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*Current and Critical Issues in Curriculum, Learning and Assessment*

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# Plan Ceibal in Uruguay: How do you educate in learning to decode the unknown?



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## Open Note of the IBE

The IBE has launched the series In-Progress Reflections on *Current and Critical Issues in Curriculum, Learning and Assessment* to open a communal space for a global conversation, collective production and discussion on those issues of high concern for Member States. It intends to support country efforts in mainstreaming challenging issues within the processes of curriculum renewal and development across different levels, settings and provisions of the education system.

Initially, the focus areas of the In-Progress Reflections series encompass, among others,: (i) Early Childhood Care and Education (ECCE) as a foundation of holistic child development and learning; (ii) Reading and writing in early grades to support the development of essential competencies; (iii) Youth Culture and competencies for Youth in the early 21st century (covering formal, non-formal and informal education); (iv) ICT curricula and inclusive pedagogy contributing to relevant and effective learning outcomes; (v) STEM (Science, Technology, Engineering and Mathematics) curricula to foster sustainable development; (vi) Curriculum for Global Citizenship Education (peace, human rights, sustainable development, values, ethics, multiculturalism, etc.); (vii) Assessment to enhance and support learning opportunities; and (viii) Inclusive education as an over guiding principle of education systems.

The series of reflections covers a wide array of knowledge products, among them: discussion papers, policy briefs, frameworks, guidelines, prototypes, resource packs, learning tools and multimedia resources. These materials are discussed, refined, used and disseminated engaging education and curriculum agencies / institutes, and in particular curriculum developers and specialists, development experts, policy makers, teacher trainers, supervisors, principals, teachers, researchers and other educational stakeholders. In addition, they serve as reference materials for the IBE menu of capacity-development training on curriculum, learning and quality education – namely masters, diplomas, certificates and workshops – to forge policy and technical dialogue involving a diversity of stakeholders and to support sustainable country fieldwork.

Through blogs and e-forums, we encourage the audience to actively interact and bring in diverse perspectives. Effectively, the online space for reflection allows us to stay connected, facilitates exchange between experts from different regions of the world, and truly fosters continuous reflection on the issues concerned. The blog is structured to gather diverse resources, which include tools and documents (as previously mentioned) under specific themes to provide a complex and rich set of materials targeted to the specific needs of Member States. The In-Progress Reflections will capture relevant visions, views and comments shared by the audience, and serve as a key resource to support Member States' efforts in mainstreaming relevant findings and effective practices in national policies, curriculum frameworks and developments and in professional practices.

**Dr. Mmantsetsa Marope: Director, International Bureau of Education**



## Introduction

Plan Ceibal is a multi-stakeholder public policy programme in education and innovation with an emphasis on the integration of pedagogy and technology in Uruguay. The following outline provides an overview of some of the most critical dimensions as well as methodological approaches pursued by Plan Ceibal, which are implemented in close collaboration with the whole education sector in the country. Some of these initiatives are not only implemented at a national level, but also in collaboration with a network of schools or education-oriented institutions throughout several countries (e.g. New Pedagogies for Deep Learning, Code.org, Design for Change).

Plan Ceibal was originally implemented as an initiative to reduce the digital divide as well as ensure that learners and educators from all socio-economic backgrounds, and regardless of their geographical location, would have access to digital devices, high-quality contents as well as connectivity on a country wide scale.

Since its foundation in 2007, Plan Ceibal has worked in close collaboration with the National Administration of Public Education (Administración Nacional de Educación Pública, ANEP) in order to implement solutions that can be adopted by educators in their classes. Additionally, the goal of this programme is to provide platforms and resources that can enhance the learning experience within the classroom, but also promote alternative opportunities of learning in other settings such as at home, after school activities, in communities of practice, socializing settings, among others.

However, this has been a learning-by-doing experience where the technological infrastructure played a key role in an early stage when it was required to build a strong educational technology solution. Nevertheless, over a ten years period, after the consolidation of this first phase, the programme offers a national ecosystem of pedagogical innovations, which goes beyond the access to technology. Today it is not limited to offering digital tools and connectivity, but also facilitates comprehensive coordination among institutions. The implementation strategy is the result of enabling social innovation and capacity development, exploring and implementing flexible and innovative forms of learning, teaching and assessing.

This report is organized according to four key pillars, which are helpful to understand both the institutional design and the action of Plan Ceibal to support education.

- I. Pedagogical perspectives**
- II. Critical skills/competencies**
- III. Ways of thinking/mindset**
- IV. Assessment toolkit**

## I. Pedagogical perspectives

Plan Ceibal does not promote a specific education model but an ecosystem of innovative pedagogies framed under the Uruguayan version of New Pedagogies for Deep Learning (Red Global De Aprendizajes) which are integrated through different forms of learning and teaching.

Under the leadership of Red Global de Aprendizajes, and the close support of Plan Ceibal and ANEP, Uruguay is an active member of an international network of learning constituted by seven countries (Australia, Canada, Finland, Netherlands, New Zealand, United States and Uruguay). This initiative is led by the Canadian pedagogist Michael Fullan and it is known as New Pedagogies for Deep Learning (NPDL). The vision of “deep learning” emphasizes the importance of continuously developing critical skills that are relevant for the 21st century societies.

