

TC DOCUMENT

I. Basic project data

| | |
|--|--|
| ▪ Country/Region: | CHILE |
| ▪ TC Name: | From Pilot to Scale: Evaluating the Expansion of Chile's AI-Powered Teacher Induction Program |
| ▪ TC Number: | CH-T1339 |
| ▪ Team Leader/Members: | Elacqua, Gregory Michael (SCL/EDU) Team Leader; Jaimovich, Analia Veronica (SCL/EDU) Alternate Team Leader; Lopez Gelb Loren Viviana (SCL/EDU); Bazan, Jorge Antonio (SCL/EDU); Tamagnan, Marie Evane (SCL/EDU); Sanmartin Baez, Alvaro Luis (LEG/SGO); Kutscher Campero Macarena Isabel (SCL/EDU); Blasco, Ivana (SCL/EDU); Del Toro Mijares Ana Teresa (SCL/EDU) Gregory Michael (SCL/EDU) Team Leader; Analía Verónica Jaimovich (SCL/EDU); Sabine Rieble-Aubourg (SCL/EDU); Michelle Leonor Moreno (ITE/IPS) |
| ▪ Taxonomy: | Research and Dissemination |
| ▪ Operation Supported by the TC: | . |
| ▪ Date of TC Abstract authorization: | 30 Aug 2024. |
| ▪ Beneficiary: | Ministerio de Educación (MINEDUC) |
| ▪ Executing Agency and contact name: | Inter-American Development Bank |
| ▪ Donors providing funding: | OC SDP Window 2 - Economic Growth(W2F); OC SDP Window 2 - Social Development(W2E) |
| ▪ IDB Funding Requested: | OC SDP Window 2 - Social Development (W2E): US\$131,250.00 OC SDP Window 2 - Economic Growth (W2F): US\$131,250.00 Total: US\$262,500.00 |
| ▪ Local counterpart funding, if any: | US\$0 |
| ▪ Disbursement period (which includes Execution period): | 24 months |
| ▪ Required start date: | January 1, 2025 |
| ▪ Types of consultants: | Individual consultants and/or firms |
| ▪ Prepared by Unit: | SCL/EDU-Education |
| ▪ Unit of Disbursement Responsibility: | SCL/EDU-Education |
| ▪ TC included in Country Strategy (y/n): | No |
| ▪ TC included in CPD (y/n): | No |
| ▪ Alignment to the IDB Institutional Strategy+: | Productivity and innovation; Social inclusion and equality |

II. Objective and Justification

2.1 Chile faces a severe shortage of qualified teachers due to an 8% annual decrease in teacher education program entrants over the last five years coupled with high teacher attrition. From 2004 to 2023, 22% of teachers left the profession in their first year, 14% in the second year, and turnover stabilized at 3% from the third year onwards. Notably, novice teacher turnover is three times higher than that of experienced colleagues. By 2025, Chile is projected to have a deficit of over 30,000 teachers, particularly in math and science and for disadvantaged regions and schools (Medeiros et al., 2018).

