

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

URUGUAY

**GENERATION D: DEVELOPING DIGITAL SKILLS WITH EQUITY
IN THE KNOWLEDGE ERA**

(UR-L1169)

LOAN PROPOSAL

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CONTENTS

PROJECT SUMMARY

I.	DESCRIPTION AND RESULTS MONITORING	1
A.	Background, problem addressed, and rationale	1
B.	Objectives, components, and cost	7
C.	Strategic alignment	9
D.	Viability analysis.....	10
II.	FINANCING STRUCTURE AND MAIN RISKS	11
A.	Financing instruments	11
B.	Environmental and social risks.....	12
C.	Fiduciary risks	13
D.	Other key issues and risks	13
III.	EXECUTION MECHANISM AND ARRANGEMENTS FOR RESULTS MONITORING AND EVALUATION.....	13
A.	Execution mechanism	13
B.	Arrangements for results monitoring and evaluation.....	15

APPENDICES

Proposed resolution

ANNEXES	
Annex I	Summary Development Effectiveness Matrix
Annex II	Results Matrix
Annex III	Fiduciary Agreements and Requirements

LINKS	
1.	Project execution plan
2.	Summary of environmental and social review
3.	Monitoring and evaluation plan
4.	Viability analysis (technical, economic, financial, and institutional)
5.	Operating Regulations
6.	Climate change annex
7.	Gender annex
8.	Vertical logic annex

ABBREVIATIONS

ANEP	Administración Nacional de Educación Pública [National Public Education Administration]
CEIBAL	Conectividad Educativa de Informática Básica para el Aprendizaje en Línea [Basic Computer Connectivity for Online Learning]
CFE	Consejo de Formación en Educación [Teacher Training Council]
DGEIP	Dirección de Educación Inicial y Primaria [Early Childhood and Primary Education Division]
DGES	Dirección de Educación Secundaria [Secondary Education Division]
DGETP	Dirección en Educación Técnico Profesional [Vocational Education Division]
ERCE	Estudio Regional Comparativo y Explicativo [Regional Comparative and Explanatory Study]
ICILS	International Computer and Information Literacy Study
ICT	Information and communication technology
MEC	Ministry of Education and Culture
MEF	Ministry of Economy and Finance
PCR	Project completion report
PCU	Program coordination unit
PISA	Program for International Student Assessment
PPC	Programa de Pensamiento Computacional [Computational Thinking Program]
RGA	Red Global de Aprendizaje Profundo [Global Network for Deep Learning]
SDGs	Sustainable Development Goals
STEM	Science, technology, engineering, and mathematics

PROJECT SUMMARY

URUGUAY GENERATION D: DEVELOPING DIGITAL SKILLS WITH EQUITY IN THE KNOWLEDGE ERA (UR-L1169)

Financial Terms and Conditions				
Borrower: Eastern Republic of Uruguay			Flexible Financing Facility ^(a)	
Executing agency: Centro CEIBAL			Amortization period:	25 years
Loan modality: Results-based			Disbursement period:	4 years
Source	Amount (US\$)	%	Grace period:	5.5 years ^(b)
IDB (Ordinary Capital):	30,000,000	100	Interest rate:	SOFR-based
Total:	30,000,000	100	Credit fee:	(c)
			Inspection and supervision fee:	(c)
			Weighted average life:	15.25 years
			Approval currency:	U.S. dollars
Project at a Glance				
Project objective/description: The general objective of this operation is to improve student learning and competencies by reducing gaps in science, technology, engineering, and mathematics (STEM) programs. The specific objectives are: (i) to expand and strengthen effective access to resources for teaching and learning; and (ii) to expand effective access to resources for enhancing pedagogical practices with the integration of technology and innovation.				
Special contractual conditions precedent to the first disbursement of the loan: (i) a signed agreement for the execution and transfer of loan proceeds between the Ministry of Economy and Finance and the executing agency; and (ii) approval by the executing agency and entry into force of the program Operating Regulations under the terms previously agreed upon with the Bank (paragraph 3.4).				
Special contractual conditions precedent to the results-based disbursements: a contract with the independent evaluator who will be responsible for verification of the results, in accordance with the terms of reference previously agreed upon with the Bank, as each disbursement will be subject to this independent verification (paragraph Error! Reference source not found.).				
Exceptions to Bank policies: None.				
Strategic Alignment				
Challenges: ^(d)	SI <input checked="" type="checkbox"/> PI <input checked="" type="checkbox"/> EI <input type="checkbox"/>			
Crosscutting themes: ^(e)	GE <input checked="" type="checkbox"/> and DI <input type="checkbox"/>		CC <input checked="" type="checkbox"/> and ES <input checked="" type="checkbox"/>	IC <input checked="" type="checkbox"/>
Sustainable Development Goals (SDGs): ^(f)	SDG 1 <input checked="" type="checkbox"/> SDG 2 <input type="checkbox"/> SDG 3 <input type="checkbox"/> SDG 4 <input checked="" type="checkbox"/> SDG 5 <input type="checkbox"/> SDG 6 <input type="checkbox"/> SDG 7 <input type="checkbox"/> SDG 8 <input type="checkbox"/> SDG 9 <input checked="" type="checkbox"/> SDG 10 <input checked="" type="checkbox"/> SDG 11 <input type="checkbox"/> SDG 12 <input type="checkbox"/> SDG 13 <input checked="" type="checkbox"/> SDG 14 <input type="checkbox"/> SDG 15 <input type="checkbox"/> SDG 16 <input type="checkbox"/> SDG 17 <input type="checkbox"/>			

(a) Under the terms of the Flexible Financing Facility (document FN-655-1), the borrower has the option of requesting changes to the amortization schedule, as well as currency, interest rate, commodity, and catastrophe protection conversions. The Bank will take operational and risk management considerations into account when reviewing such requests.

(b) Under the flexible repayment options of the Flexible Financing Facility, changes to the grace period are permitted provided that they do not entail any extension of the original weighted average life of the loan, or the last payment date as documented in the loan contract.

(c) The credit fee and inspection and supervision fee will be established periodically by the Board of Executive Directors as part of its review of the Bank's lending charges, in accordance with applicable policies.

(d) SI (Social Inclusion and Equality); PI (Productivity and Innovation); and EI (Economic Integration).

(e) GD (Gender Equality) and DI (Diversity); CC (Climate Change) and ES (Environmental Sustainability); and IC (Institutional Capacity and Rule of Law).

(f) For more information on the SDGs, go to [this link](#). To review the IDB Group's methodology for classifying projects in relation to the SDGs, go to [this link](#).

I. DESCRIPTION AND RESULTS MONITORING

A. Background, problem addressed, and rationale

- 1.1 Public education in Uruguay from early childhood through high school is primarily the purview of two agencies: (i) the Ministry of Education and Culture (MEC), as coordinator of educational policy; and (ii) the National Public Education Administration (ANEP), an autonomous entity with its own legal status that is responsible for planning, managing, and administering the compulsory public education system at the early childhood, primary, secondary, and vocational levels, as well as teacher training. CEIBAL, the Uruguayan government's center for educational innovation with digital technologies in support of educational policy, was established in 2007 to help transform education and enhance student learning and social equity through digital inclusion. Since then, it has become the leading tool for introducing new information and communications technologies (ICTs) into the Uruguayan education system. In addition to providing access to technological devices, CEIBAL promotes their use in the classroom through the deployment of educational platforms, creation of digital educational content, and teacher training. When school campuses closed during the COVID-19 pandemic, Uruguay was better positioned than other countries in the region to face the challenge of ad hoc remote learning, partly due to the availability of an ecosystem of digital tools (Uruguay's schools, moreover, were closed for a relatively short length of time). As a result, students in grades 3 through 6 do not appear to have experienced significant learning losses between 2017 and 2020.
- 1.2 Despite this success, Uruguay's education system continues to face significant challenges related to quality of learning and skills development with socioeconomic and gender equity.
- 1.3 **Low achievement in primary and secondary education.** The 2019 Regional Comparative and Explanatory Study (ERCE) for grades 3 through 6 found that, while Uruguay exceeded the regional average in all subject areas, its scores were comparable to those of the previous evaluation in 2013—except for third-grade mathematics, which saw a decline—and it still had a high degree of concentration of low-performing students. Among sixth-graders, 43.8% scored at or above the minimum level in reading; 38%, in math; and 31.6%, in science.¹ Meanwhile, Uruguay's average scores on the Program for International Student Assessment (PISA) exam for 15-year-old students increased in math (from 409 to 418) and language arts (from 411 to 427) between 2012 and 2018.² However, 44% of students scored at the lowest levels in math, as did 42% in reading, compared with 35% and 32%, respectively, of Chilean students and the 22% average among Organisation for Economic Co-operation and Development countries for both subject areas.
- 1.4 Improving student performance has been the main challenge facing education officials, at least in the last two decades. In a constantly changing world, in addition to competencies in foundational areas like mathematics and language arts, students

¹ United Nations Educational, Scientific and Cultural Organization (UNESCO) (2021): ERCE 2019. National score report: Uruguay. <https://unesdoc.unesco.org/ark:/48223/pf0000380255>.

