5 **Supervision.** The Bank, through the Education Division (SCL/EDU) will be responsible for the supervision and monitoring of this operation. The Team Leader, Gregory Elacqua, will supervise this TC in collaboration with the Alternate Team Leader based in Peru, Carolina Mendez. It is estimated that the project will have a duration of 36 months for execution and disbursements counted from the date of approval of this TC.

3.6 **Monitoring.** In order to monitor and evaluate arrangement for this TC, the team will conduct regular meetings with counterparts and consultants, as well as supervision missions.

IV. Executing agency and execution structure

4.1 In accordance with Appendix 10 of the Operational Guidelines for Technical Cooperation Products (GN-2629-1, modified in Annex 2 of GN-619-4) and at the request of the Ministry of Education of Peru, the Bank, through the Education Division (SCL/EDU) will execute this TC. The Bank has developed strong expertise in technology for centralized allocation systems in Ecuador, Brazil, and the implementation of small interventions in student allocation systems in Tacna, Peru. Additionally, the Education Division at IDB has experience carrying out successful behavioral interventions in education as well as a dense network of individuals and EdTech organizations that specialize in improving user experience in online platforms as well as applying AI and behavioral strategies in public policy. This accumulated expertise will be exploited to ensure a strong implementation of the TC and to ensure that the findings from this project are embedded in future Bank operations, policy dialogue, and are used to promote capacity building in countries in LAC that are seeking to use technology for allocating resources effectively. In addition, in alignment with GN 2629 Annex 10, execution by the Bank of the evaluation will enhance the independence of the work to be carried out, in this case, the external evaluation.

4.2 In compliance with point 17 of the JSFs Operating Guidance for Application and Implementation, a partnership with Shimpei Taguchi, researcher at the Japan International Cooperation Agency (JICA) Ogata Research Institute, will be conducted to review and innovative data visualization in online job application platforms for teachers. Mr. Taguchi will also work closely with the team to design behavioral

strategies to nudge teachers, school leaders and policy makers to make more equitable and efficient decisions.[2]

4.3 **Procurement.** All activities to be executed under this TC have been included in the Procurement Plan (see Annex IV) and will be contracted in accordance with Bank policies as follows: (a) AM-650 for Individual consultants; (b) GN-2765-4 and Guidelines OP-1155-4 for Consulting Firms for services of an intellectual nature; and (c) GN-2303-28 for logistics and other related services. All knowledge products derived from this Technical Cooperation will be the Bank's intellectual property.

V. Major issues

5.1 One of the major risks is the political change in the country given that general elections are taking place in 2021. To mitigate the risks, the team works in close coordination with technical staff and stakeholders at the Ministry of Education that have less rotation but also with supervisors in the regional offices to create a broad base of support. In general, there is wide consensus on the need to improve the platforms for teacher allocation, especially in the context of COVID-19 given that there is a need to expand the online allocation system to other “concursus”, like the temporal teachers.

5.2 There is a low risk that governments may become concerned that teachers will feel like they 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 Ecuador, Peru and Brazil, show that these concerns can be overcome through close collaboration with the Ministry of Education of Peru and clear communication to all stakeholders of the objectives of the teacher assignment system. This risk will be mitigated through frequent missions (virtually), technical assistance, and a strong team dedicated to the project. The specific behavioral strategies and AI and ML and user-experience recommendations to be developed and the specific goods to maximize will be determined in close collaboration with the Peruvian government, attending to local needs. Moreover, the strong commitment of the government with the education sector, makes the project team confident that the proposed TC design is feasible.

5.3 Insufficient, unreliable, or inadequate technological infrastructure to host enhancements or new application or module. The probability of the risk is uncertain; however, its impact on execution is likely to be high or critical. The risk will be mitigated by assessing the technological infrastructure during the diagnose stage and qualifying its capacity and adequacy in order to account for it during the design phase, adjust features, help prioritize and manage the pilot.

VI. Exceptions to Bank policy

6.1 There are no exceptions to Bank policy.

VII. Environmental and Social Strategy

7.1 Given the characteristics of the project, no negative environmental or social risks are expected. Therefore, the classification of this operation according to environmental safeguards policy (OP-703) is “C”.

Required Annexes:

[2] The work with Mr. Taguchi at JICA will be ad-honorem.

Request from the Client - PE-T1447

Results Matrix - PE-T1447

Terms of Reference - PE-T1447

Procurement Plan - PE-T1447