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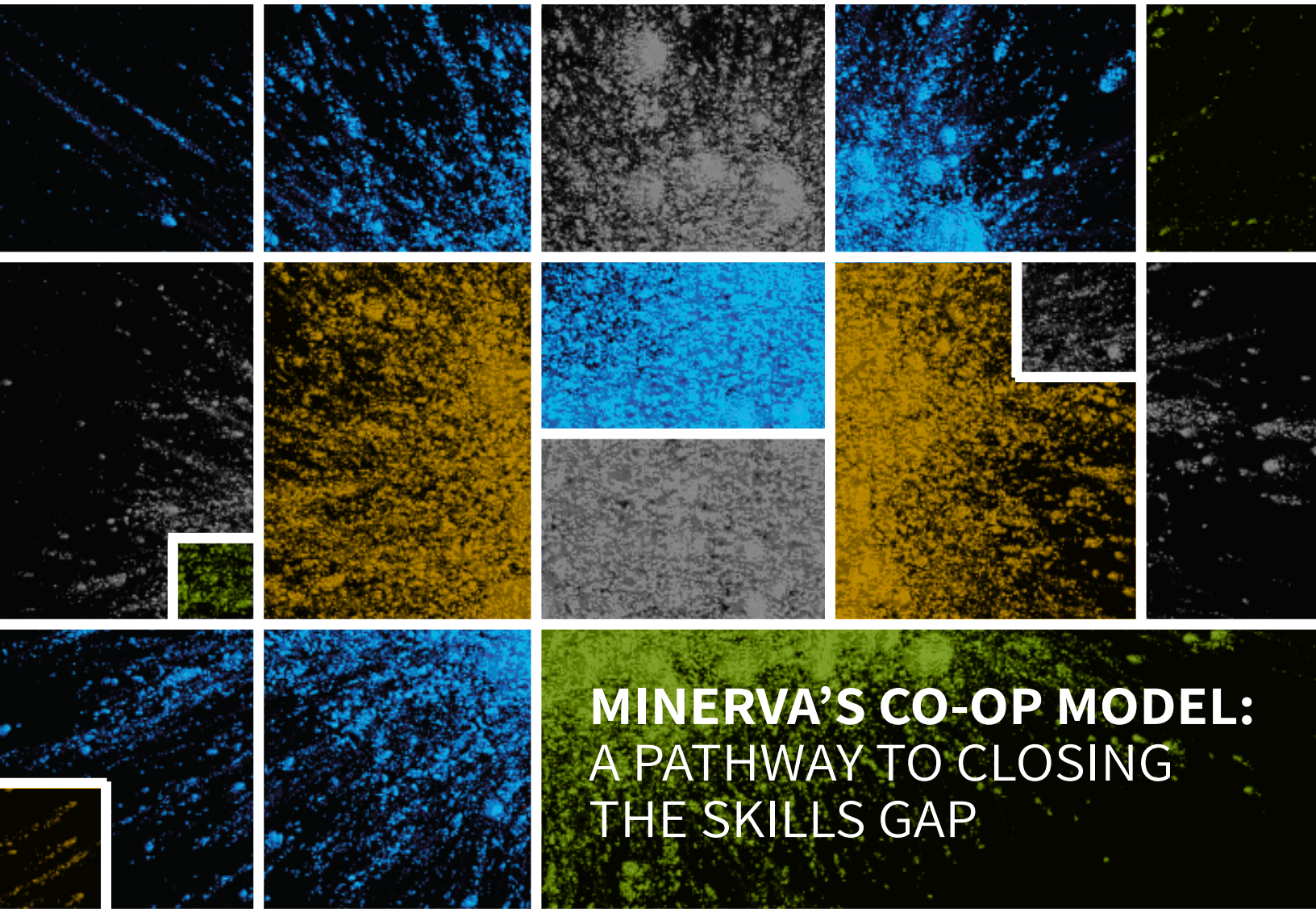

MINERVA'S CO-OP MODEL: A PATHWAY TO CLOSING THE SKILLS GAP

IDB
Inter-American Development Bank

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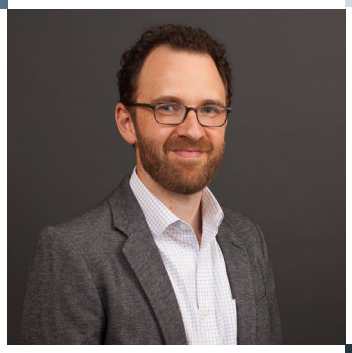

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About Minerva®

Founded in 2011 by Ben Nelson, Minerva is a pathbreaking educational innovator. Its mission, nurturing critical wisdom for the sake of the world, is being pursued in two key ways. First, by providing a premier education to the world's top students, through its flagship Minerva Schools at KGI, it is preparing future leaders and innovators to address the most complex challenges of our time. Second, by building a global network of mission-aligned partners, Minerva is extending its ability to design and deliver future-oriented learning and talent development programs to learners at multiple stages—from secondary school students to undergraduate and graduate degree candidates to working professionals and executive leaders.

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Abstract

Bridging the skills gap is necessary to increase productivity and equity. In Latin America and the Caribbean, this challenge has manifested in high rates of youth unemployment, informality, and inactivity. Traditional higher education has struggled to respond to this challenge, with rising costs limiting access and poor outcomes forcing students to question the value of a university degree. In this paper, we explore a model for collaboration between higher education providers and employers designed to overcome these challenges. In this co-op model, students earn a bachelor's degree in three years, while also working part-time during the second and third years. This model provides students with the foundational skills and knowledge needed to become broad, interdisciplinary thinkers, while also giving them valuable work experience for which they earn credit while pursuing their degree. Economic constraints are addressed by students' degrees being partly subsidized by an employer, who benefits by easily hiring employees who can fill their most critical human resource needs.

1. Introduction

Bridging the skills gap is paramount to achieve inclusive growth

A third of young people worldwide feel their current education system is not preparing them with the skills they will need to get jobs (UNICEF, 2020). In Latin America and the Caribbean (LAC), this is confirmed by high youth unemployment, informality, and inactivity. Even among young adults aged 25-29 who completed tertiary education, fourteen percent are neither in employment nor in further education or training (ILO, 2020). This translates not only to a large pool of untapped talent, but also a threat to individual wellbeing and social cohesion.