² Centro de Información para la Mejora de los Aprendizajes [education statistics portal] (CIMA), Inter-American Development Bank (IDB). <https://cima.iadb.org/regional-overview/learning/pisa>.

need instruction in other areas as well—particularly in digital, social-emotional, civic, and “green” competencies—so that they can have the skills and knowledge that will equip them to be successful in the twenty-first century. The 2018 International Computer and Information Literacy Study (ICILS) found that while students’ access to computers had improved significantly,³ their level of computer literacy was quite low: 33% of students ages 13-14 scored below Level 1 and 29% scored at Level 1, with the remaining 38% scoring at Level 2 or higher (compared with 46% in Chile and an average of 57% among participating countries). The PISA scores, meanwhile, suggest that students lack the specific and general skills they need to address challenges such as climate change. These scores show that Uruguay still faces major challenges in developing student competencies and skills and that innovative strategies need to be pursued to foster student creativity and engagement through enhanced content and opportunities to use technology in spaces for creation and learning.

- 1.5 **Inequity due to socioeconomic and gender factors.** Learning outcomes continue to vary greatly by student socioeconomic status. Students in the top socioeconomic quintile scored 102 points higher on the PISA math exam than those in the bottom quintile. This differential equates to more than 2.4 years of schooling, a gap that exceeds the Latin American and Caribbean average. As for challenges related to gender equity, 40% of students have negative attitudes toward gender equality and express stereotype-laden ideas on the role of women at home and in society; this is particularly true among older male students. ERCE 2019 revealed significant gender gaps, with girls scoring higher in 3rd- and 6th-grade reading (reflecting the regional trend) and 6th-grade science (one of seven countries in the region with such a gap). Across the board, meanwhile, boys scored higher than girls (by about 8 points) on the PISA math exam, which is consistent with the underrepresentation of women in science, technology, engineering, and mathematics (STEM) careers.
- 1.6 **The importance of developing computational thinking.** Recent innovative experiences show that robust computer science coursework⁴ for developing computational thinking skills is beneficial to students in many ways. The evidence shows that it improves academic performance, as reflected in improved rates of higher education enrollment (Brown and Brown, 2020), access to higher wages, and higher odds of employment (Hanson and Slaughter, 2016; Nager and Atkinson, 2016). Studies have also shown that computational thinking helps to develop problem-solving skills (Salehi et al., 2020). Expanded access to such coursework is also beneficial at the country level, as previous research has suggested that countries that have more workers with ICT skills will achieve greater economic growth through increased productivity (Maryska, Doucek, and Kunstova, 2012; Jorgenson and Vu, 2016).

³ www.ceibal.edu.uy. Access to computational thinking courses among the top quintile increased from 9% in 2007 to 92% in 2016 for people ages 6-13, and from 9% in 2007 to 76% in 2016 for people ages 14-24.

⁴ Computer science is defined as “the study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society” (Tucker, 2003); it enables individuals to understand how technology works and helps to develop students’ computational thinking. These skills are defined as “thought processes involved in expressing solutions as computational steps or algorithms that can be carried out by a computer” (K-12 Computer Science Framework Steering Committee, 2016).

- 1.7 Computational thinking is increasingly important in education: 43% of high-income countries require students to study information technology in primary and/or secondary school (Vegas et al., 2021). Uruguay began teaching computational thinking in 2017 through weekly remote classes held through videoconferencing for grades 4 through 6, and a pilot experience with groups from the lower secondary level was added in 2019. Computational thinking is taught using an interdisciplinary approach with other fields, such as math, language arts, and science. Classroom teachers are the ones who decide whether to incorporate computational thinking in their classes. One day per week, a remote teacher trained in computational thinking connects to the school's videoconferencing system and works in tandem with the classroom teacher, who carries out activities for the instructional sequences. Adoption of the computational thinking program has grown steadily since its debut in 2017, from 50 to 2,500 groups of students in 2022; it now covers 715 schools and reaches 50,000 students (CEIBAL, computational thinking report 2022). Despite this progress, access can still be improved: only 40% of students in these grades have access to the program. The main challenges in expanding access to computational thinking classes include: (i) the availability of teachers trained to teach computational thinking who can use technology and employ innovative teaching practices; (ii) effective access to technological infrastructure, particularly laboratories and “makerspaces”; and (iii) how to better measure and monitor competencies in computational thinking. The National Curricular Framework 2022 recently called for computational thinking to be included among basic curricular competencies, but no official timetable has been set for the implementation of plans and programs to this end.
- 1.8 **Teacher training.** Teachers report low levels of technology integration in their teaching practices, as well as low levels of collaborative or project-based learning. Teachers' use of technology remains at a basic level: the most heavily used applications are those that approximate activities that are familiar outside the digital realm, such as writing, reading, or sign-making. The frequent use of devices and connectivity to access information stands in contrast to the idealized image of the potential of ICTs in teaching.⁵ Rates of teacher participation in training courses remain relatively low, as reflected in a 2021 survey that found that 46% of teachers who took the computational thinking course reported that they had not continued the training offered by CEIBAL as part of the program (CEIBAL, 2021 survey).
- 1.9 **Basic conditions.** While primary and secondary schools have universal access to devices and connectivity, the devices—tablets delivered in secondary schools—are not the best suited for teaching computational thinking at these levels. The effective use of technology requires both devices and learning spaces and infrastructure to foster innovative pedagogical practices, such as project-based learning and teamwork. To promote such practices, CEIBAL launched its CEILAB program in 2018, with a focus on the “design thinking” methodology and “maker” practices, defined as a collaborative workspace where students explore, research, create, and share learning by doing; project-based learning is fostered through the development and integration of skills that include the use of technology in a critical sense. CEILAB equips primary and secondary schools with science, technology, engineering, and

⁵ Changes in Digital Learning During a Pandemic: Findings from the ICILS Teacher Panel. Strietholt, R., et al. (2021).

mathematics (STEM) technologies (3D printer, robotics kits, devices, programmable boards, programming resources, physicochemical sensors, drones, hand tools, and prototyping material) and modular furnishings designed specifically for a “makerspace” environment. Schools participate through an application process that specifies how these new spaces are to be used in conjunction with the schools’ teaching strategy. Once schools are selected, teachers are trained in new pedagogical practices, which entails intensive support, training, and fostering of the exchange of experiences. Participating in the program today are 110 schools throughout Uruguay, which equates to a 4% penetration rate in the education system. CEIBAL does not yet have a reference framework for the computational thinking program at the secondary level.

- 1.10 **Measurement and monitoring.** No instrument is yet available to measure, on a recurring basis, the large-scale development of these skills and provide recommendations to each teacher for improved instruction and teaching practices (Vegas et al., 2021). To mitigate this void, CEIBAL organized a Bebras challenge⁶ in which over 30,000 students participated in 2021. Bebras is not a standardized test, nor is it organized by competencies; thus, investment is needed for Uruguay to put in place an instrument to measure computational thinking. Compounding the lack of an instrument is the decentralized nature of data: Uruguay’s complex institutional architecture in its education system features a variety of information sources. ANEP’s three divisions—for early childhood and primary education (DGEIP), secondary education (DGES), and vocational education (DGETP)—have separate educational management systems (school management, student records, position allocation, and teaching hours) with varying degrees of coordination. CEIBAL, meanwhile, has its own information sources and systems. As a result, achieving a comprehensive data ecosystem is an ongoing challenge.⁷
- 1.11 **Change theory.** With the aim of enhancing student learning and competencies on an ongoing basis and reducing gaps, access to the computational thinking course should be expanded to more primary and secondary schools in Uruguay by (link 8): (i) expanding and strengthening the materials and methodology for the computational thinking course, as well as updating and enhancing infrastructure for primary and secondary schools; (ii) strengthening teacher training to potentiate innovative practices with the effective use of technology; and (iii) improving available data related to student and teacher competencies. International evidence suggests that having devices, connectivity, and suitable spaces for collaborative projects is a prerequisite for developing such competencies and, particularly, for closing gaps in access between students of varying socioeconomic status, many of whom lack the access needed to develop digital skills. The countries for the expansion of computational thinking courses have been documented in the literature (Lockwood and Cornell, 2013). To close these gaps, the evidence shows that early exposure to computational thinking increases the likelihood that these skills will be further developed, particularly for girls and other groups historically underrepresented in STEM fields and computer science (Vegas et al., 2021). “Maker” practices and

⁶ <https://www.bebaschallenge.org/>.

