

TC Document

I. Basic Information for TC

▪ Country/Region:	REGIONAL
▪ TC Name:	Refining how best to invest in cultivating human capital
▪ TC Number:	RG-T4504
▪ Team Leader/Members:	Cathles, Alison Regan (IFD/CTI) Team Leader; Radaelli, Vanderleia (IFD/CTI) Alternate Team Leader; Galeano Buitrago Maria Alejandra (IFD/CTI); Rosas Shady, G. David (SCL/LMK); Bonilla Merino Arturo Francisco (LEG/SGO); Stagno Izaguirre, Daniel Alejandro (IFD/CTI); Grazzi, Matteo (IFD/CTI); Henriquez Leblanc, Pauline (IFD/CTI); Vargas Cuevas, Fernando Esteban (IFD/CTI); Guaipatin, Carlos (IFD/CTI); Lopez Tovar, Sandra Lucia (IFD/CTI); Grant, Kayla Sharee (IFD/CTI); Diaz Gill Virginia Maria (LEG/SGO); Morales Reina Genesis Del Carmen (IFD/CTI); Gonzales Cienfuegos, Alessandra Madelaine (IFD/CTI)
▪ Taxonomy:	Research and Dissemination
▪ Operation Supported by the TC:	.
▪ Date of TC Abstract authorization:	.
▪ Beneficiary:	Policymakers and IDB specialists designing productive development and advanced human capital policies for Latin America and the Caribbean
▪ Executing Agency and contact name:	Inter-American Development Bank
▪ Donors providing funding:	OC SDP Window 2 - Institutions(W2C)
▪ IDB Funding Requested:	US\$150,000.00
▪ Local counterpart funding, if any:	US\$0
▪ Disbursement period (which includes Execution period):	36 months
▪ Required start date:	-
▪ Types of consultants:	Firms and Individuals
▪ Prepared by Unit:	IFD/CTI-Competitiveness, Technology and Innovation Division
▪ Unit of Disbursement Responsibility:	IFD/CTI-Competitiveness, Technology and Innovation Division
▪ TC included in Country Strategy (y/n):	Yes
▪ TC included in CPD (y/n):	No
▪ Alignment to the Update to the Institutional Strategy 2024-2030:	Afro-descendants; Diversity; Environmental sustainability; Gender equality; Institutional capacity and rule of law; LGBTQ+; Productivity and innovation

II. Objectives and Justification of the TC

- 2.1 The general objectives of this Technical Cooperation (TC) are to **compile and disseminate** knowledge about (a) the effectiveness of specific supply-side advanced human capital formation programs in regional and international contexts, and (b) aspects of human capital development (HCD) plans that have yielded measurable results in international contexts. The specific objectives and activities are divided into three components. The specific objective of Component 1 is to assess the effectiveness of scholarship programs at two levels of education formation: (i)

graduate STEM scholarship programs, and (ii) short and intensive advanced digital skills training programs. The specific objective of Component 2 is to identify international good practices for human capital development plans, highlighting effective macro policies that have successfully augmented local talent pools. The specific objective of Component 3 is to share the results of the evidence collected in Components 1 and 2 via a regional training and dialogue workshop that will be designed and executed based on the results from components 1 and 2. It is expected that a compilation of the evidence and results from international and regional experiences will be useful for countries contemplating launching or strengthening advanced human capital interventions or HCD plans. The knowledge products generated will provide useful capacity building inputs for policy making and program design, by complementing efforts to launch new initiatives with evidence about good design & implementation practices, and lessons learned, from past programs.