In Uruguay the Red Global de Aprendizajes offers a framework for a common understanding of how innovation in education can be developed. As it will be shown below, this goes beyond an administrative structure, offering a vast array of transformations that provides flexibility as well as the possibility of rethinking the learning experiences from different or new perspectives. Additionally, it is understood as a dynamic initiative fostering flexibility and synergy with those existing or external educational practices that are also working on promoting innovation to enrich the learning experience.

The underlying rationale is that educators and practitioners can find in Plan Ceibal a variety of solutions, strategies, and toolkits, which they can choose and adopt based on specific needs and local, educational contexts.

The implementation of Plan Ceibal in the national education system does not necessarily imply that the national curriculum has been modified to enable the technology integration. Consequently, it is up to educators (or students when suitable) to adopt these tools and platforms in ways that they can enrich their teaching or learning experiences within the existing curriculum. This promotes higher levels of autonomy among educators but at the same time it ensures that technology is at the service of education (not the other way around). The exceptions to the above will be described in greater depth in the cases of the teaching of English as a second language (Ceibal en Inglés) or the promotion of computational thinking.

On the one hand, Plan Ceibal should support the instructional design led and implemented by the ANEP, which is the institution responsible for guiding and administering education, establishing the why and what needs to be taught and learned. On the other hand, Plan Ceibal contributes to the provision of innovation in the pedagogical approaches (how to learn), to building capacities, diversifying the learning environments as well as offering tools and strategies for assessing and monitoring learning, among others.

In short, the aim is to provide tools and methodologies that can be helpful for learners and educators according to their goals, needs and contexts. The dimensions of Plan Ceibal to be presented here are:

### Deep learning and digital pedagogies to enhance learning

As the evidence shows, digital technologies are particularly effective when used as tools to work in social practices (teamwork, peers-based learning, collaborative problem solving) and especially when they are linked with real problems or project-based learning. Keeping this in mind, the different pedagogical approaches promoted by Plan Ceibal encourage teachers and learners to work with peers to conceive learning as a social experience. Nevertheless, the digital technologies (devices and educational platforms) can also be used to facilitate individual or subject-based learning. The institution’s priority is to support and facilitate experimentation, teamwork, as well as self-exploration of real problems or challenges relevant for the school community. These are some of the avenues, which are regularly promoted by educators with the support of Plan Ceibal.

The central idea of deep learning is that “students will gain the competencies and dispositions that will prepare them to be creative, connected, and collaborative lifelong problem solvers and to be healthy, holistic human beings who not only contribute to, but also create the common good in today’s knowledge-based, creative, interdependent world” (Fullan and Langworthy, 2014, p. 2)<sup>1</sup>. So, rather than the purely technological expertise, the main proficiency promoted is to engage the learners as well as the educators to use the technology not as a goal per se but as a mean or as an enabler to enhance their individual and collective capacities. As explained earlier, rather than specific guidelines to follow, Plan Ceibal provides diverse possibilities for learning which connect and leverage different perspectives and forms of learning in an integrated pedagogical environment.

### Alternative forms of integrating digital tools in the teaching of subjects

The platforms and educational resources offered by Plan Ceibal vary significantly depending on the needs of the users or participants, what is being taught or learned as well as on the specificity of the context. However, the different ways of integrating technology can be categorized in two main dimensions: a) Technologies for improving the learning experience and b) Technologies for transforming the learning experience. These categories are not mutually exclusive.

1. **When technologies are used for “improving the learning experience”** they are adopted mainly to increase or optimize the efficiency in the process. For instance, to replace one resource by a more suitable one, which can simplify, amplify or enhance something that is being used during the learning experience in a certain way, but can be enriched with technology. An example is the English blended learning programme (Ceibal en Inglés), an educational programme carried out in partnership with ANEP and the British Council. In order to overcome the shortage of qualified English teachers, Ceibal en Inglés offers a blended teaching approach of English as a foreign language that integrates remote teaching via video conference, working systematically on the learning management system (LSM) and traditional face-to-face instruction. Another example within this category is the use of Ceibal’s Digital library, where users have access to books, didactic files, sound records, educational multimedia resources, digital works of art, among others. From an online catalogue, users can access the resources in digital formats to watch them online. In both cases, technology is used to enhance and support the learning experience.
2. **When technologies are used for transforming the learning experience**, their relationship with knowledge, as well as the role of the learner and his or her interaction with peers and the teacher is also renovated. Therefore, the transformation becomes an opportunity to modify, redefine or rethink the whole learning experience. The teaching of computational thinking to primary education students illustrates this. In this case, learners can use these cognitive tools and methods to understand and work with complex problems, and to combine ideas with concrete tools (such as pocket-sized codable computer, physical or chemical sensors). The transformation comes from the integration of knowledge of different subjects and disciplines with computational thinking to solve a concrete problem or develop a project. It is important to add that during this learning experience the role of teachers is not limited to indicate what needs to be done, but also to become an active supporter of the learning experience. This means that the educator is also expected to learn while (s)he joins the problem-solving process. In sum, subjects and disciplines are combined, the curriculum interacts with real problems, and the relationship between educator and educated is transformed. The latter example represents how technology can be used as a means to facilitate a transformational learning experience.