⁷ Education Management and Information Systems (SIGEDs) in Latin America and the Caribbean: The Road to the Digital Transformation of Education Management. Arias Ortiz, E. et al. (2021).

project-based and collaborative learning have proven highly effective in enhancing learning (Bando et al, 2019). Some evidence also suggests that the integration of computational thinking in subject areas (e.g., biology, mathematics, and statistics) (Vázquez et al., 2019) and interdisciplinary projects that immerse students in imaginative challenges fosters creative, challenging, and active learning (Cobo and Montaldo, 2018). Lastly, developing an instrument to measure computational thinking and the management and information system would enable CEIBAL to have tools in place for effective monitoring.

- 1.12 **Program trajectory.** CEIBAL has gone through various phases since its inception: (i) in 2007-2009, it focused on deploying devices and Internet connectivity in schools; (ii) in 2010-2012, it focused on deploying platforms with content for learning management and teacher support; and (iii) in 2013-2019, it focused on using technologies to leverage new pedagogical methods while transforming teaching practices and expanding the use of technology as a catalyst of personalized learning processes. As a result, when the COVID-19 pandemic struck in 2020, Uruguay was better positioned than other countries in the region to face the challenge of ad hoc remote learning. The system as a whole—and administrators and teachers, in particular—were able to mount a nimble response to the health emergency. The adoption and use of platforms expanded greatly between 2019 and 2021. The number of users of the CREA learning management platform doubled, from 326,000 in 2019 to 750,000 in 2020. New teleconferencing and communication services were added as well, bolstering CEIBAL's central role in educational continuity and its use in classrooms. This program aims to support CEIBAL in its fourth phase, which began in 2020 with the outbreak of the pandemic. This phase features a systemic approach that focuses on teachers' needs and on implementing hybrid teaching to increase the time and space for learning.
- 1.13 **The Bank's experience in the sector.** The Bank has supported Uruguay's education sector in multiple operations over the past decade. The Secondary and Technical Education and Teacher Training Support Program ([2480/OC-UR](#); US\$114.5 million in total, with US\$48 million from the Bank's Ordinary Capital), executed with ANEP from 2011 to 2018, achieved a 10% improvement in grade repetition and dropout rates among students participating in educational advancement programs, as well as improvements in management processes and the upgrading of infrastructure for early childhood and secondary education. The Program of Support for Secondary Education and Teacher Training: Towards Seamless and Complete Learning Pathways ([3773/OC-UR](#); US\$74.7 million in total, with US\$50 million from the Ordinary Capital), approved in 2016 as the first individual operation of a conditional credit line for investment projects (CCLIP) and slated for completion in 2023, aims to improve access to and the quality of secondary education by achieving seamless and complete learning pathways. The second operation of the CCLIP, titled Education for Transformation: Completion of Cycles and New Educational Offerings ([5337/OC-UR](#); US\$61 million in total, with US\$40 million from the Ordinary Capital), was approved in 2021.
- 1.14 Three operations for CEIBAL were financed as well. The Support Program for the Consolidation and Expansion of Plan CEIBAL ([2260/OC-UR](#); US\$8.5 million in total, with US\$6 million from the Bank's Ordinary Capital) was executed from 2010 to 2014 to support the consolidation of Plan CEIBAL at the primary level and its expansion into secondary education. The objective of the program titled Plan CEIBAL II –

Support for Primary and Secondary Math and English Education ([3225/OC-UR](#), US\$6.9 million in total, with US\$6 million from the Ordinary Capital), executed from 2014 to 2018, was to use new technologies to improve math and English education at the primary and lower secondary levels, which was evaluated as highly successful in the [project completion report](#). Lastly, the operation titled Generation C: Consolidating Educational Innovations for 21st-century Skills and Competencies ([4290/OC-UR](#); US\$30 million from the Ordinary Capital), which used a results-based loan and was completed in 2021, aimed to improve student learning and competencies at the primary and lower secondary education levels. According to the corresponding project completion report, it obtained a very satisfactory overall score in the areas of relevance, effectiveness, efficiency, and sustainability. The Bank has also worked with Centro CEIBAL through technical cooperation operations such as: (i) validation of Korea's Home Learning Model in Uruguay (IntegraTE),⁸ which adapted and implemented an online support platform in mathematics and Spanish to reinforce the knowledge acquired in the classroom; (ii) implementation of a monitoring system in learning analytics,⁹ which will use techniques for analyzing large databases to support CEIBAL in the effective and strategic use of its wide range of data to better understand how, where, and when teachers and students participate in the process of exchanging and creating new knowledge; (iii) implementation and thorough evaluation of innovative pedagogical approaches for mathematics and computational thinking, using "high touch – high tech" strategies that combine teacher-student interaction (high touch) with learning platforms, content, and artificial intelligence to effectively provide students with personalized knowledge (high tech);¹⁰ and (iv) creation of the Unit of Behavioral Sciences in Education to support the actions, policies, and programs of basic education and teacher training in Uruguay.¹¹

- 1.15 **Lessons learned.** The main lessons learned are: (i) avoid the fragmentation of small-scale interventions and design the program in close alignment with the priorities and operational strategies of CEIBAL and the Uruguayan education system, as reflected in the operation's overall design; (ii) seek synergies between the Bank's innovation agendas and CEIBAL to forge a strong shared agenda, with support for pilot projects through technical cooperation whose lessons can be scaled on larger operations, as reflected in Component 1; (iii) maximize existing synergies with other operations in the education sector, such as operation [5337/OC-UR](#), which poses clear opportunities for the transformation of primary education curricula, the professionalization of teaching, new management mechanisms, and provision of data to schools for Component 2; (iv) the importance of including key evaluations and studies in operations to contribute to public education policy strategies. CEIBAL began to build a body of rigorous evidence on its programs' impact on learning. First

⁸ [ATN/KP-14301](#) (UR-T1084). Total amount: US\$800,000, with US\$500,000 provided by the Bank in the form of technical cooperation. Execution is at 100%.

⁹ [ATN/KP-15744](#) (UR-T1143): Total amount: US\$510,000, with US\$500,000 provided by the Bank in the form of technical cooperation. Execution is at 100%.

¹⁰ ATN/KP-18134-UR and ATN/OC-18823-UR ([UR-T1244](#)). Total amount: US\$980,000, with US\$900,000 provided by the Bank in the form of technical cooperation. Execution is at 35%.

¹¹ [ATN/OC-19389 and ATN/OC-19389-UR](#) (UR-T1276): US\$300,000 from the Bank in the form of technical cooperation. Execution is commencing.

along these lines is an impact evaluation showing the positive effects of time of exposure in the CEIBAL English program on student achievement in English in grades 4 through 6, as reflected in operation [4290/OC-UR](#). Developing an instrument to measure computational thinking competencies, as part of monitoring and evaluation, will assist in conducting such evaluations to measure the program's impact on learning and the closure of gaps; and (v) related to the previous lesson, the progressive strengthening of the evaluation capacity of CEIBAL ([4290/OC-UR](#)) and the school monitors being implemented in operation [5337/OC-UR](#), combined with the availability of information on student and teacher competencies covered by the monitoring and evaluation efforts, provides new opportunities to understand how to use digital technologies in education and how to foster better learning opportunities, as well as providing feedback within CEIBAL and to the education system.

- 1.16 **The country's strategy in the sector.** This operation is aligned with: (i) the Educational Development Plan 2020-2024 and its six strategic guidelines: (a) increase access, retention, and graduation rates and enhance students' educational pathway through improved learning; (b) reduce internal inequity and improve learning, with a focus on the most socially and educationally vulnerable student populations; (c) upgrade curricula at all levels of education; (d) strengthen computational thinking education and foster integrated learning communities; (e) design and establish a national teaching policy that covers early childhood education, professional development and career path, and working conditions; and (f) transform institutional design and management while professionalizing processes and roles; and with (ii) Centro CEIBAL's Strategic Plan 2021-2025, which guides its actions toward four strategic objectives: (a) ensure access to technology for learning; (b) innovate in technological infrastructure, content, experiences, and digital environments; (c) contribute to continuous improvement in teaching and learning processes; and (d) develop competencies for digital citizenship.
- 1.17 **The Bank's country strategy.** The program is consistent with the IDB Group Country Strategy with Uruguay 2021-2025 (document GN-3056), as it will contribute to the strategic objective of improving education and job training and supporting the most vulnerable population groups. For more information on the program's strategic alignment, see paragraph 1.24.

B. Objectives, components, and cost

- 1.18 **Objective and scope.** The specific objectives of this operation are: (i) to expand and strengthen effective access to resources for teaching and learning; and (ii) to expand effective access to resources for enhancing pedagogical practices with the integration of technology and innovation. The fulfillment of these objectives will contribute to the general objective of improving student learning and competencies by reducing gaps in STEM programs.
- 1.19 **Component 1. Improvement of computational competencies and access to devices (US\$17.9 million).** This component is aligned primarily to the first specific objective and will finance actions related to the following two lines of action:
- a. The Computational Thinking Program (PPC), which provides technology-assisted teaching in computational thinking. Financing will be specifically provided for: access of students in grades 4 through 6 in urban

schools to computational thinking classes through remote teaching assisted by videoconferencing; monitoring of quality in the PPC and remote teachers vis-à-vis the standard for the active participation of girls; and development of the reference framework proposal for a future expansion of the PPC to secondary schools.