- 2.2 The importance of human capital for innovation, technological progress, economic growth and development is widely acknowledged in economic literature.¹ The economic motivation for supply side policies (i.e., scholarships for graduate STEM studies) has been articulated by Van Reenen (2020, 2021) as a fundamental complement to demand side policies (i.e. tax credits or R&D grants to firms). If the supply of R&D workers does not respond readily to an increase in demand, there is a risk that the wages and cost of R&D simply go up. Romer (2001) emphasized the importance of human capital policies for innovation since they are the ones that directly increase the supply of potential and actual innovators. Education and lifelong skills development have been shown to be positively related to a variety of factors that contribute to economic performance and growth: labor productivity, firm innovation, development of new technologies and - absorptive capacity in firms - crucial for countries that are further from the technological frontier.² Highlighting salient threads of literature on human capital and growth in a review of empirical studies which measure human capital at both the macro and micro levels, 'general' human capital typically considered to be valued by all firms, 'specific' skills needed in a particular firm or job, as well as different embodiments of knowledge, [Flabbi and Gatti \(2018\)](#) find that the direction of impact of human capital on growth is unambiguously positive. But they reach the conclusion that it is much more difficult to assess the magnitude of the impact and, therefore, the return to any particular human capital investment. Returns might be country-specific or vary depending on the targeted population or component of human capital.
- 2.3 This is a challenge for program design. While individual program evaluations of commonly used supply-side policy interventions, mainly scholarship programs, to stimulate the formation of advanced human capital exist,³ there is not a systematic review compiling evidence from different interventions about (a) program impact, program outcomes, and program outputs, and (b) implementation challenges and

¹ See Sianesi and Van Reenen, 2003; Cohen and Soto, 2007; Goldin and Katz, 2008; and Barro and Lee, 2013.

² See Mankiw, Romer, & Weil, 1992; Lucas, 1988; Romer, 1990; Aghion & Howitt, 1998, 2006; Nelson & Phelps, 1966; Benhabib & Spiegel, 1994. Furthermore, the importance of local human capital appears to persist over the very long run, Diebolt and Hippe, 2018 find that proxies for literacy and numeracy dating back to the 1850s in sub-national regions in Europe are associated with current patent applications and GDP per capita in those regions.

³ See for example, [Bukstein et al., 2019](#); [Garcia Montalvo, 2014](#); and [Luchilo, 2009](#).

suggestions for future programs. While each program has its own specific context and intervention tailored to relative starting points, a review that consolidates the results, from a variety of vantage points and identifies overarching issues or implementation challenges would be very useful for the design of future programming efforts along similar lines.

- 2.4 Related to this, but zooming out to consider the array of possible policy interventions to foster more home-grown talent, countries often formulate national strategies or plans to develop trajectories for the formation of high-skill labor or advanced human capital.⁴ A review of international evidence and experience regarding human capital development (HCD) plans (i.e., [case study of successful macro HCD policies in Singapore](#)) and primary qualitative data collection to assess which aspects of human capital development plans are regarded as the most effective in hindsight, would constitute useful inputs for LAC policy makers developing HCDs. These reviews will consider 2 features related to the specific policy interventions described above: (a) efforts to develop Science, Technology, Engineering and Mathematics (STEM) graduates with world class R&D skills; and (b) efforts to augment lifelong learning opportunities and supply skills needed by industry, such as short intensive digital skills training programs. But these reviews will include two additional elements. As Cunha and Heckman (2006) show, skill begets skill and early period investments in human capital lay the foundations for all later investments. There is some evidence that encouraging young people to engage in science in extra-curricular environments, for example in hands-on Science museums, or Science clubs, or University-led community outreach activities stimulates wider and inclusive interest in STEM and better performance ([Magaji et al., 2022](#)), but more evidence is needed about whether these types of interventions have been included as part of HCD plans, and at what scale (i.e., municipal, sub-national, national). There are also new issues facing countries, such as the challenge of fortifying skills for the green transition, anticipating changes in demand for green skills in particular industries, and growth in demand for particular sub-fields of STEM that are vital for green jobs ([Vona et al., 2015](#)).
- 2.5 **Gender and Diversity.** It is well known that women are under-represented in STEM, the latest figures indicate that women make up only 35% of STEM graduates, and these figures are unchanged over the past ten years, with obvious and direct consequences for the gender composition in STEM careers ([UNESCO, 2024](#)). Furthermore, women are dramatically underrepresented in leadership positions within STEM occupations ([Baird et al., 2023](#)). Similarly, diverse racial groups tend to be underrepresented in STEM ([Miriti, 2020](#)), but recent research suggests that this may be uneven among different subfields within STEM ([Fry et al., 2021](#)). Yet, diversity in a R&D team can be valuable for innovation ([Garcia Martinez et al., 2021](#)). Beyond racial diversity, neurodivergent people (i.e., people with autism, ADHD, dyslexia, etc.) are prevalent in the world population, and tend have high rates of unemployment, but recent research by [Maw et al., 2021](#) shows that there may be cognitive strengths (i.e., spatial, auditory and semantic memory, enhanced visual perception and pattern recognition, etc). As such, neurodivergent talent could be better positioned in a workplace that uses cutting edge digital technologies. These elements of Gender and Diversity will be included in the systematic reviews of human capital development

⁴ One such initiative is underway in Colombia, spearheaded by Minciencias (Política de Formación e Inserción Laboral de Capital Humano de Alto Nivel (2024-2034)).

plans, and in collecting and analyzing international evidence from efforts to increase gender balance and diversity in the formation of advanced human capital in STEM.