Paradoxically, high youth unemployment is set against unfilled vacancies, with companies unable to find qualified candidates to employ. In LAC, companies report their skills needs are left unmet at higher rates than any other region. According to the Enterprise Surveys, 32 percent of firms identify an inadequately educated workforce as a major constraint (World Bank, 2020b). In a McKinsey survey, between 40 and 50 percent of Latin American employers cited a lack of skills as the main reason for struggling to fill entry-level vacancies (Mourshed et al., 2012).

Labor and human capital are two important engines of economic growth. Together, increases in labor and human capital represented two-thirds of Latin America's GDP per capita growth from 1960 to 2017 (Cavallo & Powell, 2018). This is not surprising, given that the region has benefitted from the demographic dividend and increased female labor force participation. The expanded labor force has also become more educated, with educational attainment rising in all countries. However, the channel of raw labor expansion is being exhausted because the population is aging, and gender gaps are closing. The good news is that the region still has ample scope to continue to increase human capital.

The quality and value of education lags behind those of developed nations

Latin America's education system needs to improve markedly to help address this situation. Deficiencies are already large in secondary school. Considering the 2018 Programme for International Student Assessment (PISA), 15-year-old students in the region are, on average, three years behind in reading, mathematics, and science of a student in an OECD country (Bos et al., Viteri and Zoido, 2019). Half of the students in the region do not reach the basic reading proficiency level required. This means that they cannot identify the main idea in a text, find information based on explicit criteria, or reflect on the purpose and form of texts when explicitly directed to do so.

In higher education, LAC countries have dramatically expanded the coverage of their systems, but challenges of quality and relevance persist. Between 2000 and 2018, gross tertiary enrollment rates more than doubled, from 23 to 52 percent. This is the highest rate in the developing world and well above the global average of 38 percent (World Bank, 2020a).

Even though there is a larger pool of graduates from higher education, there is a perception of insufficient quality and value of the education they are receiving. Even in Chile, which arguably has the best educational outcomes in LAC, the literacy proficiency of adults with tertiary education is lower than that of high school graduates in OECD countries (Survey of Adult Skills; OECD, 2019). Lower-quality higher education may explain why the private returns to higher education – the wage premium of university graduates versus high school graduates – have been falling in the region (Aedo & Walker, 2012; Lustig et al., 2016; Rodríguez et al., 2016). But there is evidence of a skills premium, with high-skilled graduates earning more than peers after controlling for characteristics of a degree, such as major and quality (Busso et al., Muñoz and Montaño, 2020).

Additionally, there is a disconnection between the educational system's training and the skills demanded by the labor market. Socioemotional skills, including critical thinking, responsibility, teamwork, and problem solving, are highly valued and rewarded by employers, yet the development of these skills is generally absent from curricula (Busso et al., 2012).

Making higher education affordable is key to more equitable access

The expansion of tertiary education in Latin America relied heavily on private institutions and took place in a context of profound inequalities. Private institutions now account for 53 percent of tertiary enrollments in the region, twice the share observed in the United States (World Bank, 2020a). But in many countries, unlike the United States, the government does not sponsor nor guarantee traditional student loans, and students are required to have a private guarantor to obtain loans.

Though there has been substantial progress, access remains unequal. The poorest half of the LAC population represented only 25 percent of higher education students in 2013 (Ferreyra et al., 2018). The limited public resources for higher education and the increasing role of private institutions in higher education call for a more accessible and efficient funding model.

Brazil exemplifies this challenge. Only 11 percent of higher education students have loans, although 73 percent of the enrollment occurs in private institutions. For many, being able to afford higher education is contingent on having a full-time day job, and 60 percent of students enrolled at private higher education institutions report working (Ferreyra et al., 2018). Unsurprisingly, two-thirds of those enrolled in private in-person programs choose the evening shift, which usually goes from 7 to 11pm. This is also the preferred option for a third of students in public institutions (INEP, 2019). Nevertheless, the intentional connection of study and professional practice is rare.

Even when government-backed loans are widely available, rising costs of tertiary education are a major concern. In Chile, the average tuition fees for a bachelor's degree equivalent is about $7,000 per year, among the highest in the world (OECD, 2018). This represents roughly half of the median family annual income in the country. After factoring in government grants and scholarship aid, the net price that students pay may be significantly less. Nevertheless, students staged massive

protests against crippling student loans and increasing tuition costs in 2011. Free college became a central pledge of Bachelet's presidential campaign, and her government implemented gratuidad in 2016, albeit phased down and more gradually than originally promised[1]. However, universities claim that the government appropriations provided under gratuidad are not sufficient to cover the costs of educating students and fear it may crowd-out low-income students and push those who do enroll in lower-quality institutions (Kershaw, 2019).

Reform is urgently needed, but silos, bureaucracy, and lack of strategic vision conspire against it

Solving the skills, access, and affordability problems in higher education requires bold reform. Expanding coverage based on the current offer or simply creating more financing options will not suffice. There is a dire need for better-designed initiatives that involve the private sector while creating incentives for both schools and students to achieve good results.

Given a rapidly changing workplace, preparing students with a broader base of skills and interdisciplinary studies would provide them more adaptability to employer needs in the years to come. Nevertheless, most institutions adhere to narrowly focused and discipline-specific degree programs. Most colleges and universities are "siloed" along disciplinary lines, with the faculty from different disciplines having little interaction, and students taking most courses exclusively within

1. As of 2020, gratuidad covers tuition costs at participating universities for those in the bottom 60% of the income distribution. Students are not required to meet any test-score cutoffs, as in the government-issued grants and scholarships that gratuidad replaced. The program does not support the cost-of-living expenses.

their major. Even if students across disciplines, there is no coordination between departments or instructors to ensure that foundational skills are developed, or those complementarities are identified across courses. Early specialization compounds the issue. Students are often required to make a major choice at enrollment, when they may be ill-informed about the potential of different tracks, and before they have the chance to explore their interests.