- b. The upgrading of devices for lower secondary students, with the aim of meeting the requirements of new platforms and programs offered for this level of education, with a focus on strengthening STEM programs.

1.20 **Component 2: Strengthening of in-service training and professional development of teachers for the integration of technology and innovation (US\$11 million).** This component relates to the second specific objective and will finance actions related to the following three lines of action:

- a. The Teacher Professional Development Program for Technology Integration and Innovation will offer customizable training pathways. Financing will be provided for the design and implementation of courses on a learning platform to help channel these training pathways and provide learning opportunities in innovative formats; the implementation of courses for initial teacher training; the implementation of courses and special days to promote innovation and/or support educational transformation and the priorities of ANEP's curricular reform;¹² and the development of a graduate certificate course in computational thinking to enrich the offerings in professional development.
- b. The Global Network for Deep Learning (RGA)¹³ will be strengthened by deepening and expanding schools' involvement in implementing new deep-learning pedagogies. Financing will be provided for technical training and assistance teams in the field, online courses for implementation of deep-learning initiatives, and membership fees of the RGA.
- c. The CEILAB program will be strengthened through increased engagement of schools and teachers and improved monitoring of the use of laboratories. Financing will be provided for technical teams in charge of the calls for proposals and project tutorials; pre-CEILAB kits for implementation of early pedagogical initiatives; and implementation of CEILAB labs (including furnishings and technological equipment) in schools that demonstrate a commitment and engagement level after having undergone a tutor-led process for implementation of projects at least six months in duration.
- d. Tools and process for interoperability between entities of the educational ecosystem will be developed to optimize access and the use of available information.

¹² The reform package includes climate change, gender, and diversity as crosscutting considerations.

¹³ This network seeks to create a space for the discussion and implementation of new pedagogies through the transformative drive of technologies. It focuses on two core areas: (i) working on interdisciplinary projects connected to real life and student interests; and (ii) promoting crosscutting competencies considered essential for creating citizens—creativity, collaboration, citizenship, communication, critical thinking, and character—by deploying strategies explicitly designed to foster and shape these competencies.

- 1.21 **Administration, monitoring, and evaluation of results (US\$1 million).** To support the two specific objectives, financing will be provided for actions related to the monitoring and evaluation strategy, as well as program management and administration. As part of the monitoring and evaluation strategy, financing will be provided for activities including the following: (i) upgrades and adjustments to the online learning evaluation system for testing in computational thinking; (ii) development and implementation of a test to measure students' computational thinking; this tool will place special emphasis on monitoring the socioeconomic and gender gaps described above, but it will include strategies to reduce gender biases and engage girls in the subject; (iii) the piloting of a self-diagnostic tool to assess teachers' digital competencies for the digital transformation; and (iv) the continuous improvement and expansion of the school monitor with the aim of improving access to information for administrators and teachers, as well as the education system's capacities to visualize and interpret the information. To support program management and administration, financing will be provided for technical teams in the administrative unit and the consulting firm for verification of results for each disbursement milestone. The annual and final audits will be financed by CEIBAL.
- 1.22 **Main results indicators.** The main results indicators are tied to disbursements: (i) groups with meaningful access to computational thinking classes; (ii) students using the CEIBAL device in their learning processes; (iii) students of initial teacher training who pass the courses; (iv) schools improving their capacities to use project-based learning methodologies; (v) schools in the RGA that improve their project-based learning capacities; and (vi) schools that make progress in implementing "maker" methodologies as they transition from pre-CEILAB to CEILAB. Additional indicators will be: (i) the number of teacher training processes that are approved; (ii) students participating in the annual computational thinking tests; and (iii) the number of new computational thinking courses offered.
- 1.23 **Beneficiaries.** The beneficiaries will be: (i) for the PPC, students and teachers in grades 4 through 6 in urban schools who enroll in the program; (ii) 40,000 students transitioning from primary to secondary school who will benefit from upgraded devices; (iii) regarding training pathways, the teachers who enroll in any of the three types of course offerings (initial training, continuing education for educational innovation and transformation, graduate certificate courses in computational thinking); (iv) the 750 schools participating in the RGA; and (v) the students and teachers of schools using "maker" methodologies for project-based learning.

C. Strategic alignment

- 1.24 The program is consistent with the Second Update to the Institutional Strategy (document AB-3190-2) and is aligned with the development challenges of: (i) social inclusion and equality, as it will improve the quality of public education for students from lower-income households, as well as their educational opportunities; and (ii) productivity and innovation, through the development of human capital, as it will promote computational thinking skills. The program contributes to challenges 2 (ensure that children and preadolescents develop the basic cognitive and socioemotional skills that will allow them to keep learning) and 3 (ensure that all students graduate from secondary school with the intermediate cognitive, technical, and socioemotional skills that allow them to keep learning throughout life, access high-quality jobs, and be good citizens) of the Skills Development Sector Framework

Document (document GN-3012-3). The program is aligned with the crosscutting areas of: (i) gender equality, as it will improve learning and competencies in computational thinking and enhance access to innovative offerings for student “makerspaces”; (ii) institutional capacity and rule of law, as it will modernize management and support processes in schools and classrooms; and (iii) climate change and environmental sustainability, since according to the [multilateral development banks’ joint methodologies for tracking climate finance](#), an estimated 15.22% of the operation’s resources will be invested in climate change mitigation and adaptation activities, through the incorporation of this topic in the “makerspace” curricula and the procurement (starting in 2025) of equipment with the highest energy-efficiency rating. Moreover, the program will contribute to the Corporate Results Framework 2020-2023 (document GN-2727-12) in terms of the number of students benefited by education programs. The program is included in the updated Annex III of the 2022 Operational Program Report (document GN-3087-2).

D. Viability analysis

- 1.25 **Viability analysis.** To assess the program’s economic viability, a cost-benefit analysis was carried out by comparing the interventions’ costs and benefits. The costs totaled US\$22.9 million adjusted to social prices. The benefits calculation took into account: (i) increases in the future income of students participating in the computational thinking tests each year, as a result of enhanced skills for STEM occupations; and (ii) increases in the future income of students reached by trained teachers, as a result of improved learning outcomes. The program is economically viable, with a positive net present value and an internal rate of return that exceeds the discount rate applied to the flow of net earnings throughout the period in question, in view of the base scenario (US\$14.88 million and 16.7%, respectively). The sensitivity analysis also found the program to be economically viable in a variety of scenarios using more conservative assumptions than the base scenario.
- 1.26 **Technical viability.** To improve student learning and competencies, teachers’ pedagogical practices need to be transformed by introducing and maintaining educational programs that incorporate technology and the use of information in the teaching process. If Uruguayan teachers use the pedagogical innovations, the platforms and information that these innovations will regularly generate on student performance may modify their practices, and their students will achieve better learning of both content and competencies and will develop a stronger interest in education since it will be more relatable to their daily lives; as a result, these students will remain in school until they complete their education.
- 1.27 Operation UR-L1141 (4290/OC-UR), which was recently completed, yielded useful tools such as: (i) the first ICILS international assessment of digital skills for 8th-grade (2nd year of secondary school) students and a second assessment slated for 2023; (ii) an index to measure the level of CEIBAL intervention in schools and students and an index to measure the level of RGA intervention in schools; and (iii) the study on the correlation between active pedagogies and student engagement.¹⁴

¹⁴ Soca, J. et al., Active Classrooms: The Role of the Teacher as Activator in Student Engagement (2020).

- 1.28 **Socioeconomic viability.** This analysis assessed the operation's social benefits, which stem from the sustained use of educational platforms and programs that use technology to improve student learning and competencies. The ex ante cost-benefit analysis yielded a social rate of return of 14.97%, which exceeds the 12% discount rate used by the Bank, and a positive net present value of US\$9.67 million. The program was found to be economically viable in a variety of scenarios using assumptions that are even more conservative than the base scenario ([link 4](#)).
- 1.29 **Social and environmental viability.** This has been classified as a category "C" operation, since execution of its components is not expected to cause any adverse environmental, social, or cultural impacts. The expected social impacts of the operation will be positive. The operation does not include physical infrastructure or physical modification of the environment ([link 2](#)).
- 1.30 **Institutional and financial viability.** CEIBAL is the Uruguayan government's center for educational innovation with digital technologies in support of educational policy. The creation of the Unit of Behavioral Sciences in Education, with support from technical cooperation operation UR-T1276, will mark a major qualitative leap in the capacities and tools available for the design and evaluation of educational policies and programs. The operations and capacities generated through this approach will aim to respond to problems shared throughout the education system and public policy overall. CEIBAL is the ideal place for this unit because of its flexible institutional structure, its culture of innovation, the combination of diverse disciplines among its staff, and the extensive knowledge it has gained over the past 15 years.
- 1.31 CEIBAL has built a culture of data management throughout its organization, one that features "big data" projects. Supported by this cultural framework and the availability of data, CEIBAL has an opportunity to incorporate behavioral science as a crosscutting tool to complement its current operations, while striving to develop strategies to impact how its operations are received and adopted by end users. While keeping the institution's focus on making informed decisions and generating knowledge, the incorporation of these new tools will include impact evaluations and experiments as a natural part of operations, strengthening the user-centered nature of the organization and the generation of empirical evidence.