- 2.2 International evidence shows that teacher turnover and early attrition disrupt learning, negatively impact student outcomes, and waste investments in teacher recruitment, training, and hiring (Ronfeldt et al., 2013; Boyd et al., 2008; Carver-Thomas and Darling-Hammond, 2019). Novice teachers worldwide face significant challenges as they begin their careers, including inadequate preparation for classroom realities, lack of mentoring support, and heavy workloads (Darling-Hammond et al., 2009; Kardos and Johnson, 2010). In Latin America, evidence also shows that novice teachers tend to be assigned to more challenging school environments and disadvantaged regions (Elacqua et al, 2022; Bertoni et al, 2020). These difficulties lead to high attrition rates among new teachers, which negatively impact student achievement and school stability (Ronfeldt et al., 2013; Hanushek, Kain and Rivkin, 2004). This issue is particularly concerning in the current global context of widespread teacher shortages, where the premature departure of novice teachers exacerbates these shortages, creating a cycle of understaffing and overreliance on inexperienced educators, which further strains education systems and potentially widens achievement gaps (UNESCO, 2024).
- 2.3 Education systems employ multiple strategies to improve teaching quality and retain novice teachers, such as increasing pay, improving workplace conditions, enhancing non-monetary incentives, and providing professional development opportunities. Recent studies show that induction and mentoring programs for novice teachers improve outcomes, including retention, instructional effectiveness, and student achievement (Keese et al., 2023). Typically, these programs incorporate elements of instructional coaching but go beyond in scope by also offering socioemotional support and broader career guidance (Darling-Hammond et al., 2009). In traditional teacher mentoring programs, an experienced mentor collaborates with a less-experienced teacher. Research indicates that engaging with an experienced mentor provides practical and emotional support (Strong, 2005; LaVine, 2016) and is highly valued by teachers (Kardos & Johnson, 2010; Martin et al., 2016). These mentoring and coaching programs hold promise for enhancing teacher motivation and well-being, which in turn improves retention. However, they can be very costly and challenging to scale because they require highly specialized and time-intensive human resources (Kraft et al., 2018; World Bank, 2023).
- 2.4 To better support novice teachers and reduce their attrition from the education system, the Chilean Ministry of Education (MINEDUC) implemented the National Induction and Mentoring System in 2017. This system pairs novice teachers with experienced colleagues for ten months of mentorship. To date, the system has supported a total of 705 novice teachers across Chile. A recent evaluation found that while the program is effective in supporting novice teachers, it has reached less than 1% of the target population. This limited reach is due in part to constrained human and institutional resources, as well as high program costs. An additional finding from the program's recent evaluation is that the school principal is a relatively under-leveraged figure in the current methodology, and both mentors and novice teachers highlight the value of involving the school leader more intentionally in mentoring activities, to increase impact (UNDP, 2023).
- 2.5 In response, MINEDUC has partnered with the IDB to design and pilot an innovative, technology-driven intervention (ESW: RG-E1957) to increase the impact and reach of the National Induction and Mentoring System. The strategy centers on creating a virtual mentoring system delivered via WhatsApp, utilizing generative AI for

personalized support, and building on the content of the existing model. Novice teachers and their school principals interact with AI-powered chatbots tailored to their roles. Novice teachers receive pedagogical advice, socioemotional support, and career guidance throughout the school year, while principals receive strategies and guidance on how to best support novice teachers working at their school. The system aims to boost teacher motivation and well-being, ultimately improving teacher retention rates and student outcomes.

- 2.6 During the 2024 school year, the virtual mentoring system in the form of an AI-powered chatbot named *Profe Gabi* is being developed, trained, tested, and piloted with a sample of 550 primary and secondary school teachers across various grade levels and regions in Chile. Pilot participants will use *Profe Gabi* for an 8-week trial between October and December 2024, providing feedback on their experience with the technology.
- 2.7 Considering the potential of this technology to improve teacher well-being, motivation, retention, and student outcomes in Chile and elsewhere, the objective of this TC is to support the expansion of the virtual mentoring system in 2025 to meet the legal mandate of providing mentoring for all novice teachers and to conduct a rigorous evaluation to assess its effectiveness. Specifically, this TC aims to: (1) deploy the virtual mentoring system (chatbot) to a total of approximately 13,000 novice teachers in Chile (including pre-primary education teachers) and conduct a Randomized Control Trial (RCT) to assess its effectiveness; (2) support the national scale-up of the AI-powered virtual mentoring system, under government leadership; and (3) disseminate findings regionally to share lessons learned.
- 2.8 This study is significant because it can potentially transform how the IDB assists countries on topics related to teachers and teacher careers. Supporting high-quality education for all is a key focus for the Education Division, and as outlined in the 2020 Skills Development Sector Framework, ensuring enough high-quality teachers is central to achieving this goal. Enhancing teacher retention to address shortages and improving teaching effectiveness are pressing priorities for the IDB's engagement with clients. Instructional coaching and teacher induction mentoring programs are effective strategies for improving teaching quality and retention, but their resource-intensive nature often limits scalability (Keese et al., 2023; Kraft et al., 2018; World Bank, 2023). AI-powered chatbots offer a promising approach to scaling teacher mentoring programs effectively, as they can emulate human interactions, personalize content, and reduce labor demands (Labadze et al., 2023). While chatbots have been effective in student tutoring and administrative tasks, their application in teacher support programs remains underexplored. This frontier project aims to provide the first rigorous evaluation of AI-powered chatbots in teacher support, potentially revolutionizing the IDB's approach to enhancing teacher and teaching quality across client countries. More broadly, our study contributes to the growing research on the effectiveness of AI-powered chatbots in education and beyond. Emerging technologies offer significant opportunities to enhance the impact and scale of social programs without compromising their effectiveness (Al-Ubayldi et al., 2021). Chatbots, especially those utilizing NLP, can emulate human conversations, automating services and reducing workload, making them increasingly popular across various sectors, including healthcare (Milne-Ives, 2020) and consumer services (Xu et al., 2017). Meta-analyses of chatbot applications in education highlight their benefits for students, primarily in