Accreditation systems also have a role to play[2]. They contribute to preserve traditional higher education and serve as barriers to curriculum updates. This includes both accreditation of programs by professional organizations and government regulators, both of which grant approvals based on standards designed to promote consistency rather than innovation or improvement (OECD, 2013; OECD, 2018; OECD 2019). Instead of a bureaucratic review of teaching resources and processes, accreditation should be focused on accountability for student learning outcomes and student success. Some countries grant permanent accreditation to programs (e.g., Uruguay, Honduras, the Bahamas, Paraguay, and Costa Rica) and institutions (e.g., Mexico and Venezuela) based on rigorous processes, inputs, and acceptances, rather than outputs and outcomes (Ferreyra et al, 2018). This means institutions with poor track records when it comes to retention, time to degree, and employment outcomes upon graduation, remain accredited, while promising new models face obstacles to securing approval, because they innovate rather than persisting with traditional curricular structures. The traditional division of responsibilities in training between the Ministries of Labour and Education adds to this mismatch, hindering more flexible arrangements integrating higher education institutions and employers.

Unfortunately, the higher education system lacks reliable mechanisms for coordination and articulation. Given intense competitions to maintain revenue from student enrollments, universities have few incentives to collaborate with each other to promote substantive change and reform. Without a strategic vision and leadership, the system will not change itself. Thus, responsibility for change and innovation should not be placed solely on the existing institutions. Otherwise, it is unlikely that higher education institutions will reform themselves and the system with their traditions, interests, and governance systems.

Innovative delivery models are needed to improve skill acquisition and youth employability

Latin American businesses are open to taking an active role in education. 43 percent of respondents in the Enterprise Surveys reported they currently offer formal training to their employees to alleviate the skills gap (World Bank, 2020b). This can take many forms. In one extreme, companies chose to do everything internally and developed corporate universities to deliver continuing training to employees. Those programs usually do not deliver formal degrees and are not accredited. On the other end of the spectrum, companies contribute to tuition as a retention strategy and performance incentive, with little or no inference in the degree or curriculum (education as a benefit).

2. There has been ongoing efforts to facilitate recognition of higher education qualification across countries and to interlink accreditation systems in LAC - such as the Regional Convention on the Recognition of Studies, Diplomas and Degrees in Higher Education in Latin America and the Caribbean 2019 (UNESCO-IESALC).

We argue that we can better serve both student and employer needs in an alternative path forward: education institutions' partnership with corporations. By partnering with education institutions, corporations could further leverage the resources employers dedicate to formal training in the form of money, time, and people. These partnerships can create programs that are better aligned with employer demand, better train students, and reduce the overall cost of higher education.

In the following sections, we explore a model for collaboration between higher education providers and employers designed to overcome the challenges described so far. In this co-op model, students earn a bachelor's degree in three years, while also working part-time during the second and third years. This model provides students with the foundational skills and knowledge needed to become broad, interdisciplinary thinkers, while also giving them valuable work experience for which they earn credit while pursuing their degree. Using a blended approach that integrates synchronous virtual courses with in-person, experiential learning, the approach provides a scalable educational model. This model is based on the curriculum, pedagogy, and delivery platform that we use at Minerva. Economic constraints are addressed by students' degrees being partly subsidized by an employer, who benefits from preparing cohorts of future employees who can fill their most critical human resource needs and receiving valuable contributions from those employees as they learn.

2. Characteristics of a Solution

What features should a better system of undergraduate education have?

First, the system must be designed to achieve the educational goals it sets out for students. Far too many higher education institutions appear to serve the interests of other stakeholders (e.g., donors, administrators, faculty, or governments), while failing to raise students' educational performance (Arum, 2011). In the United States, large expenditures on buildings, athletic programs, and supporting research do little to promote student learning. In LAC, research remains concentrated in a select number of universities, mostly public (Balán, 2012). However, private providers exhibit high marketing and outreach expenses. At Kroton, the largest higher education conglomerate in Latin America with 840 thousand enrolled students, the sales and marketing expenses are equivalent to 40% of the cost of providing goods and services, which include expenses with faculty, operations staff, and rent (Cogna, 2020).

Second, the system must be designed to meet the economic goals of students, employers, and the broader society. A highly-skilled workforce is a driver of economic performance, but there is a wide variation in tertiary institutions' ability to foster relevant skills in its students. Specifically, the universities should be evaluated on, among other things, the economic value created by their graduates, which can be measured in terms of employment outcomes and average earnings.

Develop the right cognitive tools for job readiness

Students should leave undergraduate education with the cognitive tools to analyze complex problems, and to know how to learn what they do not already know to solve those problems. Narrow vocational training can only prepare students for their next job. But over time, the jobs and industries that exist will change. This means that students should develop a set of cognitive tools that are broad, interdisciplinary, and transferable to a wide range of subject areas.

At Minerva, where we teach and work, these foundational skills are known as 'habits of mind and foundational concepts'. Minerva Schools at KGI's curriculum was designed to develop practical knowledge, defined as 'knowledge one can use to adapt to a changing world' (Kosslyn et al, 2017, p. 19). This practical knowledge is constituted by four core competencies—thinking critically, thinking creatively, communicating effectively, and interacting effectively. Each of these four core competencies involves different skills and habits. Nested under each of those competencies are a set of habits of mind and foundational concepts, each of which is applicable in two or more disciplines and which is derived from research or best practices in those fields.For example, one of the key concepts students are taught involves distinguishing between causation and correlation. Mastering this concept is necessary for analyzing inferences, which is one part (but not the only) of critical thinking. Each of these habits of mind and foundational concepts are introduced in a mandatory first year of education, which is then built upon in subsequent years.[3]

Further study deepens and broadens students' understanding of foundational, interdisciplinary skills while also adding additional scaffolded academic material to their broader cognitive toolkit. In their continuing coursework, students can develop and refine their ability to engage in causal inference, applying these skills in the discipline-specific fields. At Minerva Schools at KGI, these are the fields that fall under the schools five colleges: arts and humanities, business, computational sciences, natural sciences, and social sciences.

Students must engage with the world to learn to solve applied problems

To connect these cognitive tools to the ability to problem solve, both academic content and extra-curricular experiences must be designed to allow students to practice applied problem solving. For example, students might be tasked with using design thinking to reduce the level of pesticides used in large scale agriculture. This helps students learn the skill of design thinking, and apply it to a particular, tractable problem in the real world. Extra-curricular experiences might place students in a partnership with farmers who experiment with agricultural methods that use little or no fertilizer while attempting to achieve similar yields. Such experiences should be designed by staff with awareness of the skills and concepts students are studying in their academic coursework, and faculty members can coordinate assignments and other academic work with experiential learning opportunities to create an integrated and cohesive learning opportunity for students.