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<sup>1</sup> Fullan, M. and Langworthy, M. 2014. A Rich Seam: How New Pedagogies Find Deep Learning. London, Pearson. [http://www.newpedagogies.nl/images/a\\_rich\\_seam.pdf](http://www.newpedagogies.nl/images/a_rich_seam.pdf) (Accessed 5 October 2018.)

## Collaborative learning and the social construction of knowledge

Blended modality can be an opportunity to enrich the learning experience and entails more than simply combining or integrating face-to-face instruction with digital environments. It is also an opportunity to integrate individual and collective forms of developing skills and acquiring new knowledge. This is clear when implementing the different national training programmes offered to teachers, facilitators or supervisors, where technology becomes a facilitator of coordination and collaboration between the professionals who work in education. In that sense, most of the Plan Ceibal initiatives emphasize the relevance of developing community-oriented activities.

One remarkable example of the interest in promoting socially constructed knowledge is the initiative called 'deep challenge'. This is an experimental national contest promoted in the context of NPDL. It consists of national brainstorming activities, to which the education community is invited to crowdsource problem-solving ideas while promoting project-based learning. Firstly, there is an open call for submitting relevant local challenges (with direct global relevance), and participants vote for the most relevant challenges identified. Participants are invited to identify and submit a challenge aligned with the Sustainable Development Goals (SDGs). Secondly, once the main challenges are selected, there is a call to design ideas, innovation and solutions to tackle those challenges. The whole process is community-oriented. The projects are collectively developed. This is the result of a learning-by-doing approach in which collaboration becomes a key driver and technology serves to that purpose (<http://deepchallenge.org/>).

National contests on subjects such as mathematics or chess can also be considered as examples happening at a national level. In order to participate, students from different ages form groups of three members. The objective of these initiatives is using edutainment software, through which the learners can play and develop their math or logic thinking skills. These gamification activities enable personal learning as well as strengthen team-building capacities. Annually tens of thousands of students from all over the country participate in these contests. The teams that obtain the best scores participate in the "Tournament of Champions" which takes place in Montevideo, the capital city.

These are some of the examples of a large number of initiatives promoted at a country level, in which learners simultaneously use technology, work and collaborate with their peers. "Peeragogy"<sup>2</sup> plays a key role, and the learning with technology becomes a social component, and strengthens participants' engagement.

## Self-exploration, personalised and self-driven learning (Do It Yourself culture)

Although it may sound contradictory, promoting collaborative work does not exclude the possibility of self-driven learning. In fact, being able to combine both components of learning is considered of utmost importance during the learning experience. In other words, the possibility of working with others does not inhibit learners from pursuing their own interests and finding opportunities for exploring, researching, or learning something based on their personal motivation, in parallel to the development of metacognitive capacities. For instance, when individuals are capable of defining a plan, searching for relevant information to achieve the plan, implementing or developing actions and assessing to what extent these actions could effectively contribute to achieving the plans or the established goals. Self-driven learning happens when metacognitive skills are put to work. The latter are critical to regulate and self-administer the learning experience. It is important to add that self-exploration and/or self-driven learning also happens when learners find the freedom of agency to pursue their own interest or when they are motivated to explore their own curiosity. Accordingly, self-driven learning can be considered as a blended concept because it could happen in the classroom or in other environments such as at home

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<sup>2</sup> The theory of peer-to-peer learning and teaching addresses the challenge of peer-producing a useful and supportive context for self-directed learning. Learning is a social, active, and ongoing process, where groups of self-directed learners can organize their own learning experience (<http://peeragogy.org/>).

or when sharing with peers. Different studies indicate the relevance of technologies as a useful tool to enhance the learning experience when it is being used in informal settings for instance. Curiosity and the desire for self-exploration can be enriched by the use of technology, and can lead to learning on your own, as a clear expression of the 'do it yourself learning'<sup>3</sup> culture.

One example of promoting the development of personalized and self-driven learning can be found in the use of the Adaptive Mathematics Platform (PAM in Spanish). This is an online platform for learning Mathematics in Primary and Secondary Education designed to provide an effective learning opportunity for students to improve their mathematical knowledge. The platform adapts to the rhythm of each student and offers individualized support. The activities are organized in "books" or series of activities. As they are carried out by the student, the platform provides additional help through related support materials, it offers the demonstration of other forms of resolution and suggests new activities in areas that might require extra work. As the platform states: "you can access the library, you can select the "book" or set of exercises you want to perform, both at your level and at higher or lower levels than you are depending on the stage of your progression. PAM goes beyond the concepts of "right" or "wrong" because it deeply analyses all the answers to detect the cause of the error and provides alternative opportunities to further develop the learning experience, allowing students both to learn individually and adaptively based on their own performance<sup>4</sup>.