tutoring, homework assistance, and skill development, while for teachers, chatbots may improve teaching practices and offer time-saving techniques (Labadze et al., 2023; Kuhail et al., 2023). Our study aims to extend this body of knowledge by specifically examining the efficacy of AI chatbots in supporting teachers.

- 2.9 This proposal draws on insights from a successful 2021 IDB pilot using a rule-based WhatsApp chatbot to encourage enrollment in teacher education programs. It demonstrated the potential of new technologies to streamline costly and labor-intensive initiatives (Ajzenman et al., 2023). Given the rapid development of AI technologies, there is limited evidence on their effectiveness and best practices for conceptualizing, designing, testing, piloting, and scaling these technologies in educational interventions. Our study aims to fill this gap by providing a rigorous evaluation of AI-powered chatbots offering personalized support for novice teachers. The insights gained from this evaluation will have significant implications for Chile and beyond, given that teacher shortages and teaching quality are pressing policy priorities regionally (UNESCO, 2023).
- 2.10 The expected direct beneficiaries of this TC are the novice teachers in Chile who will receive support through the development and evaluation of the AI-powered chatbot. The total number of teachers receiving support from the AI-powered chatbot during the TC's implementation from 2025-2026 are 13,000. Given that this is an R&D TC, the expected indirect beneficiaries of this TC extend beyond Chile, and comprise the national and international education policymakers in the region who face similar challenges of teacher attrition and teacher shortages, and who will benefit from the evidence and knowledge generated from the development of this TC to inform and implement similar initiatives in their own contexts.
- 2.11 The TC is consistent with the IDB Group Institutional Strategy: Transforming for Scale and Impact (CA-631) and is aligned with objectives of social inclusion and equality and productivity and innovation by seeking to find cost-effective programs that use technology and AI to promote human capital development. These TC goals are also in alignment with the objectives of the Social Development Fund (OC SDP Window 2 - Social Development W2E) and the Economic Growth Fund (OC SDP Window 2 - Economic Growth W2F) which finance this TC. Finally, the TC is consistent with the Country Strategy for Chile (GN-3140-3) that states that "The IDB Group will take a multisector approach, integrated in terms of public-private coordination to support the country's efforts to improve the quality of and access to social services (pensions, health, education)".

III. Description of components and budget

3.1 This TC involves the implementation of three components:

3.2 Component 1: Large-scale implementation of the AI-powered chatbot based on the pilot and conducting an RCT to assess its effectiveness. In the first component of the project, the team will work closely with Chile's MINEDUC and the contracted technology consulting firm (CF) to make the necessary adjustments based on the 2024 pilot and deploy the chatbot to a total of approximately 13,000 novice teachers across pre-primary, primary, and secondary levels of education. The team will experimentally evaluate the impact of the intervention through an