In addition to the cognitive tools that should be introduced in the foundational first year and broadened and deepened in subsequent courses, applied problem solving, and meaningful extra-curricular experiences, students must learn to effectively interact with others. Nearly every

3. See Appendix I for a complete list of habits of mind and foundational concepts.

profession requires working in teams and understanding social dynamics to succeed. In addition to explicitly teaching relevant foundational skills and concepts in the first year (such as cognitive biases, power dynamics, and emotional intelligence), students should be placed in situations that allow them to continue to develop their ability to effectively interact with others. In classrooms, this can include small group discussions, group-based assignments, and peer review. Outside the classroom, this can include small group extra-curricular activities and, in the second and third years of the co-op model, rigorous professional experience. Students can be held accountable for this experiential learning through feedback from partners and managers of their professional placements, as well as academic work that prompts them to reflect on what they are learning through the application of their academic studies to their professional work.

Instruction must be based on the science of learning

While it is important to identify the right things to teach students (foundational knowledge that can be applied across contexts to solve complex problems), it is also necessary to find the right way to teach students. The science of learning has established some basic minimum requirements for humans to learn. First, active learning pedagogy significantly outperforms lecturing and other methods of passive information transmission in producing learning gains for students (Freeman et al., 2014; Deslauriers et al., 2019).

This means lessons must be designed so that learning basic facts and techniques occurs outside the classroom, while valuable class time with other students and the professor can be devoted to actively using and applying newly acquired material. For example, at Minerva Schools at KGI and many of Minerva Project's partners, students may have an hour or two of pre-class reading, and another hour of pre-class work that involves analyzing or applying the material covered. Students may read a paper on a particular theory of jurisprudence, and then apply that theory of jurisprudence to a given court case for pre-class work. They arrive in class with a document open (which is also submitted during an in-class poll) ready to share their analysis of how the case should be evaluated by the courts, and during in-class activities present and debate their analysis and compare and contrast it with the decisions arrived at by other students.

Second, deliberate practice at a desirable level of difficulty, followed by formative feedback, increases learning over cramming for high stakes exams that produce little or no opportunities for feedback and growth. This means that students must be given multiple opportunities, spaced over time, to practice and develop their skills, receiving feedback that helps them improve. This is in contrast to the common practice of working through a textbook, acquiring information only once, and then only receiving practice on a final test or assignment.

Third, students must be given the opportunity to transfer learning across diverse contexts. For example, a student might be introduced to the basic phenomenon of regression to the mean in a statistics course that involves quantitative reasoning. But they might then be asked later to invoke regression to the mean in a different context, such as in a business course that assesses stock market performance over time. Being able to transfer the knowledge that is already stored in their long term memory both improves their understanding of the concept and makes it usable for the future diverse contexts in which they will find themselves--their professional and personal lives will indeed require such transfer of the foundational skills and concepts they have learned.

These principles (and more) can be built into the very heart of a coop model of education, which by definition encourages knowledge transfer in different contexts, provides opportunity for feedback on student performance, requires students to 'do' rather than 'receive', and provides appropriately difficult learning opportunities.

Use technology to create scalable, accessible classroom opportunities

Each of the above educational goals can be achieved, to a significant extent, using in-person teaching in traditional classrooms. However, the continued (but uneven) spread of high speed internet access across Latin America and the Caribbean and the decreasing price of sufficient quality computers open up opportunities. Teachers can leverage technology to create scaled, active learning classrooms that are much more accessible and scalable than in-person facilities.

Virtual classrooms, including the flipped virtual classroom we teach from (Minerva's Forum™ learning platform) provide opportunities for using active learning techniques at scale. Students can answer polls, work together in breakout rooms, respond to instructor prompts in chat, use emoticons to respond to in-class activities, and can code, compute, compose, debate, design, analyze, evaluate, and more.

Depending on the size of the institution involved, curriculum can be designed to sort students into the level at which they are currently learning. This targets the appropriate level of difficulty to the student, allowing them to learn faster. It also allows educators to avoid having to teach across an extreme range of competencies, and better focus activities.

The second advantage of virtual, active classrooms is their ability to allow students to access high-quality learning experiences from diverse geographic locales without incurring the sometimes high-cost burden of leaving home and paying additional room and board. Students may enroll from anywhere as long as they have an adequate computer and internet connection, meaning that their kitchen table or the local coffee shop may be adequate space from which to take live classes. This may improve access to higher education for students who could find a way to finance tuition fees but would find the room and board associated with in-person campuses prohibitive or have work or caring obligations that keep them from leaving for in-person learning.

Highly interactive, instructor-led classes can then be supplemented by rigorous preparation and practice in advance of class time. In the institution where we work and teach, students spend about 2 hours out of class time preparing for class or working on assignments based on the class material for every hour they spend in class. When students flip all of the information acquisition outside of class time, time spent with your instructor focuses on applying, refining, and developing the skills students have learned outside of class.

Students should graduate with the skills to succeed in the labor market

Students should graduate with the cognitive, emotional, and social skills needed to flourish in the labor market. As noted above, employers report widespread inability to find and hire the talent they need, creating a drag on firm performance. Students should acquire and refine the skills needed to quickly succeed in the labor force.

Students should also have high graduation rates and face lower attrition than they currently do. Although LAC has greatly expanded enrollment in higher education, only 50% of students complete their degrees (Ferreyra et al., 2018).

Employers should be able to quickly identify employment-ready individuals

Employers spend time and resources identifying suitable candidates for needed positions and training those newly hired individuals. Reforms to higher education should increase the number of workers with the relevant skills and talents that are needed, while lowering the cost and difficulty to firms in identifying and training those individuals. If possible, employment and study can be combined, so that a student applies skills in the workplace that are developed in the classroom. For the skills gap to close, it is necessary to both produce graduates with the relevant skills, and make them easily match with employers who need those skills.

Students should face a reasonable debt burden *(or societies should face reasonable outlays to tertiary education)*

Students, their families, and their governments should pay a reasonable price for undergraduate education, leaving school with manageable (or negligible) debt burdens that can quickly be repaid by entering well-compensated employment. In countries where students and their families are primarily responsible for financing their education, students must be able to graduate without an excessive financial burden for student loan repayment.

