Sharing is caring

An exploration of educational technologies and the impact of social-emotional learning

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Introduction

This thesis is about asking questions and reflecting. The research idea started with two interrogations:

Can we really accomplish Quality Education for all by 2030 (SDG, 2020)? How?

Seymour Papert and Nicholas Negroponte believed quality education for all, especially for children in marginalized areas of developing countries, was possible. The One Laptop Per Child (OLPC) programme was a promising idea that included a personal computer for children, an educational software, a framework, methodology, and philosophy. After its launching in 2006, it was adopted in different countries, particularly in those of the Global South.

OLPC landed in Paraguay in 2008, brought by the NGO Paraguay Educa. It was first established in *Caacupé*, a city near the capital. The introduction of the programme generated an important disruption in education. Many changes and adjustments needed to be done to develop the programme in the local context. One element not taken into account by the OLPC adoption plan was how cultural and social differences in countries outside the United States will influence the implementation of the programme.

Although many of the issues presented at the beginning of the programme have been solved, the appropriate inclusion of digital technologies in education and the motivation to use them are still an issue. The latter is explored in more depth in the design proposal of this project. The centre of this investigation is the teacher, who is the first user and promoter of educational ICTs (Information and communication technology). Still reluctant to use them as tools to improve the teaching practice, a probe is proposed to enter the teacher's life, document the successes and failures during a class, and capture elements, strategies and innovations created by them that can be improved and applied in a wider educational community.

Qualitative methods are used to understand the local situation -the focus of the project-with the final aim of proposing, not a solution, but a method of analysis and debate to provoke open discussion about new ways of thinking and doing, that can contribute to new teaching experimentation and learning experiences.

Research Questions

In the 21st-century, what is worth learning, and how should it be taught?

How is pluriversity being explored in education?

How can design help to deconstruct traditional education and construct new forms of teaching?

Literature review

What is worth learning and how?

The last worldwide developments - technological, migratory, demographic, and climatic changes - have provoked a transformation in society, especially in education. Approaches used in the past have become useless and reforms have been proposed/made according to current and future needs. The 21st-century skills were formulated as transversal abilities that are "central to the development of each individual, are necessary to navigate healthy and productive lives, are reusable in the sense that they are widely exportable from one area of life to another and are not specific to a job, task, sector nor discipline" (IDBa, 2019:2).

To understand better this definition, these skills are centred in three main self-development areas (Fadel, 2008):
- **learning and innovation:** creativity, communication, and collaboration, critical thinking, problem-solving;
- **information, media, and technology:** information, media, and ICT literacy;
- **life and career:** flexibility, adaptability, initiative, self-direction, social and cross-cultural skills, productivity, accountability, leadership, and responsibility. For their development, it is recommended to have a dynamic, collaborative, and adaptable environment.

Reflecting on key reforms some developed countries -Finland, Estonia and South Korea- and Uruguay has fostered to achieve quality and more equal education, we discover similarities in the investment in technology, new environments for learning and the development of the 21st-century skills for lifelong learning (IDBa, 2020). From these four countries, Uruguay is taken as a success case study, and compared to Paraguay, the country selected for this project proposal's implementation, both are developing countries that share many cultural and social similarities.

Uruguay and other countries of the Global South have followed a path into a transition to a more communal and collective education. Many of them were able to combine westernized knowledge and good practices with local knowledge. Far from having only a Eurocentric point of view, local ontologies are considered and applied in these transformations (Escobar, 2016). Although they are not referred to as pluriversal, we can identify its close relationship with the basis of the concept. Pluriversity, as the Zapatistas defined it, is a world where many worlds fit (Kothari et al, 2019) and it is

acknowledged that "there are worlds out there -and always have been- that have historically been marginalized and suppressed by a Western cosmology and universalizing tendency that claimed a superior position" (Oslender, 2019). This does not mean suppressing the universal knowledge, but to combine them with others, especially good practices.

According to a 2020 IDB report, Uruguay was able to achieve in a decade what for the other three countries took four decades. The country focused the improvement in four aspects: infrastructure, teacher training, curriculum development, and skill-based learning. The approach taken by the government and institutions was based on social equity. They capitalized experiences from abroad and tailored them according to the country's needs. Today, Uruguay is a model of good practices in the region.

