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# Innovative Experiences 2023



NODO



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Ministerio  
de Educación  
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**Ceibal**

# Innovative Experiences 2023





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How to cite this publication:

The Ceibal Foundation (2024). Innovative experiences 2023.

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# Introduction



First implemented in Uruguay in 2021, the NODO Awards seek to become an incentive for education communities playing leading roles in pedagogical innovation by sharing their experiences with the community at large. In 2023, this initiative was expanded with the addition for the first time of the NODO Innovation Fund for the management of schools. The purpose of this fund is to recognize and highlight the work of education communities implementing pedagogical transformation projects and innovative practices for better learning.

Both initiatives – the NODO Awards and Funds – are implemented by the Ministry of Education and Culture (MEC), the National Administration of Public Education (ANEP) and Ceibal with the support of the Ceibal Foundation, the Technological University of Uruguay (UTEC) and VisitEDUfinn. Their main objective is to celebrate pedagogical innovation and draw attention to the people involved in it. The core idea behind them is to recognize and highlight projects and schools that stand out for their most creative pedagogical proposals and acknowledge their impact on improving learning.

The 2023 edition of the NODO Awards drew 57 project submissions, 10 of which were selected and 2 were given awards in the *Pedagogical Innovation* category and 1 in the *The Public's Recognition* category.

The winners received the “NODO Award” statuette, created by Uruguayan artist Santiago Dieste based on a conceptual design where all the pieces are interlocked and support the previous ones in a fashion akin to that of the education system, where the players have the same weight and are equals even if they play different roles in a system that must work collaboratively. The winners also participated in the PreCeilab programme, promoted by Ceibal, and received a starter kit to begin integrating the use of technologies into the implementation of a project, which includes training paths in Ceilab methodologies and technologies. They were also given the chance to take the postgraduate diploma course “Specialization in educational technologies” at the Technological University of Uruguay (UTEC), and 5 teachers participated in the STEP 2024 International Forum on Education organized by VisitEDUfinn in Helsinki, Finland.

As regards the first edition of the NODO Funds, 110 primary applications were submitted and 25 finalists were selected, of which 11 projects were finally chosen for funding with as much as \$1,000,000 (one million Uruguayan pesos) in 2024.

In this publication, the Ceibal Foundation presents a detailed description of each of the award-winning experiences of the NODO 2023 Award for the purpose of publicizing them and making them a source of inspiration for the whole education community in Uruguay. The intention is to draw attention to those involved in the innovation processes and showcase their work, which is necessarily collective and collaborative.

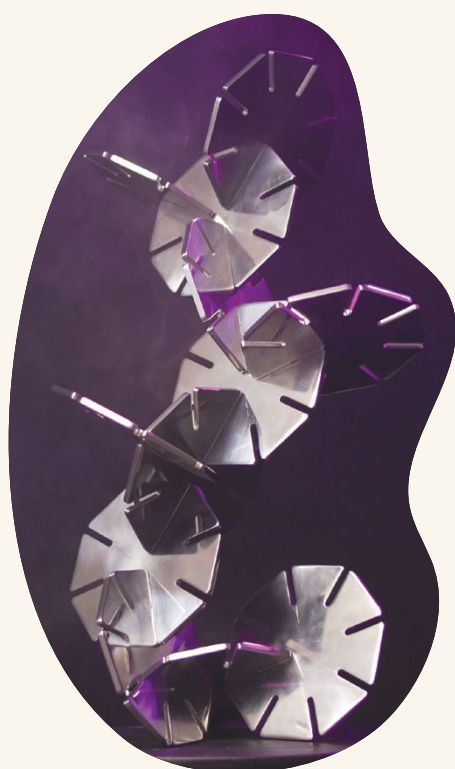
# 2023 Winners

## NODO Awards

In the third edition of the NODO Awards, the "AlfaSoft" project by Valeriano Renart Secondary School N° 3 in Artigas won the *Pedagogical Innovation* category. The project arose out of an actual challenge, and it developed software to support the literacy of students starting secondary school based on computational thinking and involving various groups: teachers, teacher training students and nearby schools. Management of the project involved working cooperatively with rotating roles.