In countries in which governments heavily subsidize or fully fund higher education, governments should have reasonable expenditures for learning that is generated, given the other pressing educational needs many countries face in early childhood, primary, and secondary education. Education funding constitutes an increasing share of government expenditure, while students in LAC remain far behind their peers in OECD countries. For example, in the OECD, 15% of students taking the PISA achieved advanced levels in math, reading, or science, while the comparable figure in Latin America is 1.5% (Bertoni et al., 2018). Indeed, to have students who can take advantage of higher education to develop the skills needed by employers, it is necessary to boost students' performance at younger ages. If funding for higher education takes a disproportionate share of publicly available education funding, this deters the ability to produce students prepared to enroll in a university.

3. Co-op Models of Undergraduate Education

Co-op models, which combine academic study with work experience, have the potential to blend the pursuit of a degree with meaningful work experience to close the skills gap and provide better pathways from college to jobs. In this section, we discuss the origins and limitations of traditional co-op models. Then, we will present our proposed model that overcomes the limitations of traditional models.[4]

Origins and limitations of the traditional co-op model

Co-op models are not new. In the United States, the model was pioneered by the University of Cincinnati in 1906, inspired by earlier British experiences. About 50 years later, the University of Waterloo created the first Canadian, and arguably the most well-known, cooperative program. Both were engineering programs, and they were used as models for many other universities implementing co-op tracks in their engineering degrees (Haddara & Skanes, 2007), including in Latin America.[5]

Engineering education was particularly amenable to the development of the co-op model to bridge the gap between theory and practice and meet the new developments in industrial needs, as the discipline tends to require hands on experience which employers are able to provide. Thus, existing co-op models, embedded within traditional degree programs, focus primarily on disciplinary knowledge and do not focus on teaching 21st century skills, an important limitation.

Two co-op models currently exist. The first alternates periods of academic coursework with periods of full-time work successively until the end of the course. In the second model, study and work happen in parallel. Both models imply different ways of arranging placements and assessing the value of the internships to each student and each host organization.

Being able to change employers at each cycle of work experience can allow students to test out jobs and industries of potential interest before graduating. However, there are limitations to traditional co-op models. First, the short nature of the work relationship may limit the ability of students to grow on the job, as they have less time to acquire skills and may be less likely to be involved in shorter term projects. Second, it can make participation less attractive to employers who do not get long term employees. Most traditional co-op programs simply conjoin degree programs with paid or unpaid internships, rather than creating opportunities for deep integration between students' academic learning and opportunities for applied practice in a real-world environment.

4. This model is based on the interdisciplinary and experiential educational model developed at the Minerva Schools at KGI, but has not been fully implemented there. The first full version of this program will be delivered in a partnership between Minerva Project and Paul Quinn College (see https://pqc-edu.squarespace.com/urbanscholars).
5. Examples include: Universidade de São Paulo (since 1989), Universidade Federal de Santa Catarina (since 2001) and Universidade do Estado do Amazonas (since 2003)

Finally, many co-op programs neglect the broad, interdisciplinary education that is characteristic of liberal arts universities, which prepare students in a wide range of skills for the rest of their work, personal, and public lives.

The proposed co-op model and its structure

An alternative co-op model combines an interdisciplinary curriculum based on the tools and mindsets students need for the 21st century economy with opportunities for professional work experience that allow students to practice the knowledge and skills they are acquiring.

Secondary education in Latin America often leaves many students unprepared for tertiary education. An effective co-op program must address gaps in student preparation before attending college. Students begin the program in person on the partner campus by taking preparatory courses designed to train and empower them with fundamental tools that are critical to their future success in their education and employment. Table 1 describes three courses designed by Minerva to provide this preparation - Strategic Learning and Growth; Expressive Clarity and Applied Quantitative Thinking.

Table 1 - Bedrock courses taken during the first semester

Strategic Learning and Growth	This course provides tools for students to reflect, plan, and act in ways that will allow them to learn new skills and reach goals more effectively. Students study key scientific findings related to learning and executive functioning and practice creating habits that promote self-awareness, knowledge acquisition, efficient planning, and careful decision making. The course will focus on instilling a growth mindset and developing practical strategies for engaging in continuous cycles of reflection and learning.
Expressive Clarity	This course focuses on clarity and style in communication. Students develop an understanding of why great writing and speaking matter and learn how to use effective word choice, phrasing, sentence structure, and tone across a variety of mediums.
Applied Quantitative Thinking	In this course, students study topics in mathematics that are directly applicable to daily life. A key goal of the course is for students to develop intuitions about how to use mathematics to solve concrete problems, as opposed to just memorizing formulas or procedures to pass an exam. Students come away from this course with the knowledge and confidence to tackle real-world problems using mathematical tools and strategies.

Following these courses, students begin an intensive general education program during the two subsequent terms. This systematically introduces and synthesizes nearly eighty Habits of Mind and Foundational Concepts that Minerva has identified as the core skills students need to learn how to apply across contexts and domains. These learning outcomes are taught using thematically orientated Big Question such as "Why do people commit crimes?" and "How do we feed the world?" which provide context for practical applications and introduce students to a wide variety of interdisciplinary problems. The courses and the topics covered in each course are described in Table 2.

Table 2 - General education courses taken during the second and third semester

Critique and Communication *(Semester 2)*	From the languages we speak to the images we see, our world is layered with information. To communicate effectively, we need to learn how to analyze these layers, see how they are organized, and understand how they will be perceived by different audiences. Learning to take critical perspectives improves our ability to weigh evidence, evaluate decisions, and craft persuasive, well-supported arguments. In this course, students learn to extend the principles of close reading and careful writing to a wide range of written and multimedia communications.
Applied Creative and Critical Thinking *(Semester 2)*	Logical reasoning, problem solving, and recognizing and mitigating cognitive biases are among the most fundamental skills that facilitate effective work in any area. In this course, we systematically practice these skills, learning to apply them to concrete problems across domains. Students will gain a foundation in critical and creative thinking upon which they can build expertise in disciplinary knowledge.
Systems and Society *(Semester 2)*	This course focuses on effective engagement in social systems. Students will examine social interaction through the lens of complex systems theory, which provides a powerful framework for understanding human behavior and group dynamics. Students learn to recognize that they are embedded within many different complex social systems, and they apply their understanding of these systems to analyzing and improving social interactions.
Statistical Intuitions and Applications *(Semester 2 & 3)*	In this course, students learn how to use probability and statistics to extract useful information from data, including identifying the correct tool to be used for a given application and set of assumptions, along with interpreting the results. Students learn how to represent a problem formally by identifying the variables and parameters and then creating a model that uses relevant data to address the problem. Students investigate the use of descriptive statistics to describe data and consider the uses and misuses of correlation models. This is followed by an examination of probability and probability distributions, focusing on how to use them to make inferences about populations from samples. We conclude by studying Bayesian statistics and inference as a framework for thinking about problems and prediction probabilistically.