Of this transition from the universe to the pluriverse, we explored in more depth, in the next titles, one of the skill-based learning reforms in South America. Uruguay, for example, centred its reform in the fostering of digital technologies in education, particularly the adoption of the One Laptop Per Child (OLPC) as a national educational programme. According to primary and secondary resources, Paraguay has developed and encouraged many of the good practices Uruguay has done too. Still, Paraguay is far behind the ideal skills development and social equity (IDB, 2018a).

As follows, the research explores what is worth learning and how it has been taught, particularly in Paraguay; and related to this aspect, the impact of the implementation of OLPC in some countries in South America including Paraguay.

Design proposal

How can design help deconstruct traditional education and construct new forms of teaching?

According to the primary and secondary research, several educational materials and tools have been tailored by teachers and institutions to improve the appropriate inclusion of digital technologies (here, OLPC XO) as a transversal tool in the classroom. Yet, the interaction between these elements (devices, guidelines, exercise sheets, among others) and the motivation and interest to use them is still an issue. Related to this, one area of development of 21st-century skills refers to socio-emotional abilities.

Social and emotional learning (SEL), is the "process through which children and adults understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions" (CASEL, 2020). Although these processes influence the final learning outcomes, the most important impact happens during the learning experience, and it affects teachers and learners. Of these two, the first one has critical influence in the latter. Let us remember that OLPC study evaluations in South American countries remarked the importance of teacher's motivation to engage with the programme and to seek constant training. Also, Ames's research refers to the importance of the environment and social universe to keep the interest growing.

Furthermore, the background research analysis highlighted that although many technical and social circumstances are explored and discussed regarding the OLPC programme, the main current issue, stated in the interviews, relates to the emotional state of both, the teacher, and the student. At the same time, this impacts the interaction with the educational tools; these not being only the laptop, but the textbooks, whiteboard, posters, flashcards, and others. The probe's aim besides what was mentioned before, is also to learn about the needs and new practical solutions teachers have created and/or adjusted to be able to continue providing a valuable learning experience.

The probe: why and how to use it?

The probe includes analogue and digital components to capture different types of data to understand in real-time the genuine performance, emotional state, and motivation of the teachers and students using ICTs during a class. The decision of combining analogue and digital artefacts was made because many teachers prefer to use some paper-based tools, while a minority prefers all digital platforms.

The first prototype included paper-based notebooks and sketchbooks but, thinking about the sustainability of the proposal and the future use the teacher can give to the tools, a reusable tool -whiteboard- was included.

Almost all the elements are provided to the user. The mobile phone is the only element not included in the probe. Being the main device to record all the process and data, is required that the participant uses its own device with the app suggested for the exercise.

In the future, the components of the probe can be complemented or changed according to need.
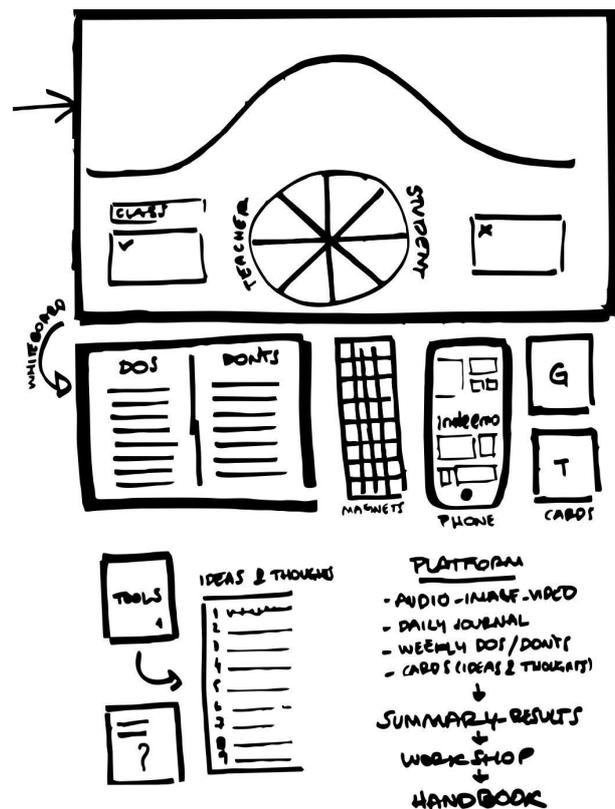
Reference: final proposal sketch