The concept of "adaptive" platform in PAM has two meanings: a) Micro-adaptability: it informs the student in each answer, providing additional and customized support; b) Macro-adaptability: it registers the learning history of each student, allowing a follow-up of their evolution. Automatically, it detects areas of knowledge where the students might require additional work. PAM has more than 100,000 exercises and online support materials, textbooks, glossaries, and so on. The fact that students (and teachers) can access PAM, and work with it at any time and place, reinforces the possibility of self-administered learning as well as traditional classes where training math exercises are conducted.

## II. Critical skills/competencies

Today, "the soft skills have become the hard skills". The relevance of key competencies in the emergence of the Industry 4.0 society remains open to change and is continuously evolving. Interpersonal, social or soft skills are not exclusive to the 21st century; however, these skills are now fundamental for a large sector of the population (i.e., not exclusively for the highly educated ones) and it is critical to promote their development at a societal level.

The challenge is to facilitate the development of critical competencies and their application in different contexts within and outside formal education. Jimenez (2006) adds that: "teaching such life skills can be integrated into every aspect of the curriculum through discovery-oriented teaching methods that include interactive learning, applying knowledge to real life problems, integrating teamwork and peer tutoring into the learning process, and inviting student input into the structure and subject matter of lessons" (p. 75). Individuals must prepare themselves as resilient, open and adaptive beings, capable of continuously 'recycling' and updating their knowledge and skills. This upskilling vision is well aligned with the lifelong learning paradigm, which supports that all individuals should progressively update and enhance their skills throughout their lives.<sup>5</sup>

In this context, Plan Ceibal promotes the development and measurement of these capacities organized under six critical competencies, which guide and structure the whole educational vision, giving coherence

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<sup>3</sup> It emphasised the learner's agency. Where teachers' and students' develop the capacities for directing their own learning processes, thinking critically for themselves, taking responsibility for their own positions and taking into account other points of view. (<https://files.eric.ed.gov/fulltext/EJ1111656.pdf>)

<sup>4</sup> Please find further information in the following website (in Spanish): <https://www.ceibal.edu.uy/es/preguntas-frecuentes/pam/que-es-pam>

<sup>5</sup> Nickson, D., C. Warhurst, J. Commander, S.A. Hurrell, and A.M. Cullen. 2011. Soft skills and employability: Evidence from UK retail. *Economic and Industrial Democracy* 33, no. 1: 65–84. doi:10.1177/0143831X11427589.

Jimenez, E. 2006. World development report 2007: Development and the next generation. Washington, DC, World Bank.



and consistency to the different educational programmes offered to the education system. The Deep Learning Competencies (better known as the 6 C's), are the skill sets each and every student needs to achieve and excel in, in order to flourish in today's complex world.

As it can be seen, these competencies are considered complementary to the academic content of the curriculum. In other words, the development of these capacities should be aligned with the acquisition of the content taught in classes, but their development should also go beyond the teaching of theoretical concepts to include hands-on exploration and action in the real world. In this approach, the use of technology becomes a critical pedagogical platform to practice, develop and improve these proficiencies in different formal and non-formal settings, regardless of the age or stage of the learner.

These competencies form the foundation for the New Measures and NPDL that teachers use to monitor the Deep Learning Progressions, and to assess students' current levels in each of the six Deep Learning Competencies. They combine this with additional information about student achievement, interests, and aspirations to get a clearer understanding of what each student needs to learn<sup>6</sup> (for additional information see the fourth pillar "Assessment toolkit"). The six competencies included are:

- **Creativity and imagination:** *having an 'exploratory mindset' for economic and social opportunities, asking the right inquiry questions to generate novel ideas, and demonstrating leadership to pursue those ideas and turn them into action* (NPDL, 2017). Creativity in students is vital. It enables them to be ingenious, imaginative individuals, who can find, pose and solve problems with an open mind; and to make connections, interpretations, take risks, learn from mistakes and explore new possibilities. Creativity engages learners and helps them prepare for the world of work and to shape their future lives. It inspires students to see who they are and envisage what they can do to realise their potential and what they can accomplish.
- **Communication:** *communicating effectively with a variety of styles, modes, and tools (including digital tools), tailored for a range of audiences* (NPDL, 2017). In today's globally connected environment, students have more access to communication tools, channels and resources than ever before in human history. Learners are able to connect and interact with others and, seek, find and share information easily. Yet, while they enjoy communicating using digital technology, they still need to be equipped with the skills to become empowered users of it. Children and youngsters need to understand what it means to be a responsible and ethical communicator and fully comprehend the myriad of ways, tools, resources and channels through which they might communicate with diverse audiences.
- **Collaboration:** *work interdependently and synergistically in teams with strong interpersonal and team-related competencies including effective management of team dynamics and challenges, making substantive decisions together, and learning from and contributing to the learning of others* (NPDL, 2017). Today's students are increasingly required to be highly collaborative global citizens who can work effectively in teams and who can learn from and contribute to the learning of others. Learners will need to demonstrate responsible social networking skills and empathy when working with a diverse range of people. To be able to work collaboratively with others and in a team is an essential competency. People collaborate every day in a variety of learning environments - in schools, families, communities - both face-to-face and online. The depth and impact of this collaboration is dependent on how well learners communicate, on the partnerships established with peers and the authentic connections they can make with experts and people of all ages in the wider community.