RCT. The team will collaborate closely with MINEDUC counterparts to identify the eligible teacher population, select participants, and assign them to one of three groups. Approximately one-third of the teachers will receive access to the chatbot for the entire school year; another third will receive access to the chatbot, with the principal at their school also having access; and the remaining third will function as a control group, receiving pre-scripted information via WhatsApp without access to the chatbot. Participating teachers with access to the chatbot will receive personalized mentoring through WhatsApp, including: (1) socioemotional support focused on promoting overall well-being; (2) pedagogical guidance, including resources to help teachers improve their teaching practice and better manage their classrooms; and (3) career guidance, providing information about relevant policies, programs, and available resources and opportunities. Participating school leaders with access to the chatbot will receive personalized guidance and strategies on how to best support novice teachers at their school. The support provided by the chatbot will be tailored to each user's needs and context, incorporating best practices in mentoring to ensure continuous, targeted, tailored and practical support. The team will work closely with MINEDUC counterparts to carry out continuous monitoring and supervision activities during implementation, ensuring that the chatbot is working as expected. At the start of the 2025 school year, the team will collect baseline data on well-being for participating teachers via a survey; teacher attendance and retention via MINEDUC administrative data, and student outcome data from national standardized assessments. At the end of the school year, the team will collect endline data using the same instruments and data sources. Results from the RCT will be published initially as an IDB Working Paper and subsequently will be submitted to a peer-reviewed journal. Additionally, the team will develop a policy brief summarizing results, lessons learned and recommendations for further expansion, based on the findings from the RCT. This component will require the assistance of 4 consultants and a consulting firm. *The expected results from the first component of the TC include (1) an IDB Working Paper presenting results from the RCT, assessing to what extent the AI-powered chatbot is effective in improving teacher well-being, teacher retention, and student outcomes; and (2) the policy brief summarizing the program's implementation and lessons learned for scale-up, available in English, Spanish and Portuguese.*

3.3 Component 2: Support national scale up implementation. Following the RCT, the second component of this project involves collaborating closely with Chile's MINEDUC to facilitate the national deployment of the chatbot within the education system. Leveraging the insights gained from the RCT and the lessons learned from the implementation and evaluation process, we will make the necessary adjustments and provide support to ensure the seamless integration of the chatbot into the existing infrastructure for novice teacher support and development. This includes assisting in the development of implementation strategies, providing training sessions for educators and system-level administrators, and offering ongoing technical assistance to address any challenges that may arise during the deployment phase. By working hand in hand with the MINEDUC technical teams, we will support the MINEDUC in helping fulfill its mandate to ensure induction and mentoring support reaches all novice teachers in the system. This component includes the assistance of 2 consultants and a consulting firm. *The expected results from the second component of the TC include (1) supporting the chatbot's deployment at the national level in Chile, including detailed documentation of the strategies, timelines, and key activities carried out to ensure its successful*

deployment, (2) a report on the implementation and integration into the government infrastructure, if necessary, including a comprehensive analysis of the integration process, highlighting best practices, challenges faced, and lessons learned. This report will also provide recommendations for future implementation and scaling efforts in other contexts.

3.4 Component 3. Regional dissemination. For the final component of the project, the team will work with the MINEDUC to draw lessons learned and policy implications from the intervention. The team will work to disseminate findings and lessons learned internally within the IDB, as well as externally with other relevant stakeholders. Internally, the team will prioritize using lessons learned and findings to inform similar projects already in development. For example in Guyana, the team is already in early phases of dialogue to develop a similar AI-powered professional development chatbot for teachers in Guyana in the context of the current loan (GY-L1079), TC (GY-T1175) and GPE-financed grant (GY-G1009) that will enable the government to provide continuous support to all teachers, especially critical for those in the riverine and hinterland regions, who face the most challenging conditions, currently receive little support, and are often untrained. Additionally, the team will conduct internal BBLs and other knowledge-sharing activities to ensure that findings from this study are disseminated widely and used in other IDB operations where they are relevant. Given the relevance of teacher well-being and increasing teacher retention for policymakers in low- and middle-income countries in Latin America and more broadly, the project team will also share results and lessons learned with a broader audience of researchers, policymakers, and development partners beyond the IDB through multiple strategies. The project team will disseminate results in relevant international events focused on teachers and teaching with other development partners and multilaterals, such as with the Coalición Latinoamericana para la Excelencia Docente network, the TPD@Scale Coalition, UNESCO's International Teacher Task Force, and the World Bank's Global Platform for Successful Teachers, and through Brown Bag Lunches (BBLs) with multilateral partners. Finally, to share insights with the academic community, the project team will disseminate the IDB Working Paper through participation in relevant academic conferences, such as CIES, LACEA, and NBER. *The expected results from the third component of the TC include (1) Organization of at least 2 internal IDB dissemination events to share results and lessons learned from the RCT, such as BBLs; (2) Participation in at least 2 external dissemination events to share results and lessons learned from the RCT with policymakers and development partners beyond the IDB; (3) Participation in at least 1 academic conference to present the results from the RCT; and (4) The publication of a blogpost through the IDB's Enfoque Educación sharing findings from the study.*