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Reference: probe elements. Gonzalez, L (2020)

DURATION	Preparation: 2 weeks Activity: minimum of 1 month Follow-up: 2 weeks
PHYSICAL REQUIREMENTS	Package, whiteboard, magnets, cards, notebook, mobile phone, whiteboard markers, eraser/mirror
ENERGY LEVEL	Low
RESEARCHER/FACILITATOR	Minimum 1
PARTICIPANTS	Minimum 15
EXPECTED OUTPUT	Text (self-documented notes, diaries), photos, videos, audio recording, artefacts

Reference: Adapted from Stickdorn (2018)

Probe elements

Gaver (1999) and other cultural probes analysed as reference usually include booklets, disposable cameras, maps, and postcards. These elements are directly connected with the aim of the probe, which usually seeks to capture local cultural information. Modern cultural probes include digital elements, like cell phones and mobile ethnography apps. For this kit, the pros and cons of the usual elements were analysed taking into account the teachers' preferences, deciding to include the following main kit elements:

Whiteboard: double-sided whiteboard with a dual-purpose surface, both dry-wipe and magnetic. Size: W 30 cm. x H 19,7 cm.
- One side of the whiteboard is for the **weekly summary**. Includes the dos and don'ts of the week divided into four quadrants. Two represent the ideal practices written at the beginning of the week and below, after finishing the week, what practices were desirable but not accomplished.
- The other side is for **daily use**. Includes the class journey map, daily dos and don'ts and a teacher and student mood meter. The purpose is to understand the teaching experience by day, recording information about the class plan and process, good and bad practices, and reactions to the different moments of the class.
    - Journey map: will highlight moments of the class where the user (teacher) will also include mood experience check-in using magnets. A linear journey design is suggested to provide space for expression and creativity.
    - At the end of the class, using the magnetic arrows, the mood meter will demonstrate the teacher's and the student's final perception of the class.

    Expected output: a visual representation of the different journeys, where also a variety of elements and emotional states will be illustrated. Reference notes should be related to the journey.

Colour-coded magnets: used to illustrate the changing mood during a class and the educational elements used (tools, methods, goals, people, concepts). Two analyses will be done to measure motivation and emotional state, one from a teacher's

perspective and another as a final perception of the student's reaction and involvement during the class.

Expected output: a visual representation of different interactions and reactions during a class.

Cards: 50 interrogation cards involving tools, goals, methods, concepts, and people. The themes are all related to education and culture. The interrogations are also related to five thinking processes: diagnose, explore, ideate, learn, and play. Ideally, one card will be analysed by the teacher and completed each day.

Expected output: written reflection in the notebook.

Notebook: double-sided paper-based notebook where the teacher will include the answers to the question cards. These statements will then be shared and compared in the workshop. The notebook can be used to write other ideas the user believes are relevant to their practice or the probe.

Expected output: written reflections.

Mobile phone: audio-visual documentation to record the results of the daily and weekly whiteboard progress, the notebook answers, and moments that the teacher believes are relevant to record and share. The data will be uploaded using Indeemo[1] (2020) and shared in real-time with a selected community.

Mirror + eraser: on the other side of the eraser, a mirror was placed. There are days when teachers do not have enough time to look at themselves. This element was added to support the concept of rediscovering yourself and taking the time to see your emotional and physical changes during the day.
The idea came up during one of the interviews (involves a peculiar story).

The probe elements were selected according to the different data the project aims to capture. They are divided into the following functions (Thoring et al, 2013):

- Documentary: record and store image, sounds and words in real-time during the teaching/learning experience.

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[1] Indeemo is a mobile ethnography and qualitative research app. It was selected for the project because of its features and easy use.