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<sup>6</sup> The description of the competencies is an adaptation of information provided by different NPDL member such as New Pedagogies for Deep Learning: A Global Partnership ([npdl.global](http://npdl.global)) State Government of Victoria, Australia ([www.digipubs.vic.edu.au](http://www.digipubs.vic.edu.au)), among others.

- **Critical thinking and problem-solving:** *critically evaluating information and arguments, seeing patterns and connections, constructing meaningful knowledge, and applying it in the real world* (NPDL, 2017). Thinking critically to design and manage projects, solve problems, and to make effective decisions using a variety of digital tools and resources. The ability to think critically is essential in virtually any field of study or practice where ideas need to be communicated, decisions need to be made and problems need to be found, analysed and solved. The capacity to think and reflect deeply and be logical, inquisitive, discriminating and analytical learners is an imperative. Today's students need to be able to think critically, evaluate, compare, contrast, synthesize information and apply it appropriately to different contexts. This ability enables and empowers them to conceptualize, organize and classify knowledge into different dimensions and multiple angles.
- **Character education:** *learning to deep learn, armed with the essential character traits of grit, tenacity, perseverance, and resilience; and the ability to make learning an integral part of living* (NPDL, 2017). Understanding character helps students build personal resilience and prepares them to navigate and feel equipped to face the many opportunities and challenges of today's complex world. This happens when learners are highly skilled at finding and creating their own learning opportunities in ways that help them build the knowledge and competencies they will need to succeed in life – and to create worthwhile solutions that impact life, work, and the world. Students are expected to actively seek out feedback and use it to better understand how well their thinking patterns and approaches to learning are helping them grow.
- **(Digital) Citizenship:** *thinking like global citizens, considering global issues based on a deep understanding of diverse values and worldviews, and with a genuine interest and ability to solve ambiguous and complex real-world problems that impact human and environmental sustainability* (NPDL, 2017). Today, digital technologies enable students to be more connected than ever before. This unprecedented access to globally connected networks enables people around the world to face global challenges together. It is essential that students develop their sense of being part of a global community, caring for the world and for those with whom they share it. Global citizenship builds connections and empowers young people to make choices and to make a difference. It nurtures intercultural understanding and encourages students to recognize their responsibilities towards each other and to learn from each other. In this context, digital citizenship and in particular 'cyber wellness' comprises capacities such as, building an online identity and empathy, managing the screen time, privacy, cyber bullying, cyber security and digital footprint<sup>7</sup>.

### III. Ways of thinking/mindset

To embrace an innovative approach as well as to facilitate the so-called “do it with others culture”, Plan Ceibal promotes a set of initiatives to enrich the teaching and learning experiences. These approaches are not mandatory, however, they are considered perspectives on methods that can be adopted when using digital technologies. Although very diverse, these approaches share a set of premises that provides a framework for implementation. These premises are:

1. **To work on real problem solving, and to focus on students' interests and concerns.** When observing their communities and their challenges in everyday life, students are asked to identify issues and problems that are interesting to them to think about. Through different strategies, those concerns and interests are subsequently transformed into very powerful learning opportunities. Students not only identify the problems, but also design and implement possible solutions. This approach provides a context where students are familiar with the topic of their projects. As a result, their motivation and levels of participation are likely to be higher and their projects are conceived as real contributions to society.

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<sup>7</sup> Additional information can be found on the partner institution: DQ Institute <https://us.dqworld.net>