- 2.6 **Strategic Alignment.** The TC is aligned with the **IDB Group Institutional Strategy: Transforming for Scale and Impact (GN-3159-12)**, specifically the objective of: bolstering sustainable regional growth, because it seeks to promote improved human capital development for increasing innovation and productivity in the private sector (pg. ix), with a gender and diversity lens (pg. 20). By collecting, analyzing, and disseminating lessons learned and international good practices, the results from this TC should provide evidenced based inputs to improve the quality and efficiency of advanced human capital formation programs (pg. 26). The TC is also aligned with the operational focus areas of: (i) institutional capacity, rule of law, and citizen security, because the evidence consolidated and disseminated via a training and policy dialogue will contribute to enhanced state capacity to design, execute and evaluate advanced human capital development plans and programs; (ii) biodiversity, natural capital and climate action, because green skills and graduates with capacity to facilitate the green transition will be crucial for economic sectors in LAC to successfully meet climate and environmental sustainability goals; (iii) social protection and human capital development, as the knowledge products generated by reviewing international human capital development plans, focusing on green and STEM skills, will provide key policy inputs for LAC policy makers; and (iv) gender equality and inclusion of diverse population groups, the underrepresentation of women and diverse groups in STEM is a well-known issue, and an important part of identifying international good practices in component 2 will focus on compiling evidence of interventions to increase gender balance and diversity in STEM. This TC is consistent with the Innovation, Science, and Technology Sector Framework Document (GN-2791-13) specifically Line of action 2 (5.7) which commits to strengthening the formation of advanced human capital via scholarships for post graduate studies for exceptional students, with a focus on STEM fields. Scholarships are identified in the Innovation, Science, and Technology SFD as one of the primary supply-side policy instruments used in LAC countries for and the purposes of increasing the base of advanced human capital and the generation of new scientific knowledge. The TC is aligned with the objective of contributing to public policies and institutions that are more effective, efficient, and transparent of the Ordinary Capital Strategic Development Program (W2C) (GN-2819-14).
- 2.7 The scope of work proposed in this TC complements research that will be conducted under two current ESWs: **RG-E1942** “Mobile Scientists as Research Agenda Influencers: Home or Away?” and **RG-E1949** “Measuring the effectiveness of Advanced Digital Skills Training Programs” led by the Labor Markets division. Project teams are coordinating across different divisions and sectors within the IDBG to ensure that the projects will not duplicate efforts, and that they are complementary with each other. It is anticipated that the projects will communicate findings and lessons learned over the lifetime of the ESWs and this TC, in order to strengthen bank-wide knowledge on this topic.

- 2.8 This is a Regional Research and Dissemination TC and so the knowledge produced and disseminated by the TC should be beneficial for all countries in the region,⁵ yet some specific countries⁶ (indicated as participating countries) at the time of project design, are expected to benefit from the results of this TC, primarily due to recent current dialogue with country counterparts or operations recently developed that contemplate formation of advanced human capital. TC is aligned with the country strategies: **Bolivia (2022-2025)**: This TC proposal is aligned with Bolivia's country strategy in terms of its first priority area, "Economic reconstruction and boosting productivity" explicitly in terms of generating inputs that will be useful for creating policies and programs aimed at increasing human capital development, including a gender and diversity perspective, factors articulated by the strategy as essential in order to boost productivity (3.5). **Colombia (2019-2022, extended until August 7th, 2024)**: This TC proposal is aligned with the Colombia's country strategy to increase economic productivity, explicitly by supporting knowledge products and dissemination activities that can serve as guidance for the design and implementation of policies and programs to expand access and graduation rates in technical and technological education via strengthening existing supply and generating new, quality educational options (page 6). **Ecuador (2022-2025)**: This TC proposal relates to the first priority area in Ecuador's country strategy, "Development of the productive sector as a driver of sustainable growth", by explicitly by supporting the development of guidance for investments in human capital with the ultimate aim of creating inputs that will serve to generate local talent to build innovation capacity and foster digital transformation (page 17). **Belize (2022-2025)**: This TC proposal is directly related to the third priority area of the Belize country strategy, "Human Capital" and specifically to the goals to improve learning outcomes in STEAM; and upskilling the workforce through digital skills training programs. The knowledge products produced and disseminated in the proposal TC would serve as useful inputs for policy making and programs in these areas. **Trinidad and Tobago (2021-2025)** This TC proposal is aligned with Trinidad and Tobago's country strategy, which identifies a focus on digitalization to support economic transformation and mentions the need to fortify digital skills and using digital tools to improve educational outcomes (page 14) to boost competitiveness.