3.5 The TC's total budget is US\$262,500, US\$131,250.00 will be funded by the OC SDP Window 2 - Social Development(W2E) (Social Development Fund), and the other US\$131,250.00 through the OC SDP Window 2 - Economic Growth(W2F) (Economic Growth Fund). The execution and disbursement periods will be 24 months. The table below shows the indicative budget.

Indicative Budget

| Activity/Component | Description | IDB/W2E Funding | IDB/W2F Funding | Counterpart Funding | Total Funding |
|--------------------|---|-----------------|-----------------|---------------------|---------------|
| Component 1 | RCT of large-scale implementation of chatbot (Jan-Dec 2025) | \$131,250.00 | \$50,000.00 | \$0.00 | \$181,250.00 |
| Component 2 | Support national scale-up with government leadership (Jan-Dec 2026) | \$0.00 | \$56,250.00 | \$0.00 | \$56,250.00 |
| Component 3 | Regional dissemination of findings and lessons learned (July-December 2026) | \$0.00 | \$25,000.00 | \$0.00 | \$25,000.00 |
| Total | | \$131,250.00 | \$131,250.00 | | \$262,500 |

IV. Executing agency and executing structure

- 4.1 This TC will be executed by the Bank through SCL/EDU. The main reason for this execution structure is that the Bank has developed strong expertise in the use of technology, including AI, to improve educational outcomes cost-effectively. This TC builds on RG-E1957, which was executed by the Bank through SCL/EDU and which is financing the initial conceptualization, development and piloting of the AI-powered chatbot during the 2024 school year. As a continuation and extension of this work, SCL/EDU is best placed to carry out this TC. The SCL/EDU team will collaborate closely with Chile’s MINEDUC and its Centro de Perfeccionamiento, Experimentación e Investigación Pedagógica (CPEIP) to carry out and execute this TC. The SCL/EDU and CPEIP/MINEDUC teams will have weekly project meetings to ensure that the TC is advancing well and to be able to address any potential roadblocks or challenges.
- 4.2 The project team has ample experience carrying out similar research projects focused on supporting teachers and more effective teacher policies in Latin America successfully, including by leveraging technology to increase scalability and impact. Most recently, the team led a collaboration with the national Chilean government to leverage WhatsApp technology to improve teacher recruitment systems (Ajzenman et al., 2023). In the design and implementation of this past project, the team gained important experience dealing with issues around user experience, data privacy and data collection, as they relate to the use of chatbots in the education sector, that is highly relevant for the project proposed here. The team has also recently collaborated with the governments of Ecuador and Peru in initiatives to improve teacher allocation (RG-T3433, EC-T1385, PE-T1447, RG-E1672), by using technology and behavioral science insights to encourage teacher applicants to hard-to-staff schools and to reduce applicant congestion and improve the efficiency of the teacher recruitment process (Ajzenman et al, 2021 and Elacqua et al, 2022). Currently, the team is involved in similar ongoing projects with Brazil, Colombia, Costa Rica, and Guyana, among others.