2. **Focus on 21st century competencies and new literacies.** When thinking about reducing social gaps, developing the set of competencies to succeed in this century (as earlier described) is crucial. New literacies regarding social media, digital critical thinking, coding and emerging languages are some of the challenges students are already facing. Through the national implementation of projects like Computational Thinking in schools and Coding.org, Ceibal enables public and private school students to have equal access to opportunities, quality training and challenging competitions like the annual Robotics, Coding and Videogames Olympic Games, held yearly in Montevideo every November<sup>8</sup>.
3. **High levels of contextualization.** Since projects are designed by schools, a diversity of strategies and infrastructural needs are significant. Resources are limited and it is Ceibal's concern that everything is seized to the maximum extent. It is also important to engage students in a reflection of what they have and what they need. For this reason, a very important step in project design is to think about which technologies school communities will actually need or might benefit from.
4. **Technology as a leverage of learning processes.** Although technology is a key aspect, it is not meant to be the ultimate goal in Ceibal's initiatives. It must leverage thinking skills, competency building and learning opportunities. A great example of this is the already described Ceibal en Inglés, the initiative that enabled public education students from 4th to 6th Grade to learn English throughout the country.
5. **Student-centred approach with teacher playing a key role.** One of the most important actors in Ceibal's initiatives are teachers, but from a different perspective. So far, over 28,000 enrolments for teachers training courses in educational technologies have been offered by Ceibal. It is frequently heard that technology competes with teachers, but this statement is distant from what is really happening in classrooms. Nowadays, teachers are more needed than ever to strengthen their role as guiding learners and learning. Students need spaces to discuss, to explore, to cultivate critical thinking skills. It is the teacher who facilitates and sets up these spaces, and who knows what works best for each group of students. The teacher is a leader. Leadership is a key aspect that only teachers can bring to these projects.
6. **Engage students and teachers in blended models of education.** According to Ceibal's experience in innovative projects, those who have better outcomes are the ones that integrate technology and other materials such as building blocks, construction kits, manipulatives and even flashcards to support learning. All these materials combined with educational software enable teachers to create real "learning by doing" experiences that engage and motivate students. The teacher has the key role of carefully selecting which materials would be suitable for each project and for each particular group of students.
7. **Integration of formal and informal learning,** in other words, combining the curriculum with extra-curricular activities. School time organized by disciplines is getting more and more distant from the real world. Students can learn from various sources of knowledge and use several approaches to learning in a more holistic way. In this regard, Ceibal is, through a variety of initiatives, fostering interdisciplinary work in the classrooms as well as in some spaces dedicated to non-curricular activities that also cover curricular content. In this way, students are immersed in creative and challenging activities that enable them to learn in a more active way.

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<sup>8</sup> The Olympic Games is a two days competition where students have to show and defend their projects in an open Fair. Almost 3000 students participate every year.

8. There has been a **strong tradition of teachers' isolation** in Uruguayans schools, where teachers would often have visits from experts or supervisors just to be evaluated. ANEP and Ceibal have been joining efforts to **change this reality**. Coaching, peer work, collaboration with school staff and working on the so called soft skills in a systematic way are some of the strategies that teachers are currently using to exchange and enrich their practices.
9. **Lifelong learning**, providing continuous and ongoing opportunities for teachers training and up skilling programmes, which also include deans, supervisors as well as other professionals linked with the school staff is crucial. Supervisors, classroom teachers and workshop teachers have plenty of professional development opportunities provided by the Teachers' Development Department at Plan Ceibal. Again, using blended methodologies, teachers have access to a wide variety of formats, such as online courses, experts conferences, workshops around topics like flipped classroom, gamification, art thinking and design thinking, among others.
10. Finally, it is important to provide **an ecology of different technological solutions** by integrating Bring Your Own Device (BYOD) with Ceibal laptops as well as by bridging the use of formal education software's with other solutions such as social network platforms, user generated contents or other expressions of community of practice.

To illustrate how these premises are getting to the field, we will briefly describe how some of the educational initiatives are currently implemented in schools under the Plan Ceibal framework.

- **Diseñando el Cambio:** Inspired by and being partner in the global movement Design for Change, Ceibal brought 'Design Thinking' to public schools in Uruguay. Middle and High school students are engaged in the design thinking process to solve a problem of their community with the help of technology. Learners identify opportunities and features of Ceibal toolkits (online tools or platforms solutions) and decide what to use for their project, which may refer to experiences such as re-designing a school yard (to avoid accidents and boring recesses) or creating a radio for the community, among other issues that matter to local young people. Diseñando el Cambio is a powerful methodology, which fosters collaboration, project-based learning, as well as the creative use of technology.
- **CEILAB:** Ceilab could be defined as "Ceibal maker spaces". Maker culture is swiftly growing and it is necessary to bring it into the classrooms, as a form of learning by doing. Taking this framework together with computational thinking models, Ceilab seeks to create spaces in schools where students can think, design, prototype and develop their ideas with an active use of technology. Schools are required to customize a particular set of innovative technologies (Drones, 3D printers, Sensors, Lego kits are some of the options) as part of a catalogue. The Ceilab team works together with teachers and students in the design of those spaces, selecting what needs to be developed by each project. The starting point is a school proposal in which the project is described (goals, participants, technological needs). This particular aspect is a key factor for students' motivation and engagement. Once the proposal is accepted, a group of experts from the Ceilab team works closely with school staff and students to draft a possible maker space, select the most suitable technology and condition a physical place to deploy the project. Once implemented, each school works on their respective projects and they are encouraged to present them in national and international fairs.
- **Ceibal en Inglés:** As explained earlier, this groundbreaking project aim to solve a great problem: the lack of English Teachers in Uruguay. School programmes mandated to have English lessons since primary school but the lack of teachers was an impediment. Combining videoconferencing, a content platform, digital materials and forming alliances with international partners such as the British Council, Ceibal en Inglés is reverting this situation. The combination of English Programmes managed by ANEP and Ceibal en Inglés made it possible for all students from 4th to 6th grade to learn English at school.

In *Ceibal en Inglés* and by using videoconference technology, students have classes once a week with a remote English teacher, who introduces new contents. In addition, twice a week the classroom teacher (who often does not know English) facilitates learning activities provided by the remote teaching through Ceibal's LMS<sup>9</sup> and CREA2. Classroom teachers often learn with students, being a key actor as facilitator and classroom management expert. Data shows that the outcomes of this innovative method are comparable to the outcomes of face-to-face lessons.