III. Description of activities/components and budget

- 3.1 **Component 1. Assessment of the effectiveness of scholarship programs at two levels of education formation, (i) graduate STEM scholarship programs and (ii) advanced intensive digital skills training programs (US\$70,000).** The key research questions that will be addressed regarding **graduate STEM scholarships** part of the component are: (a) What are the international metrics used to assess STEM scholarship programs, and which of these international metrics have been applied in past program evaluations of IDB programs?; (b) What are the results achieved in past IDB STEM scholarship programs?⁷; (c) Are specific program characteristics (i.e., size,

⁵ This TC does not anticipate conducting pilot activities. It is acknowledged that no TC activities (i.e. pilots) will be financed in any of the beneficiary countries until the corresponding request or non-objection letter is received.

⁶ These countries were selected as participating countries because CTI has recently engaged in dialogue about advanced human capital. These are not necessarily the countries where CTI has supported advanced human capital programs in the past.

⁷ Including, but not necessarily limited to: AR-L1156, CR-L1043, PE-L1162, PR-L1086, UR-L1142, UR-L1158, UR-L1187.

duration, domestic, international, return-policy, strict selection criteria) consistently associated with positive attainment of program objectives?; and (d) What are the lessons learned during implementation? As a point of departure, the methodological approach used in this component will be to conduct a systematic review of international effectiveness metrics used to assess STEM scholarship programs and complement these efforts by compiling evidence of their effectiveness via a systematic review of evaluations of graduate STEM scholarship programs, including Program Completion Reports (PCRs), and the underlying evaluations conducted to inform the PCRs, for IDB supported interventions. This will be complemented by interviews with innovation agencies or entities that executed the programs to collect additional information (i.e., in case they have maintained updated databases, and surveying former participants). A matrix of 'success/failure' criteria will be established based on the literature and the PCRs and their underlying evaluations. A matrix of 'success/failure' criteria will be established based on the international literature and the PCRs⁸, but initially will include metrics such as program completion, employment in-field, salary, and in cases where it is possible - bibliometric analysis. The key research questions that will be addressed regarding the **advanced intensive digital skills training programs** part of the component are: (a) What are the range of results achieved in short intensive advanced digital skills trainings (i.e., coding bootcamps)? (b) What program characteristics are associated with positive attainment of program objectives? (c) What are the lessons learned during implementation? (d) What are the shortcomings of the program results evaluations conducted up until now, and what are the key elements needed for more robust evaluations of advanced digital skills training programs? The methodological point of departure will be a systematic compilation of results from multiple short and intensive advanced digital skills training programs launched in recent years, and their corresponding program impact evaluations, when applicable. To assess previously undocumented results and lessons learned (beyond what might have been captured in program evaluations and PCRs), qualitative research (i.e., interviews or surveys) with executing agencies and past program participants will be conducted.

- 3.2 **Component 2. Identification of international good practices for human capital development plans, highlighting effective macro policies that have successful augmented local talent pools (US\$45,000).** The approach for this component will be to conduct a systematic review of good practices, including a meta-analysis of results, that have successfully led to increased generation of interest in STEM and formation of STEM talent and lifelong specialized skills needed by industry. **The review will be conducted considering the lenses of the green transition, as well as gender and diversity, as part of a sub-analysis.** As such, it will analyze international evidence on (i) occupations, advanced degrees and skills that will be needed for the green transition, (ii) gender and diversity representation in each area, as well as efforts to stimulate gender-balance and greater representation of diverse groups. It is anticipated that the information generated by these activities will be useful for designing loan operations that contemplate a human capital component.