- 4.3 All procurement to be executed under this Technical Cooperation have been included in the Procurement Plan (Annex IV) and will be hired in compliance with the applicable Bank policies and regulations as follows: (a) Hiring of individual consultants, as established in the regulation on Complementary Workforce (AM-650) and (b) Contracting of services provided by consulting firms in accordance with the Corporate procurement Policy (GN-2303-33) and its Guidelines. The Consulting Firm (CF) that will lead the implementation of the RCT (Component 1) and that will support the chatbot's integration into the government's infrastructure and systems (Component 2), Patagonian US Corp, will be hired through a Single Source Selection (Direct Contracting), as this work builds on and extends that of the ESW, RG-E1957, which financed the initial conceptualization, development, and piloting of the AI-powered chatbot. It is important for the same CF to refine the chatbot, prepare it for scale-up, and support its implementation, to ensure that lessons learned from the pilot stage are well incorporated into the revised version and that implementation nation-wide goes smoothly.
- 4.4 The knowledge products generated from Bank-executed activities within this technical cooperation will be the property of the Bank and may be made available to the public under a creative commons license. However, at the request of the beneficiaries, in accordance with the provisions of AM-331, the intellectual property of said products may also be licensed through specific contractual commitments that shall be prepared with the advice of the Legal Department. The knowledge products that will be generated as part of this TC will be produced and disseminated in accordance with AM-331 and AM-325.

V. Major issues

- 5.1 We have identified three potential issues for this project, mainly related to the use of generative AI within the teacher induction and mentoring program. A first key potential issue concerns the nature and maturity of the technology to be deployed within the treatment arms, specifically, the risk that the AI-powered chatbot providing mentoring support may share incorrect, inconsistent, or hallucinatory information with users. This could lead to confusion among teachers and school leaders or the dissemination of inaccurate or inadequate guidance. To mitigate this risk, we are implementing multiple strategies. First, we have hired a highly specialized technology firm to develop the chatbot, with experience in developing similar products and platforms for the social sector, that will implement the most rigorous and comprehensive testing, quality assurance, piloting, and monitoring protocols. Second, the chatbot is being developed with strict content parameters, that is, it is being designed to limit interactions with users to specific topics regarding pedagogical guidance, socioemotional support, and career advice. Additionally, the chatbot is being trained and developed on a content bank of materials from the existing induction and mentoring program, that have been consolidated and validated by MINEDUC program experts. This content bank is

complemented with rich user research data from focus groups and interviews carried out with novice teachers and mentors. Third, the chatbot was developed and tested over an extended timeline to ensure it is functioning well (June 2024-September 2024) and is currently undergoing extensive piloting (September-December 2024), with a diverse group of teachers who will provide feedback on their experience with the chatbot. This feedback will be incorporated into the final version of the chatbot that will be rolled out nationally and evaluated through the RCT proposed here. Furthermore, we will implement continuous monitoring and supervision of the chatbot's performance, as well as ongoing updating of its knowledge base during implementation to ensure the information it provides remains reliable and up to date.

- 5.2 A second potential issue is that users may not actively engage with the AI-powered chatbot, which could limit its impact on the expected outcomes. For example, if teachers do not regularly interact with the chatbot, they will not reap the benefits in terms of enhanced support. Three strategies are being implemented to mitigate this risk. The first concerns the chatbot's design, which is being developed to provide users with personalized, relevant, and timely support, which will increase the perceived value of the chatbot's support and encourage regular engagement. Importantly, novice teachers and experienced teacher mentors are both participating in the development of the chatbot via user research focus groups and interviews, tailored to gather insights about the specific functionalities the chatbot must include to be of use and value to teachers. Second, the chatbot is being extensively piloted with a diverse and nationally representative group of approximately 550 teachers, who will have the opportunity to use the chatbot and share their candid feedback regarding its use and value-add. The chatbot will be subsequently improved based on this user feedback and experience. Finally, during the chatbot's scale-up during the 2025 calendar year, we will closely monitor engagement metrics, such as the frequency and duration of interactions, and gather user feedback to continuously improve the chatbot's usability and effectiveness. By focusing on engagement and continuously refining the chatbot based on user feedback, we aim to maximize its impact on teacher well-being and effectiveness.
- 5.3 The final potential issue concerns data privacy. The collection, storage, and use of teacher data through the chatbot may raise concerns about data privacy and security. Teachers may be hesitant to engage with the chatbot if they are unsure about how their personal information will be handled, which could limit the program's effectiveness. To mitigate this risk, we will adhere to strict data privacy and security protocols, ensuring compliance with relevant regulations including Chile's data protection laws as well the IDB's Data Privacy policy. We will develop clear data privacy guidelines for the chatbot's use that will outline how teacher data will be collected, used, and protected. Potential users will receive clear information about the purposes of the chatbot and the way that their data will be used in the study, and their informed consent will be required prior to participating in the program. User data from teachers and school leaders using the chatbot will be anonymized, encrypted, and stored securely on servers with limited access granted only to authorized personnel.