- Visionary: helps learn about visions, ideas, emotions and wishes. Depending on the way the tool is used, it can capture the student's visions too.
- Inspirational: probe tools can be used to promote inspiration. It helps the user to acknowledge information that was not considered initially.
- Motivational: motivation is the core of the project. Tools can help improve the engagement of the users. Ideally, intrinsic motivation (Deci, 1975, 1985) should be encouraged.
- Provocative: challenge, disturb, stimulate, and finally inspire the user to generate change.
- Instructive: understanding the probe is essential for it to work. Clear instructions can help improve the engagement of the users. Communication is one of the main variables of this project and the approach delivered can change the way people engage and use the artefacts.
- Practical: elements that make the probe workable.

Reference: probe elements. Gonzalez, L (2020)

Design and implementation

The proposal involves three main stages.

PLANNING, PREPARATION AND DEVELOPMENT	DATA COLLECTION	INTERPRETATION AND COMMUNICATION
Following the project's research questions and answers obtained during the interviews, the focus of the probe is identified as an exploratory research toolkit. The different elements are planned and designed according to need. The design of the elements of this project's probe uses some references for OLPC (icons, software).	The kit is given to the participants. The package will include instructions and contact details in case the participants have questions or doubts regarding the components and activities. The progress can be monitored using the platform suggested.	Unlike usual cultural probes, this kit will not be sent back to the researcher since all the results will be uploaded in the platform selected. After finishing the period of testing, the results will be analysed and summarized. Relevant passages will be highlighted, and patterns will be identified. Once the results are analysed and interpreted, a summary will be shared in a scheduled workshop, where other methods can be used to continue working on the results and finally generate new ideas taking into consideration successes and failures.

Before and after using the probe, training workshops should be developed. A first one to deliver and explain the probe's use and another one, to share and debate the probe's results. From these reflections, a good and bad practice guideline can be delivered afterwards to all the participants. Ideally, this workshop should be done every six months to measure changes and impacts.

According to one of the interviewees, the training workshops usually share the purpose of creating a space for self-reflection, sharing and collaboration. They seek to enhance a sense of community and teamwork, create opportunities, recognise differences and similarities, and value feedback as part of the learning process (Gonzalez, 2020). A probe can be an innovative tool that can be introduced in these events.

Results

As mentioned in the methodology, during the research some qualitative methods and tools were used to understand the current situation involving ICTs in education. Probes are usually done in the early stages of a design project. Here, it was proposed as a way to return to the beginning of the research subject and understand what elements can be changed to achieve the final goal, which is the improvement of the learning experience. The decision of proposing a research tool after doing the interviews was because of its non-participant approach, which provides a more sincere, personal, and real-time information. The data collected can then be contrasted with the current methods and tools being used, and adjustments can be proposed.

For user-testing purposes, after developing the probe, it was delivered to one of the interviewees. The user selected represents one of the stakeholders, who is in charge of organizing teacher training workshops and designing tools for them. The user interacted with the prototype. She read the instructions of use and tested the different elements. Afterwards, the user-provided her feedback on the tools and purposes of each element according to her personal experience. The evaluation was divided into 3 components: usability, desirability, and differentiation.

Although the probe can be used for different purposes, i.e. other than evaluating education; this experience was developed following the hypothetical use of the OLPC interface, including current guidelines created by Paraguay Educa.

The results of the feedback were the following:

	FEEDBACK
Usability Assess the physical usability (size, shape) and clarity of the interface (cognitive) (March 1994). Consideration: visual clarity, visual order, sense and harmony, the product's symbolic value and the emotional responses delivered	The user stated that at first glance the proposal is visually attractive. It makes you want to use it. Regarding the individual elements: ● The whiteboard is a wise option since it allows reuse without generating waste as it would if it was made out of paper. It looks fun. ● The colour palette is attractive and harmonious. ● The magnets are easy to use and understand once you know what each letter and expression means. ● It is practical to have included a paper-based notebook because many things happen in a school day and if they are not written down, they get forgotten. ● Having the option of making a weekly record is very useful. Is

a visual roadmap that will then be accompanied by the progress of each day.
- The most difficult elements of the probe are the question cards since they require more time to analyse. You could request to do the exercise daily but there are days when the teacher will be tired to carry out this activity. However, the function of the card is interesting because it induces reflection, which is vital for a teacher.

In general, the probe looks feasible but not for every class of each day. She recommended that the teacher should choose which class is going to be analysed with the probe.