- **Computational Thinking Classes:** In order to improve problem-solving skills, students from 5th and 6th grade in primary schools are engaged in fun, game-based activities that enable them to see their own thinking processes. Once a week they have a videoconference with a subject-area expert who introduces one aspect of Computational Thinking (ex. Decomposition) from a game-based approach. Through games and group work students start to reflecting on their own sets of skills and how they use them to solve different everyday problems. Apart from the video conferences, the classroom teacher facilitates two other days of the week to work on assignments that the remote teacher provides to review and revisit what they have learnt. For this purpose, they use CREA2 (Ceibal's LMS) that enables the remote teacher and students to communicate through a suitable learning environment.
- **Coding and Robotics:** STEM and learning by doing are part of this initiative. Using diverse coding softwares such as App Inventor and Scratch, students are encouraged to create their own applications and games responding to challenges and topics designated by Ceibal and ANEP (for example, last year was "how to obtain and preserve clean water" and the year before "Sustainable Cities"). Ceibal provides training with experts and the infrastructure needed to code; and students engage in group creation with the aim of presenting their projects in the National Olympic Games. Schools are provided with kits to create their robots and solve issues in their communities (a great example is a robot that separates good seeds from bad ones when planting or the winner of NASA Tournament that measured pH in soils to prevent leptospirosis). Also, in partnership with First Lego League (FLL), students explore robotics foundations oriented at problem-solving and compete to represent Uruguay in International competitions. In 2017, students from a rural High school in Tacuarembó, a province in the center of Uruguay, won a prize for the best investigation in FLL California, for their project that recycled rainwater to be used later in watering the crops.

#### IV. Assessment toolkit

It does not make sense to promote innovation within education if assessment is not included as a critical part of this digital education transformation. Below are a list a set of evaluation approaches that are currently being promoted and adopted within the different programmes:

- Digital badges (cryptographic certificates)
- Rubrics
- Computational thinking assessment
- Adaptive assessment (Ceibal en Inglés)
- Formative assessment (SEA)
- Learning analytics (large scale feedback intervention, global monitoring system, clustering the patterns of learners)

In Plan Ceibal, a fundamental area in the implementation of public policies is the monitoring and evaluation stage. To generate critical information for better decision making, transparency and accountability are the main objectives of the monitoring and evaluation systems.

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<sup>9</sup> Learning Management System

Latin America has had a slow progress in the incorporation of monitoring and evaluation systems (Yarahuán and Maldonado, 2015; Pignata, 2015; Cecchini and Martínez 2011). Although new progress in this field is needed, Uruguay has made progress in this area. In 2012, the Uruguayan government passed the Law 18.996, that broadens the scope of the Office of Planning and Budget of the Uruguayan Republic (Oficina de Planeamiento y Presupuesto de la República) regarding the evaluation of public interventions of the central administration (Font in Yarahuán and Maldonado, 2015).

In the national context, Plan Ceibal has been as a pioneer in thinking about its intervention in conjunction with the evaluation. In 2007, the pilot implementation in the town of Cardal (Florida, Uruguay) was launched. By 2008, Ceibal expanded to the inner provinces of the country and in that same year the Evaluation and Monitoring Department within Plan Ceibal carried out its first Evaluation study, "Monitoring and evaluation of social impact of Plan Ceibal", of which the main results were published in 2009. Since then, Ceibal has continued to implement (by designing, executing or participating in studies), monitor and evaluate the implementation of this public policy. The goal of this Evaluation and Monitoring Department is to produce systematic and rigorous information on the processes, results and impact of Plan Ceibal. This information is used as an input for the decision making of the organization, both, in relation to the institutional strategy and the operational management of the different technical teams. This department creates the indicators, tools and processes the organization uses to measure if a programme has been implemented according to the plan (monitoring) and if it is having the desired result (evaluation).

Currently the culture of accountability is a transversal concern and a reference point in the organization for all areas that implement programmes in the field, providing meaningful and valuable data for general management and decision- making. The area has an interdisciplinary team from different social sciences. In order to illustrate what the monitoring and evaluations approaches adopted by the institution consist of, four sub-areas below are highlighted: a) infrastructure; b) impact evaluations and process monitoring; c) innovation laboratory; and d) international Studies.

### Infrastructure

The infrastructure component is framed within the classic topic of monitoring. The monitoring consists of an annual examination of the conditions of laptops and tablets, two measurement moments in primary education and two in secondary including a representative sample of the whole country. The sample is conducted by the Statistical Institute (IESTA) from the Faculty of Economic Sciences of the national public university (UdelaR). After defining the stratum (school), they select one of the groups from second to sixth grade. CAPI (Computer Assisted Personal Interview) questionnaires are applied to each student with questions related to the possession and condition of their device. Based on this data, the condition of the devices are diagnosed and supervised to take cross information with the technical service system and make better decisions of logistic and operative issues.