Regular security audits and risk assessments will be conducted to identify and address any potential vulnerabilities in the system. Importantly, the team is already in conversations with the Chile's Comisión Nacional de Tecnología, the governing body for the use of technology within the Ministry of Education, to ensure that the chatbot development, design, deployment, and evaluation adhere to all relevant data privacy and use policies, and follow evolving guidance on the use of data privacy within generative AI projects.

- 5.4 To effectively address the concerns listed above and any that emerge during the project's lifecycle, we will foster close collaboration with the government and ensure clear communication to all stakeholders regarding the objectives of the intervention. We will further mitigate risks through regular missions, technical assistance, and a dedicated team. In addition to the mitigation measures listed above, the RCT will be submitted for review and approval by the Institutional Review Board (IRB) of McGill University by December 2024, as the team has done in past projects, including similar ones that have deployed chatbot technology as part of an educational intervention. This crucial step ensures that the study adheres to ethical standards and protects the rights of human participants. Additionally, the research team will submit a pre-analysis plan to strengthen the study's transparency and methodological rigor.

VI. Exceptions to Bank policy

- 6.1 This Technical Cooperation does not require any exceptions to Bank policy.

VII. Environmental and Social Classification

- 7.1 This Technical Cooperation is not intended to finance pre-feasibility or feasibility studies of specific investment projects or environmental and social studies associated with them; therefore, this TC does not have applicable requirements of the Bank's Environmental and Social Policy Framework (ESPF).

[Results Matrix_12964.pdf](#)

[Terms of Reference_49089.pdf](#)

[Procurement Plan_32224.pdf](#)

References

Ajzenman, N., Elacqua, G., Marotta, L., & Olsen, A. (2021). Order effects and employment decisions: Experimental evidence from a nationwide program. IDB Working Paper. Inter-American Development Bank (Conditionally accepted at the *American Economic Journal: Applied Economics*).

Ajzenman, N., Elacqua, G., Jaimovich, A., Pérez-Nuñez, G. (2023). Humans versus Chatbots: Scaling-up behavioral interventions to reduce teacher shortages. IDB Working Paper. Inter-American Development Bank (Conditionally accepted at the *Journal of Political Economy Microeconomics*).

Al-Ubaydli, O., List, J. A., & Suskind, D. (2019). The science of using science: Towards an understanding of the threats to scaling experiments (No. w25848). National Bureau of Economic Research.

Athey, S., Tibshirani, J., & Wager, S. (2019). Generalized random forests, *The Annals of Statistics* 47(2): 1148–1178.

Beg, S. A., Fitzpatrick, A. E., & Lucas, A. (2023). Managing to learn (No. w31757). National Bureau of Economic Research.

Bertoni, E., Elacqua, G., Marotta, L., Martinez, M., Mendez, C., Montalva, V., Olsen, S., Román, A., Soares, S., & Santos, H. (2020). El problema de la escasez de docentes en Latinoamérica y las políticas para enfrentarlo. IDB Technical Note. Inter-American Development Bank.

Bertoni, E., Elacqua, G., Jaimovich, A., Rodriguez, J., & Santos, H. (2018). Teacher policies, incentives, and labor markets in Chile, Colombia, and Peru: Implications for equality. IDB Working Paper. Inter-American Development Bank.

Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2008). Who leaves? Teacher attrition and student achievement (No. w14022). National Bureau of Economic Research.

Carver-Thomas, D., & Darling-Hammond, L. (2017). Teacher turnover: Why it matters and what we can do about it. *Learning Policy Institute*.

Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N., & Orphanos, S. (2009). Professional learning in the learning profession. Washington, DC: National Staff Development Council, 12.