II. FINANCING STRUCTURE AND MAIN RISKS

A. Financing instruments

- 2.1 **Financing modality and structure.** This operation will use a results-based loan charged to the Bank's Ordinary Capital in the amount of US\$30 million, with no local counterpart contribution. The operation meets the requirements for a results-based loan (document GN-2869-1) since: (i) it supports the Educational Development Plan 2020-2024 in delivering results through financing for expenditures on CEIBAL programs; (ii) it promotes good practices in educational management and good pedagogical practices; (iii) it promotes improved performance of an existing government program, with an emphasis on achieving results; and (iv) as evidenced in the previous operation (4290/OC-UR), CEIBAL has the legal authority, a suitable governance structure and institutional environment, and sufficient managerial and technical capacity to administer and monitor a results-based loan. The excellent experience with this loan operation prompted Uruguay to continue using this

modality in view of its advantages in terms of: (i) focusing execution on the fulfillment of development objectives, while reducing Bank transaction costs; and (ii) aligning with its annual management commitments to the executive branch. In changing the nature of the dialogue, the results-based loan increases the Bank's added value by aligning incentives to improve program performance and expanding the room for its technical contribution.

- 2.2 **Cost, financing, and disbursement timetable.** Table 1 and the estimated cost ([link 1](#)) provide a breakdown of the budget by component and source of financing. The program's disbursement period will be four years. This period is similar to that of the latest operation executed by CEIBAL as a results-based loan (4290/OC-UR). It is consistent with the nature of the activities involved in this operation, as well as the pace of activities and results. Disbursements will be made in accordance with the schedule and tranches described in Table 2.

Table 1. Estimated program costs (US\$ million)

Components ¹⁵	IDB	Total	%
Component 1. Improvement of computational competencies and access to devices	17.93	17.93	60
1.1 Computational Thinking Program	10.49	10.49	
1.2 Updating of devices	7.44	7.44	
Component 2: Strengthened in-service training and professional development of teachers for the integration of technology and innovation	11.07	11.07	37
2.1 Teacher professional development program	1.02	1.02	
2.2 Global Deep Learning Network (RGA)	6.84	6.84	
2.3 CEILAB program	3.21	3.21	
Administration, monitoring, and evaluation of results	1.00	1.00	3
Total	30.00	30.00	100

Table 2. Disbursement schedule (US\$ million)

Components	Year 1	Year 2	Year 3	Year 4	% of total
IDB	7.46	7.47	7.52	7.55	30.00
Total	7.46	7.47	7.52	7.55	30.00
%	24.87	24.90	25.07	25.16	100.00

B. Environmental and social risks

- 2.3 In accordance with the Bank's Environmental and Social Policy Framework, this has been classified as a category "C" operation ([link 2](#)), since execution of its components is not expected to cause any adverse environmental, social, or cultural

¹⁵ The costs per subcomponent or main activity are indicative.

impacts. The expected social impacts of the operation will be positive. The operation does not include physical infrastructure or physical modification of the environment.

C. Fiduciary risks

- 2.4 In preparing the program, no fiduciary risks that would have an adverse effect on execution of the operation were identified. The risk identification and management process will continue throughout the execution period.

D. Other key issues and risks

- 2.5 **Development risks.** The following are classified as medium-level development risks: (i) execution environment: low participation of lower secondary teachers in the PPC; (ii) execution environment: low demand for courses among teachers; and (iii) low usage of the school rubric in schools participating in the RGA. To mitigate these risks, the following actions are proposed: (i) the PPC will be broadly disseminated among officials, middle management, and teachers' unions; (ii) courses will be designed with cumulative training pathways that accrue credits for other graduate certificate courses; (iii) CEIBAL teams will prioritize schools participating in the RGA; and (iv) meetings of the expanded board will be used to coordinate and solve problems.
- 2.6 **Sustainability.** As noted in paragraph 1.17, this program supports actions included in the Educational Development Plan 2020-2024 and the Strategic Plan 2021-2025 of Plan CEIBAL, which are the strategic and budgetary frameworks of ANEP and CEIBAL, respectively, for the next five years. Uruguay will finance the program through its annual budget. The program accounts for only 15% of CEIBAL's budget over the execution period.

III. EXECUTION MECHANISM AND ARRANGEMENTS FOR RESULTS MONITORING AND EVALUATION

A. Execution mechanism

- 3.1 **Borrower and executing agency.** The borrower will be the Eastern Republic of Uruguay. Centro CEIBAL will be the executing agency tasked with implementing the program while coordinating with ANEP in the expanded board¹⁶ for activities as appropriate.
- 3.2 The institutional arrangement used to implement the three previous operations, which worked well, will essentially be maintained for execution of this program in view of CEIBAL's and ANEP's current organizational charts. The program

¹⁶ Under Law 18,640 (as amended by Law 18,719), Centro CEIBAL is a non-State public entity governed by a board of directors comprised of a delegate from the executive branch (who serves as chairperson), a delegate from ANEP, a delegate from the MEC, and a delegate from the Ministry of Economy and Finance (MEF). The board of directors is the center's highest authority and performs its functions directly and with the support of the Office of the Executive Director, primarily responsible for overseeing overall management of Centro CEIBAL pursuant to regulations and resolutions issued by the board of directors. In addition, Centro CEIBAL has an expanded board comprised of representatives of the Central Governing Council (CODICEN), the Teacher Training Council (CFE), the DGEIP, the DGES, the DGETP, and the MEC. The Office of the Executive Director is supported by seven technical departments, each of which has technical and management support areas.

coordination unit (PCU) will consist of a coordinator and permanent members from the planning and budget unit (Supply and Finance Division) and the monitoring and evaluation unit (Behavioral Science and Data Division). The PCU will be directly responsible for heading up program implementation and will work on the programming and organization of activities, evaluation of results, compliance with contractual requirements, and communications with the Bank. The PCU will coordinate program implementation with the Centro CEIBAL units directly involved in execution, as follows: Office of the Executive Director and the Divisions of Science and Technology, Education, and Deep Learning; Professional Training for Teachers; Behavioral Science and Data; Operations; Supply and Finance; and Human Resources.

- 3.3 **External verification of results.** This will be done by an individual consultant acting as an independent external evaluator of the achievement of results. The evaluator will be required to submit a results verification report to the Bank in advance of each disbursement request. Verification of the achievement of results will focus on two objectives: (i) render an opinion as to the accuracy, reliability, validity, and consistency of the information regarding the results; and (ii) determine the values of the results indicators provided for each disbursement tranche. The evaluator may also make recommendations aimed at promoting achievement of the targets based on the evaluation. The evaluator will be required to have experience in project evaluation and monitoring, in working with results indicators, and in evaluating the reliability of the information sources and the methods used to produce it. The evaluator will be contracted through single-source procurement in accordance with the terms of reference previously agreed upon with the Bank and with the Bank's policies for the selection and contracting of consultants.
- 3.4 **Special contractual conditions precedent to the first disbursement of the loan: (i) a signed agreement for the execution and transfer of loan proceeds between the Ministry of Economy and Finance (MEF) and the executing agency; and (ii) approval by the executing agency and entry into force of the program Operating Regulations under the terms previously agreed upon with the Bank.** For the first condition, the agreement will establish conditions for the transfer of resources from the MEF and will specify Centro CEIBAL's obligations as the executing agency for the program. For the second condition, the Bank's experience in the region indicates that approving the Operating Regulations prior to the first disbursement benefits the executing agency's internal organization for program execution.
- 3.5 **Special contractual conditions precedent to the results-based disbursements: a contract with the independent evaluator who will be responsible for verification of the results, in accordance with the terms of reference previously agreed upon with the Bank,** as each disbursement will be subject to this independent verification.
- 3.6 **Operating Regulations.** The program Operating Regulations will detail the operation's execution strategy, including: (i) the program's organizational structure; (ii) technical and operational arrangements for program execution; (iii) arrangements for programming, monitoring, and evaluating results; (iv) operational guidelines for the results-based loan; (v) terms of reference for contracting the independent evaluator and the financial audit;

and (vi) a detailed description of the results indicators, particularly those related to disbursements and related verification protocols ([link 5](#)).