Comments about order and information for the user guide (instructions) were given. These comments were taken into account and corrections were made for the final proposal.

Desirability Evaluate proposal's potential user satisfaction, perceived value, and emotional response (Crilly et al, 2004; Menold et al, 2017) Consideration: Will this solution fill a need? Will it fit into the teacher's life? Will it appeal to them? Will they want it?	The participant stated that it is a tool for self-reflection that can have positive consequences in their work. One problem, she said, is the lack of time. Teachers already have a big amount of work and this is another activity. On the other hand, if teachers do not have a tool or a task that requires them to reflect, they do not do it. "The only way to improve as a teacher is by reflecting on what you do. If you do the same thing every day, do not expect to have different results. You will always get the same result. Hence, to grow and improve, you have to reflect." The tool plays that role. "It is useful, it is important and necessary, but you need to create first the space and the way to use it, to make it work". This was mentioned in terms of the implementation in an educational institution. First, there must be a space (workshop) to explain and deliver the tool and after using it for a period, reflect on the results. In the meantime, supervision can be made. If the institution decides to apply it more than once, it has the possibility of becoming a habit for teachers. They must realize by themselves that the tool and process are helping them. Only by following a process of action and reflection, you can generate change.
Differentiation Value novelty, similarities and differences from other tools used in the workshop	The user does not remember seeing a similar product in the market that includes the different features involved. Many question cards, toolkits and teacher training apps can be found, but this proposal includes other elements that are also important, and not included in those options. She emphasized that the whiteboard can have other uses in addition to what is required for the activity and that extends its use.

Discussion

OLPC was an ambitious idea developed by the Global North for the Global South, during the growing movement of design for social innovation or for the other 90% (Smith, 2007). It involved not only the "charismatic" XO laptop but a set of disruptive educational tools and framework. For some people, the programme can be considered as ongoing imperialism (Ames, 2019) and cultural hegemony (Gramsci, 1971), which sought to homogenise and extend education (Freire, 1973) from the North into the South, imposing their beliefs, values, and culture (Tunstall, 2016). One evidence that can be referred to is the importance of coding in the programme. For it to be accomplished, a foreign language must be learned.

For others, and in my opinion, from all the elements of the OLPC and its legacy, the Sugar interface is the most disruptive and provocative one. It accomplished in many ways the socio-constructivist (Vygotsky, 1986) and constructionist (Papert, 1980) ideals, through its design and use. The learner is not an "island" that learns in solitude but in a community where he/she can share interest and knowledge with peers from his/her same school level and location. At the same time, it can be shared with other users from different locations of the world. The platform becomes a tool not for universalising nor homogenising, but a path to share a pluriversal knowledge, where difference and diversity are valuable, and comparison and reflection can foster exploration and become new learning.

In connection with the previous reflections, comparing specifically these two elements, an ontological duality within their conceptions and design can be remarked (Escobar, 2016). While the XO laptop presented the philosophy of ownership, individualism, and control, most related to ontological patriarchy; Sugar promotes sharing, collectivity, respect and coexistence, related to a more social ontology. In the end, both elements can coexist and also work independently. However, Sugar's versatility of use with other devices shows a more open and speculative future vision in contrast to the XO.

Some case studies explored in this work, like Uruguay, Peru, and Paraguay, demonstrate through their individual stories that heterogeneity and pluriversality can

be accomplished (Escobar, 2018; Kothari et al, 2019). OLPC connects the user to the world and at the same time, records, stores and shares local cultural knowledge, for example, language. Depending on the way the device, the platform and the contents are planned by the teachers, educational technologies can become a platform to give voice to the different communities, including the oppressed ones (Freire, 1970). The space also allows the interaction of different disciplines working transversally, demonstrating that education in this century can be transformed from a banking and fragmented education, to a more critical, reflective, and collective learning (Freire, 1970).