Deriving Insights from Evidence *(Semester 3)*	Students in this course learn to combine creative and critical thinking to quantitatively apply methods used in the natural and social sciences. Students learn to frame problems effectively, develop and test hypotheses, and derive insights from empirical evidence. Students will dig deeply into different types of data; comparing cases in which direct manipulation of the phenomena being studied is not possible (such as observational studies, case studies, and surveys), and cases in which variables are manipulated to different degrees (such as randomized controlled medical trials and quasi-experiments). We emphasize the tenets of good research design, strengths and limitations of different design types, quantitative methods to validate data, and the generalizability of inferences drawn from distinct study designs.
Interpretation, Communication, and Design *(Semester 3)*	To communicate effectively, one must be able to convey the result of one's thinking to others in a compelling manner, and to persuade them to adopt the same or similar views. Humans organize and interpret what they see and hear according to certain principles. Everything from sophisticated art forms to everyday gadgets must take these principles into account in order to be successful. Knowing these principles enhances our ability to evaluate a wide range of products from films and video games to material objects. Applying them enables us to create high quality multimodal and multimedia communications. In this course, students will learn to interpret and create communications from written essays to presentations to artistic works based on the principles of verbal and nonverbal expression and design.
Systems and Strategic Leadership *(Semester 3)*	Building on Systems and Society, students use their knowledge of complexity in social systems as a basis for learning tools for interpersonal and group engagement, including strategy development, negotiation, and leadership. By synthesizing knowledge of complex systems with techniques for influencing individuals and groups, students learn how to interact effectively within and across groups and organizations.

In addition to their academic coursework, first-year students engage in experiential learning to provide students with professional and practical guidance to help them prepare for employment opportunities following the first year. This curriculum covers topics from professional dress and etiquette to writing a resume and preparing for an interview. This co-curricular program provides real world applications for the habits and concepts learned in the formal curriculum while practicing a large array of skills required to be effective in various professional situations. Students are evaluated through a combination of self-assessment and feedback from coaches and mentors, and participation and successful passage of the program is required to participate in the co-op component of the program.

Students who maintain a strong academic record as well as demonstrated mastery in the co-curricular program are invited to rank their preferences for placement options, and will be matched with employers. Companies do not interview students directly, rather they determine the criteria for selection by assigning relative weights to the first-year courses or specific competencies. Those two inputs, from students and companies, are used in a matching algorithm to determine the cohort's placement. Candidates who do not meet the thresholds may continue their education in a non co-op track at the same or another institution, with full transfer of credits earned.

In the second and third years, co-op students undertake part-time employment with a company, government, or non-profit organization that is sponsoring their degree, while continuing their academic studies. The sponsoring employer provides the student with a small stipend to help cover living expenses, and contributes to the cost of tuition. Students work 20 hours per week in a role appropriate to their academic interests and course of study.

Students continue their academic work during this time, completing academic credits in addition to credits earned as part of their employment in the program. Universities may offer students one or more major subjects to focus on, which provide depth to their studies. Interdisciplinary concentrations that further expose students to methods from fields, such as business, engineering, psychology, and economics, provide a strong complement to their professional work.

Courses are delivered in an efficient, scalable manner allowing distributed cohorts of students to be instructed by a campus-based or remote faculty member. Students take a seminar during the first semester of their second year to share and reflect on the connections between their studies and their work placement, and finish their degree by completing a final project that synthesizes their academic studies with the professional work they have undertaken through their co-op experience.

The integrated co-op model is structured as a three year long, year-around study. That is, students enroll in three fourteen-week terms per year, with two to four weeks of break between each term. Credit earned for academic work related to their professional placements, as well as the program's year-around nature, allows students to complete required credits to complete their degree in three years while completing the same number of credits as a four year course of study.

4. Benefits and challenges of implementing a co-op model in LAC

The importance of creating quality education and training programs for youth that help them transition to decent employment is recognized in several targets of the Sustainable Development Goals (SDGs)[6], a call for action by all countries. In Latin America, the co-op model of education could provide significant benefits to employers, higher education institutions, and students—described in detail in this section. We also cover some key challenges associated with its implementation.

Benefits for the employers: access to a talent pipeline at lower hiring costs

Companies spend a significant amount of money on hiring new employees. The average U.S. employer spends about $4,000 (SHRM, 2016) and 24 days to hire a new worker. Time to hire is longer in Brazil and Mexico, 40 and 31 days, respectively (Glassdoor, 2017). Talent acquisition is more than the cost per hire - there are also costs of getting a hire wrong.

Talent acquisition costs are significant enough in Latin America that Revelo, a human resources technology startup, built a business model of providing matching candidates to companies. Revelo screens and interview candidates in exchange for a success fee equivalent to two monthly wages of the position if the hiring goes through (Revelo, n.d.).[7]

The benefit of the proposed co-op for employers relies on the same principle. Companies outsource the matching to the education provider, providing specific criteria and skills that are used to find adequate students among the pool of rising sophomores. Interests of the co-op and the recruiter are fully aligned—the co-op is accountable for ensuring the high quality of students and their career-readiness. Otherwise, the continuity of the partnership is threatened.

Because of the nature and value of the first year program, student employees are prepared to think critically, collaborate, and develop innovative solutions to challenges, and can add value on day one of their employment. After the placement, the employer pays the tuition costs of the sponsored student for their second and third year, which can be interpreted as a success fee as well as an investment in further training. The student is not viewed as cheap internship labor, rather as a new recruit that the company wishes to invest in and retain. Employers will have the opportunity to hire students into full-time roles upon graduation who already have two years of experience in the company and work function.

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6. See Appendix II for details.
7. Firms and candidates do not pay to participate. Revelo has a selective filtering process that admits only about 5% of prospective candidates into the platform. Companies pay the success fee if the hiring is concluded, with a 90-day guarantee during which, if the employee is terminated, the company can retain the credit for a new hire. Revelo focuses on careers such as Business Administration, Business Intelligence, Design, Finance, Information Technologies, Marketing, Programming. (Revelo, n.d.) (see: https://revelo.zendesk.com/)

Some countries in Latin America have initiatives to promote the hiring of young workers without prior experience by providing subsidies for wages or social security contributions or tax breaks. Examples include Chile's Youth Employment Subsidy, Mexico's Ley de Fomento al Primer Empleo, Uruguay's Youth Employment Law, and Brazil's Apprenticeship Act. These policies would add to the benefits for the employers in those countries.