In the same *Pedagogical Innovation* category, the project Football with good vibes by the Brazo Oriental Higher Education Institution: Los Céspedes Annexe in Montevideo was also honoured with an award. Students from Basic Professional Training in Sports and Recreation conducted research and developed devices to facilitate football for the blind by means of armbands that vibrate when the wearer approaches the rival's goal. The project manages to mobilize the community by placing technology and learning partnerships at the service of inclusion and leading roles for adolescents.

Meanwhile, in the category *The Public's Recognition*, Dr Juan Belza Secondary School in Canelones received an award for the project "Gamified recycling station". At the instigation of secondary school students from San Ramón, gamified waste containers were created and devices designed to recycle that waste and obtain paints, educational material and fertilizers. The project demonstrates not only ecological sensitivity but also creativity in actively involving the community in sustainability.







In addition, the project "*Placita inclusiva*" (Inclusive Square) by Manuel Francisco Artigas Primary School No. 34 in Florida received an honourable mention. This project involved schoolchildren from Casupá using First Lego Explore to build a mock-up of an inclusive square and set up local partnerships to make it real. Dreamt up and designed by children, this initiative brings into play robotics skills, computational thinking, collaboration and inclusion, and demonstrates that ideas can have an impact on the community.



Other shortlisted projects of the 2023 edition were "Inclusive Yaguareté Ecopark", by Agustín Ferreiro Primary School No. 6 in Río Negro; "Serendipity", by *Ánima* in Montevideo; "innovative Cycle", by the Osimani and Llerena Departmental Secondary School in Salto; "EduAventura + Allá del Norte", by the CME Baltasar Brum (Full-time School) in Artigas; "Gone with the water", by the Educational Technopole in Tacuarembó, and "Cañada de los Hornos Project", by Secondary School No. 4 and Primary School No. 99 in Soriano.



NODO 2023 award-giving ceremony.



## NODO Fund

The NODO Fund selected 11 projects for their funding with as much as 1,000,000 Uruguayan pesos in 2024. These initiatives are: "1984: *El ojo te mira*" (1984: The eye is watching you), by Sagrada Familia Primary and Secondary School in Montevideo; "*e'a! Festival de ilustración y lectura 2024*" (e'a! Artwork and Reading Festival 2024), by the Southwest Teachers Regional Centre in Colonia; "*Espacio de Creatividad & Tecnología*" (Space for Creativity & Technology), by the Los Rosales Foundation in Montevideo; "Sustainable Space", by Flor de Maroñas Technical School No. 2 in Montevideo; "Aesthetics and ICT in school environments for meaningful learning", by Colonia Nicolich Primary School No. 155 in Canelones; "Laboratory of Innovation and Educational Outreach", by Alberto Candeau Secondary School in Paso Carrasco, Canelones; "Podcasts, school radio and streaming in support of learning processes", by Emilio Oribe Primary School No. 46 and Cerro Largo Primary School No. 6; "Our environment – Reasserting a sense of belonging", by Homero Macedo Secondary School No. 3 in Treinta y Tres; "Our woods, our roots", by Partner School No. 103 and Rural School No. 103 in Soriano; "Cañada de los Hornos Project", by Grito de Asencio Primary School N° 99 and Secondary School N° 4 in Soriano, and "Flavours on Wheels", by Atlántida Technical School, Soca Annexe in Canelones.





PEDAGOGICAL INNOVATION

# AlfaSoft

*Valeriano Renart Secondary School N°3, Artigas*



## PEDAGOGICAL INNOVATION

# AlfaSoft



Valeriano Renart Secondary School N° 3 in Artigas won the NODO 2023 Award in the *Pedagogical Innovation* category for their AlfaSoft project. Their end product involved developing an app for Android devices comprising three sections arranged from greatest to least complexity for the purpose of contributing to strengthening reading and writing skills. In the first section, the user must complete the letters of the alphabet below the image of each grapheme in upper and lower case; in the second section, they copy phrases broken down into syllables; and in the third section, they reproduce short paragraphs which they first have to listen to and then write. In each interface, they are given the possibility to click on the letter, syllable or word to hear its sound.

This initiative was prompted by the difficulties of grade 7 students, whose literacy was lower than expected for the level. Through a learning proposal based on projects and problem solving, the grade 9 students of Computer Science at the Secondary School were able to respond to a specific challenge and make a positive impact on other students' lives.