Elacqua, G., Gómez, L., Krussig, T., Marotta, L., Méndez, C., & Neilson, C. A. (2022). The potential of smart matching platforms in teacher assignment: The case of Ecuador IDB Working Paper. Inter-American Development Bank

Elige Educar (2020). Análisis y Proyección de la Dotación Docente en Contextos Rurales. Santiago, Chile: Elige Educar.

Global School Leaders, (2024). Evidence Review 2024: A Review of Research on the Role of School Leaders in Improving Student Learning Outcomes. Global School Leaders: Los Angeles.

Hanushek, E. A., Rivkin, S. G., & Schiman, J. C. (2016). Dynamic effects of teacher turnover on the quality of instruction. *Economics of Education Review*, 55, 132-148.

Kardos, S. M., & Johnson, S. M. (2010). New teachers' experiences of mentoring: The good, the bad, and the inequity. *Journal of Educational Change*, 11, 23-44.

Keese, J., Thompson, C. G., Waxman, H. C., McIntush, K., & Svajda-Hardy, M. (2023). A Worthwhile Endeavor? A meta-analysis of research on formalized novice teacher induction programs. *Educational Research Review*, 38, 100505.

Kraft, M. A., Blazar, D., & Hogan, D. (2018). The effect of teacher coaching on instruction and achievement: A meta-analysis of the causal evidence. *Review of educational research*, 88(4), 547-588.

Kuhail, M. A., Alturki, N., Alramlawi, S., & Alhejori, K. (2023). Interacting with educational chatbots: A systematic review. *Education and Information Technologies*, 28(1), 973-1018.

Labadze, L., Grigolia, M., & Machaidze, L. (2023). Role of AI chatbots in education: systematic literature review. *International Journal of Educational Technology in Higher Education*, 20(1), 56.

LaVine, M. E. (2016). Mentoring and professional development opportunities as perceived by novice physical education teachers in the induction year. *Teacher Education and Practice*, 29(2), 293-313.

Leithwood, K., Seashore, K., Anderson, S., & Wahlstrom, K. (2004). Review of research: How leadership influences student learning.

Martin, K. L., Buelow, S. M., & Hoffman, J. T. (2016). New teacher induction: Support that impacts beginning middle-level educators. *Middle School Journal*, 47(1), 4-12.

Medeiros, M. P., Gómez, C., Sánchez, M. J., & Orrego, V. (2018). Idoneidad disciplinar de los profesores y mercado de horas docentes en Chile. *Calidad en la educación*, (48), 50-95.

Milne-Ives, M., de Cock, C., Lim, E., Shehadeh, M. H., de Pennington, N., Mole, G., ... & Meinert, E. (2020). The effectiveness of artificial intelligence conversational agents in health care: systematic review. *Journal of medical Internet research*, 22(10), e20346.

Programa de las Naciones Unidas para el Desarrollo (PNUD). (2023). Evaluación del Sistema de Apoyo Formativa y del Sistema de Reconocimiento y Promoción de la Ley 20.902. Informe Final. Santiago, Chile: PNUD.

Romero, M., Bedoya, J., Yanez-Pagans, M., Silveyra, M., & De Hoyos, R. (2022). Direct vs indirect management training: Experimental evidence from schools in Mexico. *Journal of Development Economics*, 154, 102779.

Ronfeldt, M., Loeb, S., & Wyckoff, J. (2013). How teacher turnover harms student achievement. *American educational research journal*, 50(1), 4-36.

Strong, M. (2005). Teacher induction, mentoring, and retention: A summary of the research. *The New Educator*, 1(3), 181-198.

UNESCO & International Task Force on Teachers for Education 2030. (2024). *Global report on teachers: addressing teacher shortages and transforming the profession*. Paris: UNESCO.

World Bank. (2023). *Making Teacher Policy Work*. Washington D.C.: World Bank Group.

Xu, A., Liu, Z., Guo, Y., Sinha, V., & Akkiraju, R. (2017, May). A new chatbot for customer service on social media. In *Proceedings of the 2017 CHI conference on human factors in computing systems* (pp. 3506-3510).