3.7 **Fiduciary agreements and requirements.** [Annex III](#) includes the financial management and procurement guidelines for the program. Procurement items financed with loan proceeds will follow the policies of the executing agency. The Bank's procurement policies, as described in documents GN-2349-15 and GN-2350-15, as appropriate, will apply only to the commissioning of the independent verification of results, which will be procured through single-source selection as a continuation of previous services,¹⁷ for the four verification cycles planned for this operation (one per year). Financial management will be carried out in accordance with the guidelines set out in document OP-273-12. The resources transferred to the program will be managed in accordance with the procedures set forth in the Operating Regulations.

3.8 No exceptions to Bank policies will apply. No early procurement, advances of funds, retroactive financing, or recognition of expenditures is anticipated.

B. Arrangements for results monitoring and evaluation

3.9 **Monitoring.** The program will adopt the Bank's supervision arrangements. The program's monitoring arrangements will include: (i) defining the protocols for external verification of fulfillment of the disbursement indicators; (ii) holding at least two meetings per year for a technical and operational review of progress on the program, problem resolution, and risk mitigation (including updating the risk analysis to be performed in the final meeting of each year), in which the relevant key institutional actors and the Bank will participate, and following which the management agreements reached will be duly publicized; (iii) implementing a project management system for purposes of generating the semiannual program report; (iv) semiannual reports on the achievements and problems faced in each of the components and the program's performance according to the agreed-upon results matrix ([Annex II](#)), at least as of the second year from the effective date of the program; and (v) use of the management tools described in the monitoring and evaluation plan ([link 3](#)) and agreed upon in the start-up and planning workshop, so as to have instruments in place to plan the activities and processes needed to achieve the physical outputs and the intermediate and final outcomes.

3.10 **Evaluation.** The program evaluation plan ([link 3](#)) calls for the following evaluations: The program will conduct a midterm evaluation, a final evaluation, and a project completion report (PCR), each of which will cover technical, administrative, and financial aspects and will include an ex post cost-benefit analysis. The midterm evaluation will be conducted after at least 40% of the loan proceeds have been disbursed or once three years have elapsed since the effective date of the loan contract (whichever occurs first). The main objectives of the midterm evaluation are to review progress on all activities scheduled to have occurred by that time, along with any potential deviations and their causes; propose corrective measures; and verify midterm outputs, the materialization of risks identified in the risk matrix, and the implementation of risk mitigation measures. The final evaluation will be carried

¹⁷ In accordance with paragraph 3.11 (a) of document GN-2350-15. The consultant was selected through a competitive process for the same task as part of operation 4290/OC-UR.

out after at least 90% of the loan proceeds have been disbursed, and its objective will be to verify progress in fulfilling the targets for each expected outcome and the generation of outputs for each component. The Bank will prepare a PCR, which will be submitted within 180 days after the last disbursement and will be based on the executing agency's semiannual progress reports, the progress monitoring report, and the Results Matrix ([Annex II](#)). In addition, exploratory studies will be carried out using descriptive methodologies to shed light on potential results of the program ([link 3](#)).

- 3.11 **Impact evaluation.** An impact evaluation based on a quasi-experimental methodology will be carried out to determine the impacts of the intervention. This will include an evaluation of the impact of instruction in computational thinking on the reduction of gender and socioeconomic gaps in this subject area. This is expected to yield evidence for public policy recommendations to improve the decision-making process and make adjustments to how computational thinking is taught ([link 3](#)).

Development Effectiveness Matrix		
Summary		UR-L1169
I. Corporate and Country Priorities		
Section 1. IDB Group Strategic Priorities and CRF Indicators		
Development Challenges & Cross-cutting Issues	-Social Inclusion and Equality -Productivity and Innovation -Gender Equality and Diversity -Climate Change -Institutional Capacity and the Rule of Law	
CRF Level 2 Indicators: IDB Group Contributions to Development Results	-Students benefited by education projects (#)	
2. Country Development Objectives		
Country Strategy Results Matrix	GN-3056	Improve education and job training. Support the most vulnerable population groups.
Country Program Results Matrix	GN-3087-2	The intervention is included in the 2022 Operational Program.
Relevance of this project to country development challenges (If not aligned to country strategy or country program)		
II. Development Outcomes - Evaluability		
3. Evidence-based Assessment & Solution		Evaluable
3.1 Program Diagnosis		8.9
3.2 Proposed Interventions or Solutions		2.5
3.3 Results Matrix Quality		3.5
3.3 Results Matrix Quality		2.9
4. Ex ante Economic Analysis		9.0
4.1 Program has an ERR/NPV, or key outcomes identified for CEA		1.5
4.2 Identified and Quantified Benefits and Costs		3.0
4.3 Reasonable Assumptions		2.5
4.4 Sensitivity Analysis		2.0
4.5 Consistency with results matrix		0.0
5. Monitoring and Evaluation		10.0
5.1 Monitoring Mechanisms		4.0
5.2 Evaluation Plan		6.0
III. Risks & Mitigation Monitoring Matrix		
Overall risks rate = magnitude of risks*likelihood		Medium Low
Environmental & social risk classification		N.A.
IV. IDB's Role - Additionality		
The project relies on the use of country systems		
Fiduciary (VPC/FMP Criteria)	Yes	Financial Management: Budget, Treasury, Accounting and Reporting, External Control, Internal Audit. Procurement: Information System, Price Comparison, Contracting Individual Consultant, National Public Bidding.
Non-Fiduciary	Yes	Monitoring and Evaluation National System.
The IDB's involvement promotes additional improvements of the intended beneficiaries and/or public sector entity in the following dimensions:		
Additional (to project preparation) technical assistance was provided to the public sector entity prior to approval to increase the likelihood of success of the project		

Evaluability Assessment Note:

The general objective of the operation is to improve learning and skills by reducing gaps in STEM programs. The specific objectives of this operation are: (i) to expand and strengthen effective access to resources for teaching and learning; and (ii) expand the effective access to resources for the improvement of teaching practices with the integration of technology and innovation.

The project diagnoses that among high school students, only 38% achieve a minimum level of performance in mathematics (ERCE, 2019). The identification of determinants is based on those areas that the literature shows are key areas to foster learning (Lockwood and Cornell, 2013, Vegas et al., 2021, Bando et al. 2019 and others). The need to expand access to resources for learning is quantified with the fact that only 40 percent of students from 4th to 6th grade have access to computational thinking training (CEIBAL, 2022). The need to improve teaching practices is quantified by the fact that the 46 percent of the teachers who took a course in computational thinking did not follow the training offered (CEIBAL, 2021). Studies show that teachers use devices and connectivity for simple tasks such as writing and reading (Streholt et al, 2021). The diagnosis also identifies cases that demonstrate the interventions are effective by studies such as Bando et al (2019), Vazquez et al (2019) and Cobo y Motaldo (2018).

The economic analysis includes all costs derived from the operation and assigns a monetary value to the expected learning gains through the returns to education derived from the use of resources. The analysis results in an estimation of a net present value of US\$14.8 million and an internal rate of return of 17%. The sensitivity analysis contemplates increases in costs by 20% or a reduction of 20% in benefits. The benefits incorporated in the results analysis are linked to the five indicators and the sensitivity analysis is not linked to the risks of the operation, for which points are deduced.

The monitoring is based on reports and verification mechanisms associated with the Ceibal program, however, some indicators need greater clarity on the mechanisms through which the achievement of results will be verified. The evaluation plan proposes a reflective analysis to estimate results and proposes an impact evaluation on learning with a differences in differences methodology.

Five risks are identified out of which one is classified as medium low and the rest are classified as low.

RESULTS MATRIX

Project objective:	The objective of the program is to contribute to continuous improvement in student learning and competencies by reducing gaps in science, technology, engineering, and mathematics (STEM) programs. The specific objectives are: (i) to expand and strengthen effective access to resources for teaching and learning; and (ii) to expand effective access to resources for enhancing pedagogical practices with the integration of technology and innovation.
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GENERAL OBJECTIVE

Indicators	Unit of measure	Baseline value	Baseline year	End of project	Means of verification
The objective of the program is to contribute to continuous improvement in student learning and competencies by reducing gaps in STEM programs.					
I.1 Gender gap in computational thinking test scores of 6th-grade students in primary school, as measured by the difference in standard deviations between the average scores of girls and boys.	Standard deviations	0.12 ¹	2021	To be determined	Based on the computational thinking test being developed by CEIBAL, which will be supported by the operation. <u>Source:</u> Computational thinking test database. <u>Responsible party:</u> CEIBAL.
I.2 Socioeconomic gap in computational thinking test scores of 6th-grade students in primary school, as measured by the difference in standard deviations between the average score of students at schools in quintiles 1-3 and the average score of those in quintiles 4-5.	Standard deviations	0.28 ²	2021	To be determined	
I.3 Average score of 6th-grade students in primary school taking the computational thinking achievement test.	Average score	TBD	2024	Baseline + 0.116 standard deviations	

¹ The preliminary baseline value was calculated by comparing the difference in average scores of girls and boys in the controlled sample of groups of 6th-graders, with and without the computational thinking program, who participated in the Bebras challenge pilot initiative in 2021. This value will be updated with 2023 values after the calibrated test is administered.