## *Characteristics* **of the school**

Valeriano Renart Secondary School N° 3 belongs to the General Directorate of Secondary Education (DGES). It was founded in 1996 and is located in the city of Artigas, the Department capital furthest from Montevideo. With a population of just over 40,000 inhabitants, it is located on the banks of the River Cuareim and borders the Brazilian city of Quaraí, with which it maintains close economic, social and cultural ties.







The institution provides Lower Secondary Education (third cycle of Integrated Basic Education) in morning and afternoon shifts, and the first year of Upper Secondary Education. There are 614 enrolled students distributed in 23 groups in both shifts. The school is a large two-storey building with, in addition to classrooms and offices, an assembly hall, a multipurpose room, a cafeteria, a library, science and IT labs, and an outdoor courtyard with communal facilities for basketball, volleyball and football.

It has a large teaching staff with a strong sense of belonging made up of 55 teachers, 6 student support assistants, a pedagogical guiding teacher, a sexuality counsellor, a laboratory preparation assistant, a bibliographic guiding teacher, a secretary, two administrative clerks and a team of six long-serving service assistants. In addition, the school has been part of *La Red*<sup>1</sup> since 2016, has the support of a mentor and eight hours of a counsellor teacher on the school premises.

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<sup>1</sup> A pedagogical innovation community started in 2014 by the National Administration of Public Education (ANEP) and Ceibal.

# Project *features*



## Motivation



The initiative emerged in early 2023 in the grade 9 groups of the morning shift when they found out that some students had joined the school that year who – as a result of the pandemic as well as other factors including family reasons – did not know how to read or write as expected for their level. In the Computer Science class, taught by Ms Betty Albornoz, and at the instigation of one of the student support assistants, Laura Marcelino, they decided to help them. They then came up with the idea of developing an application that would enable them to improve their literacy. Many of the students were in their last year at the institution, so the project was seen as a great opportunity to contribute to the school.

## Sequence

Work on the proposal to develop a platform to increase the literacy of students with reading and writing difficulties was undertaken at the same time throughout the school year by the four grade 9 groups. At the beginning of each class, the Computer Science teacher would set a specific goal, and each team would focus on achieving it by taking on one of the proposed roles: a programmer responsible for making the codes; an editor in charge of producing and editing pictures and audio and video clips; and a graphic designer and director tasked with the general coordination and updating of the project report.

To develop the programming, the students used HTML code, which some had already learnt about in previous years and was easier for them to work with. The resources available in the school were very limited in relation to those required, so they had to tap into their creativity to find alternatives. In addition to programming, other kinds of activities and resources were necessary for modelling the interface and designing the aesthetics. For the graphic part, they relied on the Canva platform, which offered templates, pictures and icons that were not subject to copyright. Periodic presentations inside the classroom and in other spaces such as institutional coordination meetings contributed to progress usually along a common line, even though each team was given freedom to develop their proposals.

Around October, the teams selected a version of the platform, which they presented in a final stage. Once the product was obtained, it had to be tested. Betty Albornoz worked together with the headmistress and the team of student support assistants on the evening shift. In the presence of their families, the students were given the application so that they could try it, with very satisfactory results.





The next step was to disseminate it for use as a support resource among the students who needed it. The application was installed on all the tablets of the institution, and it was distributed to the teachers so that they could test it. At present, AlfaSoft is in operation for the Android operating system, hosted in a Google Drive folder and available for download through a link. The tool was also shared with several institutions.

## Strengths of the innovation

- **The students' learning process:** The project goes beyond the academic sphere and promotes comprehensive development.
- **Good coordination and collaborative work:** The work between direct and indirect teaching figures was strengthened in order to identify problems and support students.

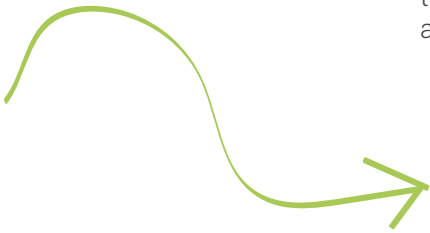


- **Development of various competencies:** The interaction with teachers, the reception and management of the contributions and the effective communication of abstract ideas strengthened skills such as communication.
- **Use of different methodologies:** The project included project-based learning, problem solving and computational thinking.
- **Opportunity to provide a solution to a specific challenge:** The outcomes had a positive impact on the lives of other students.