To get to these reflections is important to remark the implementation of design anthropology studies (Gunn et al, 2013) in the project. Different specialists -mostly anthropologists and designers- have worked to understand the processes and artefacts created by humans, that then translate values into tangible experiences, which can generate change. The probe seeks a similar result, translating intangible emotions and empiric knowledge into tangible platforms for analysis, reflection, and change. Within this process, learning experience design (Floor, 2020) is also involved, as a holistic and interdisciplinary approach which is user centric. Many of the flaws of the OLPC could have been avoided or solved, during the ideation and design process, if the local context of implementation was considered in advance and if the process included more interdisciplinary actors.

The analysis and results of the primary and secondary resources lead finally to more questions and many possible solutions. The design process ended up being divided in short, medium- and long-term actions that needed to be done first to try to accomplish -and answered- the first research question: Can quality education for all be accomplished for 2030? Let us remember that what works in one place in another does not.

The socioemotional factor was mentioned in the different research results and as a consequence in this project, for its vital influence in the whole educational system. Thinkers -many of them Ibero-american- like Fals Borda (1989), Escobar (2014), Freire (1973/1976), Maturana (2001), Savater (2016), Hoyos-Vasquez (2008), among others, talked about the importance of reflexive learning, education for reconstruction,

and also, about the impact of feelings and emotions in the learning experience - thinking with the heart and the mind-. It can be said that traditional education has always tried to suppress the "feeling" and just work on the "thinking". In contrast to new tendencies, like SEL (CASEL, 2020), the emotional state is acknowledged and takes an important place in the way teaching and learning is going to be engaged.

The current crisis of civilization and the increase in inequalities have driven us to this inevitable change of paradigms and ways of thinking. Many of the thinkers mentioned before and others have talked and fought for an education that can be different from the current neoliberal, colonialist, and capitalist one. Yet, what has been discussed for a long time is the WHAT while the HOW remains unanswered. Educational technologies are part of this crisis and maybe, they can be part of the change and the how.

Overall, this crisis should not be taken as a threat but as an opportunity to open and explore new pathways to the world in other worlds, and with that, the true pluriversity of knowledge.

Conclusion

At the end of this project, the first research question remains unanswered, but it helped generate critical reflection and formulate other interrogations regarding education today. Unlike the articulations recommended by the "universal" sustainable development goals, particularly number 4, this research invites the reader to discover pluriversal interventions that seek the same aim but through alternative actions in local more than global communities. Some of them small but towards a greater transition and transformation.

Regarding what is worth learning, there is no single answer as we accept the world's diversity and how necessities can be different between locations and time. However, it can be pointed out that the 21st-century skills are the main goals currently, and educational technologies -which are part of it- have demonstrated improvements after their inclusion in different countries, including Paraguay.

In this particular case, the success and continuity, after the adoption of ICTs in education like OLPC, were influenced by the key roles of:

- Paraguay Educa, as adopter and implementer;
- the institution directors, for fostering different mindsets that change inevitably the way teaching is done;
- the teachers, for implementing the ideals and methodology of the programme and tailoring the educational materials to the local context;
- the community, for supporting their children and educational actors, and especially,
- the cultural and social context, which helped break and tailor the original OLPC framework to be adjusted to the local context.

Referring to the how should be taught, in contrast to Negroponte's initial utopic ideas of equal education, ICTs can increase or decrease social, economic, and cultural differences depending on the way they are taken advantage of. Different from other countries of South America, the OLPC evolved slowly in Paraguay and during this long journey, it provoked questioning and positive change in education.

The new goal, following the constructionist framework, should focus not only on educational innovations through technological devices. Other elements and methods can also promote critical thinking and construction. They can also be combined and applied transversally inside and outside the classroom. Yet, for this to happen, training workshops need to become more frequent and varied, exploring different subjects that are necessary for the generation of local educational innovations.

Although the proposal was not tested with a wider public, it can be said that the different tools of the probe, especially the questions cards and notebook, invites to reflect and deconstruct traditional education, provoking the construction of new forms of teaching, and in consequence, of learning. The role of design in this project is to accompany and provide tools that help improve the experience of the teaching and learning, inside and outside the classroom. However, the proposal as a critical design can, and should, be tested and improved constantly, considering also the communication of the individual results that will then be used to create collective knowledge.

Finally, we need to remember that educational technologies are just a means to an end, and without proper training and development, learning outcomes cannot be achieved. The role of the teachers, and more specific, their interest and motivation, are key for this achievement ∎

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