² The preliminary baseline value was calculated by comparing the difference between the average score of students at schools in quintiles 1, 2, and 3 and the average score of those in quintiles 4 and 5 in the controlled sample of groups of 6th-graders, with and without the computational thinking program, who participated in the Bebras challenge pilot initiative in 2021. This value will be updated with 2023 values after the calibrated test is administered.

SPECIFIC OBJECTIVES

Indicators	Unit of measure	Baseline	Baseline year	Year 1	Year 2	Year 3	Year 4	End of project	Means of verification	Disbursement indicator (yes/no)	Observations
Specific objective 1: To expand and strengthen effective access to resources for teaching and learning											
R1.1 Groups with meaningful access to computational thinking classes in grades 4-6 in urban primary schools	Groups	2,314	2022	2,436	2,558	2,679	2,801	2,801	Report by Computation Thinking Area, based on data from CEIBAL's videoconferencing system	Yes	Meaningful access (as a measure of usage) is defined as at least 20 classes delivered. The baseline is a projection to December 2022 and will be updated at the start of the program.
R1.2 Students participating in computational thinking achievement tests each year	Students	30,026	2021	35,000	40,000	45,000	50,000	50,000	Report by Computation Thinking Area, based on data from the Online Learning Assessment System (SEA)	No	This is a test that will be offered to students on a voluntary basis each year. The baseline is from the 2021 Bebras challenge pilot initiative and will be updated once data from the final test are available.
R1.3 Minimum number of 7th-grade students (1st year of secondary school) using program-financed devices that year, delivered during the year	% of students	90%	2022	90%	90%	90%	90%	90%	Report by Operations Division, based on data on device usage and connectivity	Yes	The target is a minimum expectation, not a maximum target. Valid devices are those that enable access to all CEIBAL educational platforms for the student's grade and cycle and allow for software updates.

Indicators	Unit of measure	Baseline	Baseline year	Year 1	Year 2	Year 3	Year 4	End of project	Means of verification	Disbursement indicator (yes/no)	Observations
Specific objective 2: To expand effective access to resources for enhancing pedagogical practices with the integration of technology and innovation											
R2.1 Students in initial teacher training who passed CEIBAL courses recognized by the Teacher Training Council (CFE)	Students in initial teacher training	450	2022	550	750	1,000	1,200	3,500	Report by Professional Training for Teachers Division; evaluation based on data in the CRM or equivalent	Yes	These courses are part of the curriculum for initial teacher training. CRM is the course management platform.
R2.2 Teachers completing CEIBAL professional development courses/workshops each year	Teachers	9,048	2022	9,248	9,448	9,648	9,848	38,192		No	Course/workshop completion will be verified via instructor or system records showing the teacher has completed at least 80% of the coursework (attendance and activities). This includes virtual and hybrid courses/workshops, whether self-directed or instructor-led and synchronous.
R2.3 Schools in the Global Network for Deep Learning (RGA) that improve their capacities for project-based learning, using the school self-evaluation rubric	Schools	225	2022	236	248	260	273	1,018	Report by RGA Area, based on data in the SEA	Yes	This indicator will be measured using the school self-evaluation rubric. The RGA provides training, instructional materials, and assistance to teachers and school administrators for implementation of project-based learning. Use of the rubric is optional and reflects the school's commitment to implement project-based learning. The rubric is available throughout the year on the SEA platform.

Indicators	Unit of measure	Baseline	Baseline year	Year 1	Year 2	Year 3	Year 4	End of project	Means of verification	Disbursement indicator (yes/no)	Observations
R2.4 Schools that transition from pre-CEILAB to CEILAB each year as a result of sustained engagement in implementing “maker” methodologies	Schools	20	2022	20	20	20	20	80	Report by the Digital Labs Area, based on the report on the selection of new CEILAB schools	Yes	Sustained engagement will be verified by whether at least one teacher has worked with a group of students on a project for at least six months and has received at least one mentorship. Projects selected for pre-CEILAB will receive a basic kit and at least six months of mentorship for project development. Schools that move from pre-CEILAB to CEILAB have demonstrated commitment and teacher engagement. A complete lab for the implementation of “maker” methodologies is then installed at the school.

OUTPUTS³

Outputs	Unit of measure	Baseline value	Baseline year	Year 1	Year 2	Year 3	Year 4	End of project	Means of verification	Observations
Component 1. Improvement of computational competencies and access to devices										
1.1 Groups of students in grades 4-6 in urban primary schools signed up for remote computational thinking classes	Groups of students in grades 4,5, and 6 of primary school	2,566	2022	2,680	2,813	2,948	3,081	3,081	Video-conferencing system reports from CEIBAL	Remote computational thinking classes are offered on a voluntary basis to all groups in grades 4-6 in public schools. The application is submitted by the classroom teacher, who coordinates with the remote teacher regarding content to be prioritized and with the Computational Thinking Program (PPC) regarding logistics for remote classes.
1.2 Remote teachers evaluated vis-à-vis the standard for active participation of girls in the program	Percentage	100%	2021	100%	100%	100%	100%	100%	Reports from CEIBAL's computational thinking quality team	Remote teachers are evaluated as part of the quality system pursuant to standards for inclusive teaching of computational thinking. Reported by the PPC quality team.
1.3 Students receiving program-financed new devices for lower secondary education in the current year	Students	0	2022	10,000	10,000	10,000	10,000	40,000	Report on delivery of CEIBAL devices	The devices will be certified by the Federal Communications Commission (FCC), and both the devices and the chargers will be environmentally certified as compliant with the Restriction on Hazardous Substances (RoHS). Starting in year 3, there are plans to apply for the Energy Star (or equivalent) label, as a requirement for meeting energy efficiency standards.

³ All output indicators referring to students or users will be monitored by gender.

Outputs	Unit of measure	Baseline value	Baseline year	Year 1	Year 2	Year 3	Year 4	End of project	Means of verification	Observations
Component 2. Strengthening of in-service training and professional development of teachers for the integration of technology and innovation										
2.1 Initial teacher training courses delivered	Courses	3	2022	3	4	5	6	6	Report from CEILAB's Education Division	
2.2 Courses to promote innovation and support educational transformation delivered	Courses	0	2022	3	5	7	9	24		
2.3 Computational thinking certificate course document validated	Document	0	2022	0	1	0	0	1	Validation certificate from CEIBAL board of directors	
2.4 Schools participating in the RGA for implementation of new deep-learning pedagogies each year	Schools	750	2022	750	750	750	750	750	RGA management report from CEIBAL	Participation will be verified via records of schools' voluntary applications and records of training, instructional materials, and assistance for teachers and administrators to implement project-based learning.
2.5 Schools assisted in getting started with implementation of "maker" methodologies (pre-CEILAB)	Schools	42	2022	40	40	40	40	160	CEILAB management report	Assistance will be verified via record of at least one mentorship visit to the school in the past six months.
2.6 Schools equipped with a CEILAB	Schools	20	2022	20	20	20	20	80	CEILAB management report	A CEILAB is a workspace installed in a room at the school, with furnishings and "maker" technologies provided by CEIBAL.

Outputs	Unit of measure	Baseline value	Baseline year	Year 1	Year 2	Year 3	Year 4	End of project	Means of verification	Observations
Administration, monitoring, and evaluation of results										
3.1 Development hours used for continuous improvements and adjustments to the SEA platform for administration of the computational thinking test	Hours	0	0	500	500	0	0	1,000	Information technology management report, CEIBAL	Contributes to R.1.2
3.2 Approved document on the computational thinking skills evaluation instrument, calibrated and available on the SEA	Document	N/A	N/A	0	1	1	0	2	Education Division management report, CEIBAL	Contributes to R1.2
3.3 Software for new versions of the "school monitor" platform made available	Software	0	0	2	2	2	2	8		It will be deemed available when it is ready to be installed in the deployment environment in the CREA platform.
3.4 Pilot initiative for self-diagnostic assessment of digital skills completed	Document	N/A	2022	0	1	1	0	2		Contributes to R2.2
3.5 Reports on evaluations of results and processes	Reports	0	2022	1	1	1	2	5		See the monitoring and evaluation plan for a list of planned evaluations.