⁸ The IDB has supported scholarship programs that range from 'first time ever in the country' graduate scholarship programs (i.e. PR-L1086) and others that have built on a much longer history (i.e., UR-L1142). Therefore, the PCRs are likely to cover different results depending on the maturity of the scholarship system itself. This is why the complementary qualitative analysis will be crucial.

- 3.3 **Component 3. Capacity building and dissemination (US\$35,000).** Drawing on international initiatives and experience, experts will be hired to help design and facilitate (i) a training program workshop, and (b) a dialogue workshop with innovation agencies, government entities, and investigation centers that have been supporting or are interested in developing advanced human capital via scholarships and other initiatives. The design of the training and dialogue workshops will include input from private sector stakeholders in the region. It is evident that several countries in the region have accumulated experience in supply-side Science Technology and Innovation advanced human capital policies and have learned lessons along the way ([IDB, 2002](#)), but it is less clear that experiences from individual countries are being shared regionally for the benefit of those countries that have less experience in implementing these policies. The purpose of the training and dialogue workshops will be to share knowledge and experiences among relevant actors. Communications support will be required to effectively realize the capacity building and dissemination component of this TC.

IV. Budget:

- 4.1 The total budget of the TC amounts to US\$150,000. It will be fully financed by the IDB through the Strategic Program for the Development of Institutions Financed solely with Ordinary Capital Strategic Development Program (OC SDP), Window 2, Priority Area 3: Effective, Efficient and Transparent Institutions (W2C) (GN-2819-14) , as follows. There will be no counterpart funding.

Indicative Budget

Activity/Component	Description	IDB/Fund Funding	Total Funding
Component 1	Assessment of scholarship program effectiveness at two levels: (a) STEM graduate programs (b) Advanced intensive digital skills training programs	US\$70,000	US\$70,000
Component 2	Identification of international good practices for human capital development plans	US\$45,000	US\$45,000
Component 3	Capacity building and dissemination	US\$35,000	US\$35,000
Total		US\$150,000	US\$150,000

V. Executing agency and execution structure

- 5.1 The executing agency for this technical cooperation will be the Inter-American Development Bank (IDB) through the Competitiveness, Technology, and Innovation Division (IFD/CTI). Since this is a regional technical cooperation, there is no individual entity (i.e., Innovation Agency, or Ministry of Science, Technology, and Innovation; Industry, or other Ministry) with legal capacity to take over the implementation of the technical cooperation - each entity can only operate within the limits of its national borders. Each entity can only operate within the limits of its national borders. The TC

proposes that the Bank act as the executing agency and, therefore, be responsible for the consultant procurement processes in accordance with the Appendix II of document OP-619-4.

- 5.2 The execution and disbursement period will be 36 months and the UDR will be IFD/CTI. All procurement to be executed under this Technical Cooperation have been included in the Procurement Plan (Annex III) 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.

VI. Major issues

- 6.1 At the time of design, there are no special issues for analysis, beyond those that are common to most projects. The most important risk for this TC is related to conducting the research, for which there can always be obstacles. For example, if there are entities, experts, or potential survey respondents who do not respond to requests to participate in the research, it could lead to non-response bias. To mitigate this risk research techniques to mitigate non-response bias will be implemented (i.e., keeping survey or interviews short and simple, setting expectations with potential respondents) and appropriate qualitative research design methods will be used to target, assess, and calibrate analysis based on responses. Given that this is a regional technical cooperation, there is a risk that some individual countries' public sector entities will not join the training and dialogue workshops that will be organized. To mitigate this, the communication effort surrounding the training and dialogue workshops will actively reach out to all countries in the region.

VII. Exceptions to Bank policy

- 7.1 At the time of design, this TC does not contemplate any exceptions to Bank policy.

VIII. Environmental and Social Strategy

- 8.1 This TC will not finance feasibility or pre-feasibility studies of investment projects or associated environmental and social studies, which is why it does not have applicable requirements of the Bank's Environmental and Social Policy Framework (ESPF).

Required Annexes:

[Results Matrix_38088.pdf](#)

[Terms of Reference_30385.pdf](#)

[Procurement Plan_22562.pdf](#)