## Main challenges

- Although the app is currently in operation for the Android system, it has not been possible to start a specific dissemination campaign or keep up the initiative.
- The feedback from the different stakeholders who have come into contact with the application has not been recorded and systematized yet.
- Although those involved share the perception that the application could continue to be disseminated and improved, they also acknowledge difficulties associated with lack of time, student graduation, and rotating roles.



# Key points of the innovation according to those involved

## ➔ Active learning experience based on collaboration and problem solving



"Betty would set goals for the classes and we would decide. For instance: "the programmer needs the audio clips". The audio team would then go off to record, others would design, and by the end of the class everyone had done their bit," Mellanie Valerio, former student at Secondary School N° 3 and project participant.



"I remember that Betty would give us a number of codes, and we were supposed to work out how to adapt them. For instance, if it read "image code", we had to find a way to make it fit with the alphabet," Gerardo Efimenco, former student at Secondary School N° 3 and project participant.

## ➔ Collaborative work and strong support to the students by the direct and indirect teaching staff

"It happened thanks to the students' commitment as well as the seamless communication established by the teaching teams and integration with the student support assistants and the principal. It was a well-oiled machine, and that was really very stimulating," Betty Albornoz, IT and Educational Technology Guiding Teacher (Spanish acronym: POITE) and Computer Science teacher at the school continuously since 2019.

"Dialogue. Not keeping information to yourself, in frustration, shutting yourself off and unable to find a solution. In this case, we discussed it, we talked it over, we thought together, we reached out to the principal, and it came off," Adriana Cabrera, student support assistant at the school between 2014 and 2023.

## ➔ Promoting the students' comprehensive development

"From the pupils' perspective, they gained new insights into programming, but also into things like awareness, empathy, solidarity, social commitment. That was quite interesting. They leave with that wealth of topics that matter in personal development, not just at the technical level, because they are instrumental in developing a knowledgeable citizen: that is extremely important," Betty Albornoz, IT and Educational Technology Guiding Teacher and Computer Science teacher at the school continuously since 2019.



"That's something that moves me. It really touches me, because they worked hard; they overcame all the difficulties they encountered – which is very stressful – thinking about someone else who had a difficulty. This goes to show that young people are empathetic, supportive and always seek to help their peers," Ana González, principal of the school since 2012.

➔ **An initiative resulting from a challenge from the institution, with a social impact and the possibility of further development**

"They were so committed that I think many times they lost sight of the issue of getting a mark and focused on the serious part of this game, which was the production of a program for someone who could neither read nor write," Betty Albornoz, IT and Educational Technology Guiding Teacher and Computer Science teacher at the school continuously since 2019.

"I think this could be something much bigger that could reach more people, because I think it's a very important issue that must be solved," Mellanie Valerio, former student at Secondary School N° 3 and project participant.

"We know educational institutions are receiving more and more youngsters with a range of difficulties. A few years ago, that wasn't common; they used to fall by the wayside. Today, educational inclusion is encouraging them to stay on", Ana González, principal of the school since 2012.







## Technological resources used



- + **CANVA:** a tool for the design and publication of documents in various formats such as presentations, videos, brochures, banners, etc; collaboration capabilities. [About Canva](#)
- + **Draw.IO:** free tool for creating and editing diagrams, such as UML diagrams, network diagrams, flowcharts, engineering and electronics diagrams, concept maps or Venn diagrams. <https://app.diagrams.net/>
- + **Emulators:** software that enables programs (hardware or an operating system) to be run on a platform other than the one for which they were originally created. The aim is to accurately model the device so that it functions as if it were being used on the original device.
- + **OpenShot:** free cross-platform non-linear video editing software. <https://www.openshot.org/es/>
- + **Google DRIVE:** a file storage system with associated collaboration capabilities at different levels (viewer, commenter, editor). <https://workspace.google.com/products/drive/>.
- + **HTML (Hypertext Markup Language):** the Web's most basic building block, it defines the meaning and structure of web content. In addition to HTML, other technologies are usually used to describe a web page's appearance/presentation (CSS) or the functionality/behaviour (JavaScript). "Hypertext" refers to the links that connect web pages to each other, either within a single website or between websites. HTML uses "markup" to annotate text, images, and other content for display in a Web browser.
- + **Javascript:** programming or scripting language that allows developers to implement complex functions on web pages. It makes it possible to create content that is updated in real time, control multimedia, animate images, and more.
- + **App Inventor:** platform for developing applications for the Android operating system. <https://appinventor.mit.edu/>