Ultimately, the cost to employers is not substantially higher than costs already paid for entry-level labor, but the benefit is considerably greater. It allows them to access at low cost a pipeline of well prepared employees who have been trained in disciplines that prepare them for critical jobs and who have also learned the soft skills required to be work-ready upon employment. It also allows employers to encourage employees to integrate their work experiences into their course of study.

Benefits for the higher education institution: attraction, retention and asset utilization

New program openings play a critical role in the expansion of students' options, as well as in higher education institutions attractiveness. Having a diversity of student programs can be a driver of student interest and the co-op model can be a differentiating factor in a highly competitive market. The relationships developed with sponsoring employers for the co-op could also spillover to placement of students from the non co-op programs.

Another key advantage for universities is getting a better utilization of campus facilities, given the year-round nature of the co-op program. With classes in the second and third year being taught online, an increase in enrollment can be supported without any new buildings.

Lastly, the co-op model can counteract a major problem faced by private higher education institutions: retention. With many students dropping out because they can not afford to continue their education, a more sustainable model for students would also mean better retention and a more predictable revenue stream for education providers.

The ideal university partners to implement this co-op model are those who are under pressure from their constituents, including students, faculty, employers, government, to better prepare students for their professional futures. Universities in which a large share of the student body who already works part-time may identify more immediate benefits.

Benefits for the students: pathways from college to jobs

Students will benefit significantly from this program, which offers an undergraduate degree, substantive work experience, and systematic training in practical skills and knowledge that will allow them to adapt when their job functions continue to evolve as the world changes.

Financially, the co-op model is very attractive for students. Since employers sponsor tuition during the second and third years, students only have to finance the first year of their degree. Traditional student loans and financial aid provided by or supported by the government are natural options in countries where they are available.

Another promising option involves partnerships with private providers of income-contingent loans (ICL), which peg repayments to graduates' earnings. Because debtors do not have to pay when they experience poor financial outcomes, it has features of an insurance system for students. Originated in Australia, this model is already present in some LAC countries.[8] In some arrangements, the educational providers share the risk with the loaners and are held accountable for student outcomes, an option that could be explored.

Arguably, the largest benefit for the students is the clear pipeline to employment after graduation it provides. At graduation, students have already accumulated two years of work experience inside the sponsoring organisation, and have developed a related Capstone project. This gives the students an opportunity to showcase their work and have a successful launch into their careers. This could be re-hiring at the firm where they had been working, or a new position based on their extensive work experience (in comparison to similarly situated peers).

At the end of their first year, only students who meet certain performance thresholds continue in the co-op program and are placed in employment. Candidates that do not meet the conditions would nevertheless have the option to continue their studies for one additional term to obtain an Associate Degree, or for longer to obtain a traditional Bachelor Degree from the same or another institution. The time and tuition spent invested are not lost, as all credits would be fully transferable.

8. Created in 1989, the Australian Higher Education Contribution Scheme (HECS) has graduates only making payments for their college educations when they reach a minimum salary, being progressively charged 4-8% of their earnings. In Latin America, the for-profit provider Lumni offers ICLs in Colombia, Peru, Mexico and Chile since 2002 (For more information, see: www.lumni.net).

Main challenges relate to equity, minimum efficiency scale and regulation

Ensuring that the co-op model is equitable and inclusive requires both the higher education institution and the participating employers to proactively do what they can to counteract pre-existing social and economic inequalities which may make it easier for some students to take advantage of the program. First, the program must actively tackle inequalities in job-preparedness amongst an entering cohort, including through extracurricular programming that provides students with relevant skills in project management, professional communication, and interpersonal relations to make their first year on the job a success.

Second, if scalable technology (like Minerva's Forum) are used to deliver virtual classes across a wide geographic region (that is, beyond the walls of the existing institution's physical campus), the institution must ensure that students have adequate computers and access to internet connectivity to successfully participate in the virtual classroom. This challenge can be met by proactive administrators. For example, including in student fees a commitment to provide a new computer that can be paid for overtime via existing student fees, or working with students at the end of their first year to identify suitable locations from which to take class in their second and third years as they engage in virtual learning, or providing special financing to boost internet speeds in the second and third years, might all be necessary to ensure that students are not disadvantaged based on their geographic location or available technology.

The initial outlay of costs to establish and commence a co-op model may deter some higher education institutions from pursuing this model. But such resistance would be short-sighted. While the program will involve startup costs (in curriculum design, licensing relevant software, staffing needed program managers and admissions officers, marketing, and more), these costs should over time easily pay for themselves as a new stream of students (and hopefully one that makes more efficient use of capital resources with lower volatility due to fewer dropouts).

Relatedly, the co-op program must recruit a sufficient number of students in the early years to make the program economically efficient. If you recruit too few students, the fixed costs associated with the establishment of the program won't be covered by the new tuition revenue. Successfully recruiting sufficiently large initial classes is necessary both to cover the costs of establishing the program and to maintain relationships with employers whose involvement will only be worthwhile if they can maintain a sufficient pipeline of new employees.

Just as one must establish a sufficiently large class of students, you must also commence with a large and diverse set of employers eager to commit to co-op students. In order for the matching at the end of the first year to be meaningful, there must be a sufficiently wide and varied set of positions such that students find work they can do and employers can find the right employees from the cohort of available students.

Appropriate government regulation is necessary for the success of the co-op program. Accreditation regimes, initially designed to ensure the integrity of academic degrees, have in many jurisdictions become a barrier to innovation, not least because new entrants or new programs struggle to gain accreditation until proven successful. (At Minerva Schools at KGI, we partnered with an institution, the Keck Graduate Institute, which already held accreditation and has the foresight to anticipate

the value of a new educational institution that would be built from the ground up using scalable technology and curriculum designed based on the science of teaching and learning.) Many existing accreditation regimes make it very risky for both students and the institution to proceed without institutional imprimatur. Governments eager to help close the skills gap, reduce time to graduation and associated drop out rates, and ease student debt burdens must act to ensure degrees conferred via the co-op model are granted official recognition.