MATRIX OF DISBURSEMENT INDICATORS

	Baseline value	Year 1		Year 2		Year 3		Year 4		End of project	
		Target	Amount (US\$000)	Target	Amount (US\$000)	Target	Amount (US\$000)	Target	Amount (US\$000)	Target	Amount (US\$000)
(R1.1) Groups with meaningful access to computational thinking classes in grades 4-6 in urban primary schools	2,314	2,436	2.84	2,558	2.85	2,679	2.90	2,801	2.90	2,801	11.49
(R1.3) Students in the first year of secondary school using program-financed devices, delivered in the current year	90%	90%	1.86	90%	1.86	90%	1.86	90%	1.86	90%	7.44
(R2.1) Students in initial teacher training who passed CEIBAL courses recognized by the CFE	450	550	0.27	750	0.27	1,000	0.24	1,200	0.24	3,500	1.02
(R2.4) Schools in the RGA that improve their capacities for project-based learning through use of the school self-evaluation rubric	225	236	1.69	248	1.69	260	1.72	273	1.74	1,018	6.84
(R2.5) Schools that transition from pre-CEILAB to CEILAB each year as a result of sustained engagement in implementing “maker” methodologies	20	20	0.80	20	0.80	20	0.80	20	0.81	80	3.21
Total			7.46		7.47		7.52		7.55		30.00

The targets are the same as in the previous table.

Country: Uruguay

Division: EDU

Project No.: UR-L1169

Year: 09/08/2022

FIDUCIARY AGREEMENTS AND REQUIREMENTS

Executing agency: Centro CEIBAL

Project name: Generation D: Developing Digital Skills with Equity in the Knowledge Era

I. FIDUCIARY CONTEXT OF THE EXECUTING AGENCY

1. Use of country systems in the operation¹

<input checked="" type="checkbox"/> Budget	<input type="checkbox"/> Reports	<input checked="" type="checkbox"/> Information system	<input type="checkbox"/> National competitive bidding (NCB)
<input checked="" type="checkbox"/> Treasury	<input type="checkbox"/> Internal audit	<input type="checkbox"/> Shopping	<input checked="" type="checkbox"/> Other: The executing agency's procurement system, subject to the conditions described below.
<input type="checkbox"/> Accounting	<input type="checkbox"/> External control	<input checked="" type="checkbox"/> Individual consultants	

2. Fiduciary execution mechanism

<input checked="" type="checkbox"/>	Features of fiduciary execution	Results-based loan, with no local contribution.
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3. Fiduciary capacity

Fiduciary capacity of the executing agency	Since this operation meets the conditions for forgoing the use of the Institutional Capacity Assessment Platform, the fiduciary capacity analysis of the executing agency is based on prior experience and the satisfactory results achieved by CEIBAL. This reflects the fact that CEIBAL has adequate well-developed fiduciary systems in place to ensure that it support execution and the achievement of expected results. No fiduciary risks that might adversely affect execution of the operation were identified.
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4. Fiduciary risks and risk response: No fiduciary risks that might adversely affect execution of the operation were identified. The risk identification and management process will continue throughout the execution period of the operation.

¹ Any subsequently approved system or subsystem may be applicable to the operation in accordance with the terms of the Bank's validation.

5. Policies and guidelines applicable to the program: For financial management: document OP-273-12 or its successor; for procurement: use of the executing agency's procurement system and the policies for the selection and contracting of consulting services, document GN-2350-15, for selection of the consulting team or independent verification firm.
6. Exceptions to policies and guidelines: None.

II. CONSIDERATIONS FOR THE SPECIAL PROVISIONS OF THE LOAN CONTRACT

Special conditions precedent to the first disbursement:
Exchange rate: For the purposes of Article 4.10 of the General Conditions, the parties agree that the exchange rate will be as specified in paragraph (b)(ii) of Article 4.10. Along these lines, the agreed exchange rate will be the rate as of the date on which the borrower, the executing agency, or any other person or entity authorized to make expenditures makes the applicable payments to the contractor, provider, or beneficiary.
Type of audit: The executing agency's financial statements, duly audited by an independent audit firm acceptable to the Bank, will be submitted within 120 days after the end of the executing agency's fiscal year. The last audited financial statement will be submitted within 120 days after the date of the last disbursement or any extension thereof.

III. AGREEMENTS AND REQUIREMENTS FOR PROCUREMENT EXECUTION

☒	Special procurement provisions for the operation	<p>The executing agency's procurement system is deemed consistent with internationally accepted principles, practices, and standards for all procurement methods and allows for bidders from all countries to participate. It will be used to procure goods and nonconsulting and consulting services (firms and individuals). Only the selection of the consulting team or independent verification firm will follow the procedures set forth in the Policies for the Selection and Contracting of Consultants Financed by the Inter-American Development Bank (document GN-2350-15).</p> <p>Procurement processes will be supervised through the program audits.</p>
☒	Single-source selection	<p>Single-source selection will be used for what is categorized as a continuation of previous services, in accordance with paragraph 3.11 (a) of document GN-2350-15. This contract, estimated at US\$60,000, will cover all four verification cycles for the operation (one per year) under the same arrangement as on the previous operation: a single contract will cover the verification of all four tranches (one per year). The consultant was selected through a competitive process under UR-L1141.</p>
☒	Records and files	<p>Centro CEIBAL has a system of filing and recording support documentation for the procurement of works, goods, and consulting services in which it will include the records created through this operation, in accordance with the Bank's procurement policies.</p>

IV. FINANCIAL MANAGEMENT AGREEMENTS AND REQUIREMENTS

☒	Programming and budget	Under the execution agreement to be signed between CEIBAL and the MEF, the former will receive an annual budget allocation. CEIBAL has an updated integrated management system (ERP) that includes a budget module whose structure reflects the nature of execution of the resources it manages, which are basically defined as projects. The loan proceeds will therefore be listed under a project with the corresponding budget record. Both the MEF allocation and the budget execution will be recorded in Uruguay's country's system (SIIF).
☒	Treasury and disbursement management	The loan proceeds will be disbursed to the national single account at the Central Bank of Uruguay and subsequently transferred to CEIBAL's institutional account at Banco de la República Oriental del Uruguay. CEIBAL's ERP has a treasury module that provides traceability of incoming funds in real time and execution of the funds allocated to a project through the use of budget items and separate bank accounts for each project. This makes it unnecessary to open separate bank accounts at CEIBAL to manage the Bank loan. Disbursements will be made once results are achieved, as measured by results indicators and/or intermediate results, and independently verified. The operation does not call for an initial disbursement or retroactive financing.
☒	Accounting, information systems, and reporting	CEIBAL's accounting, which uses its ERP system, is governed by the ordinance issued by the Tribunal de Cuentas [Court of Auditors], the provisions of which are consistent with the International Financial Reporting Standards. The chart of accounts is set up to correspond to the budget items and open projects in the budget module, so that every accounting record will impact the execution of the corresponding budget, subject to budget availability. For purposes of this operation, it is agreed that CEIBAL will establish auxiliary accounts (accrual accounting) for the use of the Bank's proceeds.
☒	Internal control and internal audit	CEIBAL maintains an internal audit department and a control environment focused on systematizing its processes, supported by computerized management systems and internal control procedures formalized and available through its intranet portal. Its internal audit function is tasked with evaluating and verifying the systems deployed for using the financial resources it manages, including those of this operation.

<input checked="" type="checkbox"/>	<p>External control and financial reports</p>	<p>CEIBAL is subject to annual financial audits, performed by an independent audit firm contracted through a competitive process for periods of at least three years. The audit report is submitted to the Board of Directors in the first quarter of each fiscal year for consideration and approval. These audits have always resulted in an unqualified opinion.</p> <p>For purposes of the program, it is agreed that CEIBAL's audited financial statements will be sufficient to fulfill the contractual provision required by the Bank, provided that: (i) the audit firm is deemed eligible by the Bank; (ii) the terms of reference include the Bank's requirements; (iii) international auditing standards are used to audit the financial statements; and (iv) notes are included with the financial statements to provide the information required by the Bank.</p>
<input checked="" type="checkbox"/>	<p>Financial supervision of the operation</p>	<p>Adjustments may be made in view of program execution and external audit reports. The program's progress and instruments will be monitored, disbursement requests will be reviewed, and visits (in-person or virtual) will be made to CEIBAL.</p>

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

PROPOSED RESOLUTION DE-___/22

Uruguay. Loan ____/OC-UR to the Eastern Republic of Uruguay. Generation D: Developing Digital Skills with Equity in the Knowledge Era

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the Eastern Republic of Uruguay, as borrower, for the purpose of granting it a financing aimed at cooperating in the execution of the program "Generation D: Developing Digital Skills with Equity in the Knowledge Era". Such financing will be in the amount of up to US\$30,000,000 from the resources of the Bank's Ordinary Capital, and will be subject to the Financial Terms and Conditions and the Special Contractual Conditions of the Project Summary of the Loan Proposal.

(Adopted on ____ 2022)