### Impact evaluations and process monitoring

Also framed within the classic studies of the area, from 2008 to 2012, general annual evaluations were conducted at both primary and secondary levels to measure different aspects of the implementation of the Plan. As Ceibal diversifies its intervention, future studies began to be more specific. Different monitoring tools are currently implemented so different programmes can have information on the management of their implementation. Regarding learning evaluation, Plan Ceibal works in close collaboration with different partners, such as the Research, Evaluation and Statistics Division of ANEP, the Department of Second Languages and Foreign Languages of the CEIP, the Ceibal in English Programme, National English Supervisors of the Council of Secondary Education (CES), the Council of Technical and Vocational Education (CETP) and the British Council Uruguay in the Annual Adaptive English Assessment. The test has been applied since 2014.

Among the most relevant impact assessment studies, was the evaluation of the Math's adaptive platform (PAM) offered by Plan Ceibal carried out in 2017 together with the team of the Center for Economic Research. This study describes the impact of the math platform. This longitudinal study showed a positive effect (of 0.20 standard deviations) in the gain of mathematics learning in those children who had used PAM vs a control group that had not used it. Noteworthy, the study also indicated that the major effects were observed in students of lower socioeconomic status.

### Innovation laboratory

Plan Ceibal works together with ANEP to innovate in the methods and instruments used to assess non-traditional learning outcomes. Two examples can be highlighted: 1) Development of an auto-administered speaking test for children or youth. This completes a fourth component of the English test in a special area in which the teaching is impacted. It needs to be done in a progressive way; 2) Development of a learning instrument in Computational Thinking. Having described the use of videoconference for teaching computational thinking as well as the "Ceibal maker spaces" (CEILAB), now an expert team is currently working on creating a validated assessment instrument to measure the learning acquired by students who participate in these computational thinking learning experiences.

### International Studies

In 2017, Plan Ceibal started participating in international studies. Below are mentioned two relevant examples: Kids Online Uruguay and the International Computers and Information Literacies Study (ICILS).

Kids Online Uruguay is included in the framework of Global Kids Online and Uruguay worked with an alliance of national and international organizations constituted by Unicef, Unesco, Agesic, Ceibal and the Catholic University of Uruguay. The study investigates the ways of access to the Internet and online behaviour of children and adolescents in the country. The data is of great interest to Ceibal and decision makers from the public policy sector. Uruguay participates for the first time in a study aimed at providing information about the opportunities and risks that Internet brings to the younger generations.

ICILS 2018, developed by the International Association for the Evaluation of Educational Achievement (IEA), is the second edition of this international test of digital skills and the first for Uruguay. The study was designed to answer the following question: How well prepared are students for studying, working and living in the digital age? In 2018, the final test was applied, involving 177 Schools throughout the country, each with 20 students and 15 teachers. The test instrument is administered through the computer and consists of five modules of 30 minutes, of which each student answers only two. Each test module is made up of a series of tasks that evaluate different digital skills in the population of second year of secondary education. Results will be published during 2019.

## Closing remarks

One of the hardest elements to understand, given its intangibility, is the fact that the current digital revolution is not a revolution of devices, infrastructure, platforms or channels of trade. Rather, it embraces a redefinition of what learning means and stands for in the 21st century. Although what attracts much of the attention in this kind of educational analysis are the devices, the substantive transformations are more subtle. The deeper transformations in education also involve the thinking of educators whose contribution goes far beyond being technology facilitators; such as redefining the role of teachers in a different relationship with knowledge and skills. This means that the core value no longer lies in accessing or mastering some particular knowledge or technology, but in the ability to exchange, collaborate and rebuild knowledge by means of new combinations, diversification of the learning formats, contexts and experiences. In a nutshell, a redefinition of what it means to provide and receive education.

The incorporation of technologies by itself will not suffice to broaden the outlook that a change in education requires. That is why Plan Ceibal has already passed that time where only infrastructure (devices and internet) were the main goal.

A new framework that includes 21st century competencies is being adopted to enrich the traditional formats and ways of teaching and learning. However, new challenges are envisioned in the forthcoming agenda. What is really worth learning? How do you educate in learning to decode the unknown? What are the best approaches to connect subjects or contents with different life situations? Novel platforms, new tools, but also guidelines and training in new fields will be required, for instance learning from: digital citizenship; hyper-connection, self-regulation or personalized learning; content curation; a critical and at the same time proactive approach to understand technologies. All these aspects are considered critical.

New ways of teaching, innovative pedagogies and cutting-edge pedagogical projects are the main focus of the organization that today is understood as a vibrant innovation in the education laboratory. All these new challenges will require the creation of new instruments to assess and recognize knowledge and skills. Issues such as educational data mining and learning analytics are among the main challenges envisioned in the Plan Ceibal agenda.

Although the foundational principles of the organization, grounded on digital inclusion to ensure equal access to technology and connectivity for every student and teacher, are still at its main drivers, they are also subject to constant revision. This is due to the ever-changing character of the organization and its evolving and dynamic agenda, which is constantly seeking to offer solutions to a changing educational landscape.