One final obstacle is the general institutional inertia and reluctance to change that is widely but not universally present across higher education. In many ways, universities and colleges have been slower than their peers at lower levels of education to change methods of teaching to respond to the discoveries in the science of learning. You are unlikely to find long powerpoint lectures in primary education, because students would quickly tune out. Still, somehow these outdated ideas of what teaching and learning continue to persist in tertiary education. The co-op model described above, leveraging new technology, building interdisciplinary skills that should prepare students for the wide variety of jobs they are likely to do after graduation, requires bold thinking which challenges established paradigms, and indeed may challenge existing constituencies.

5. Concluding Remarks

There is a mismatch between the skills sought by employers and the skills that job seekers possess, and bridging this gap is paramount to achieve inclusive growth in Latin America. Higher education institutions should upgrade their curriculum and teaching methods to better prepare their students for a complex and changing world. And tertiary education systems must enhance their effectiveness to become more equitable and affordable, given limited public resources.

We have explored a model for collaboration between higher education providers and employers designed to overcome these challenges. By blending the pursuit of a degree with meaningful work experience, the co-op model described above offers students pathways from college to jobs, providing them with the foundational skills and knowledge needed to become broad, interdisciplinary thinkers. Employer tuition subsidies can make opportunities for students more accessible—while employers benefit from access to a talent pipeline at low hiring costs.

While this approach is not a panacea, nor do we believe that there is only one model for reforming higher education and closing the skills gap, the approach we discuss here has the advantage of aligning the interests of students, universities, and employers. By removing inefficiencies—such as the mismatch between the knowledge and skills students gain in college and those needed for 21st century jobs and the high cost of identifying and recruiting talent—the Minerva co-op model can bring much needed improvements to the college to employment pipeline.

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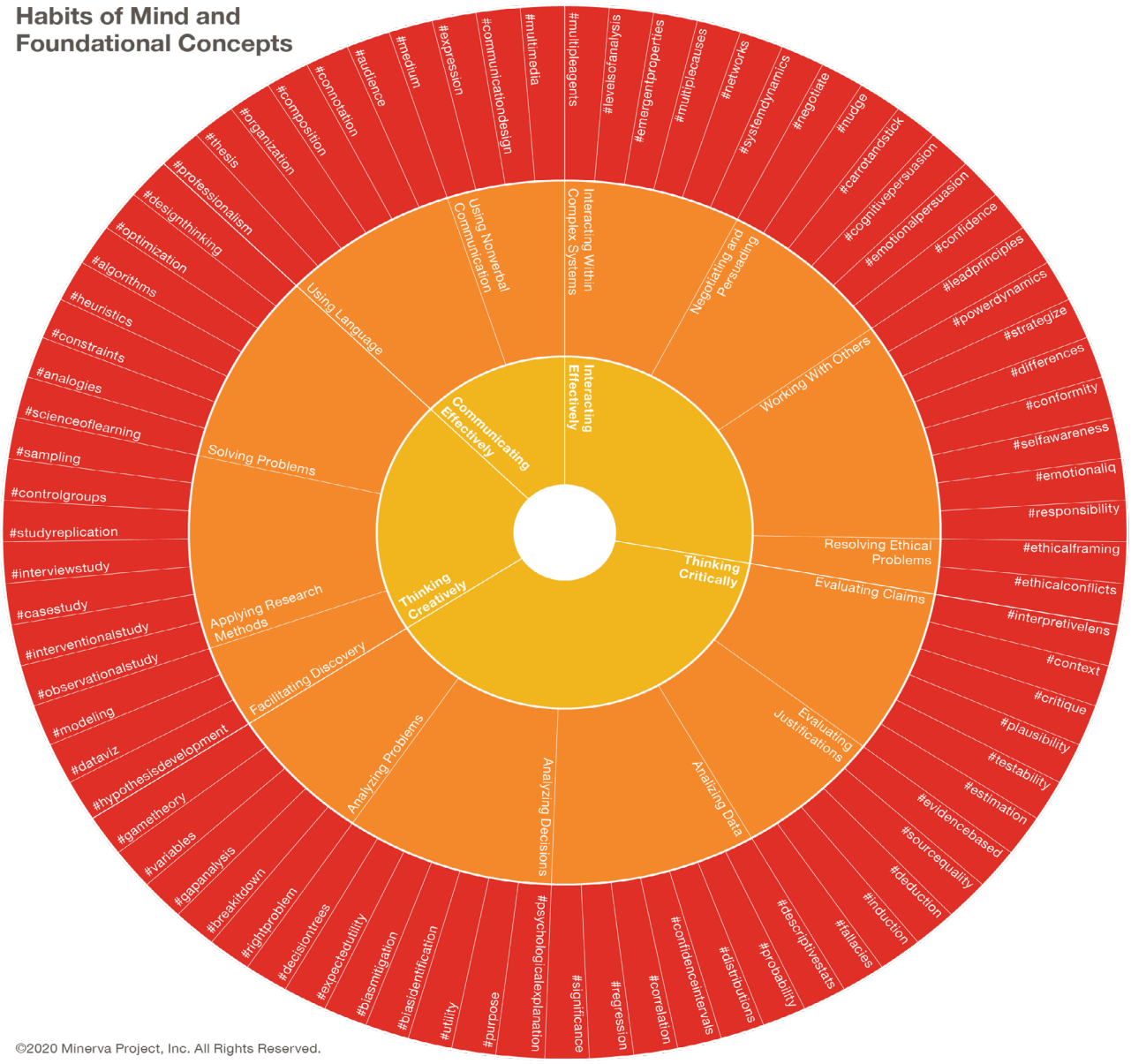
Appendix I -

Minerva's Habits of Mind and Foundational Concepts (HCs)



Appendix II -
Related UN development goals

The importance of creating quality education and training programs for youth that help them transition to decent employment is recognized in several targets of the Sustainable Development Goals (SDGs), reproduced below:

Goal 4 "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all"

- Target 4.3 - By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university

- Target 4.4 - By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship

- Target 4.7 - By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development

Goal 8 "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all".

- Target 8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

- Target 8.6 By 2020, substantially reduce the proportion of youth not in employment, education or training

- Target 8.B By 2020, develop and operationalize a global strategy for youth employment and implement the Global Jobs Pact of the International Labour Organization


IDB
Inter-American
Development Bank