# Voices of the education community

**Conrado Muñoz**, former student at Secondary School N° 3 and project participant

“ Many times, you show people the app and they say, 'Oh, that's so easy to make', but it's not at all. We've been through a whole year of very tough processes. It's like, sometimes you go and see 'A, B, C, D' on the computer, press the key and that's it; but it was something so challenging to do. It took all your hard work, so, yes, I feel that a lot more work could be done. ”



**Mellanie Valerio**, former student at Secondary School N° 3 and project participant

“ We started out with the basics of the project; the idea that we wanted to implement with it. And then we began looking for the codes, programming, testing, and many times it didn't work. You had to delete it, do it again, but when it worked it made you really happy. That was the best thing. The best feeling was that; when you managed to make it work the way you wanted it to. ”



**Ana González**, principal of Secondary School Nº 3 since 2012



I'd say it's well worth it because you'll get many things from the students. It's not just that they'll get very high marks but also the fact that we're training them in a different way. This is what we really want for the student of the future, because we can't have students who only repeat things but who are creators of different things; innovators.

**Betty Albornoz**, IT and Educational Technology Guiding Teacher (Spanish acronym: POITE) and Computer Science teacher at Secondary School Nº 3 continuously since 2019

We all know each other, and when we sense a need or a problem, even if it doesn't concern us directly, we keep thinking about solutions and talking. I think that's one of the institution's great strengths, in addition to the management team's great support for the teachers' work.



PEDAGOGICAL INNOVATION

# Football with good vibes

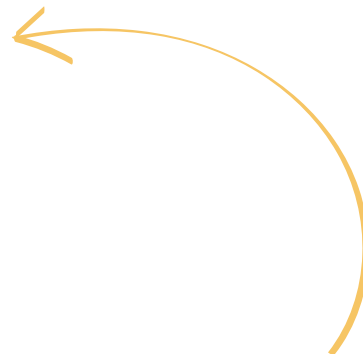
*Brazo Oriental Higher Education Institution:  
Los Céspedes Annexe, Montevideo*





## PEDAGOGICAL INNOVATION

# Football with good vibes



The Los Céspedes Annexe of the Brazo Oriental Higher Education Institution was honoured with the NODO 2023 Award in the Pedagogical Innovation category for the project Football with good vibes. It was conceived as a living lab, where theory is made available to practice: it helps combine technology, football and attention to disabilities through the development of a device that will improve the performance of blind or visually impaired people in this discipline. It involved developing an armband for each player that gives out a signal when they come within 12 metres of the attack guide behind the opponent's goal.

In collaboration with the amateur blind football team of *Club Atlético Peñarol* – the only club with a blind football team at the time – this project gave students insights into programming which they integrated into their specific training. It also brought them into contact with the needs of visually impaired people who play football and pushed back the boundaries of this educational institution for learning activities in other areas of the city and other departments.

## *Characteristics* of the school

The Los Céspedes Annexe is a school of the General Directorate of Vocational and Technical Education (DGETP) administered by the Brazo Oriental Higher Education Institution. The latter, founded in Montevideo in 1964, offers Technological Upper Secondary Education (level 3) and Technological Secondary Education (level 2) in Sport, IT and Administration, and has an estimated 1,400 enrolled students.



In 2021, the Los Céspedes Annexe was founded through an agreement between the DGETP and *Club Nacional de Football's Fundación Nacional*, which provides the infrastructure where the courses are held and offers students breakfast or an afternoon snack depending on their shift. It provides Basic Vocational Training in Sports and Recreation and Upper Secondary Education in Sports. In the afternoon, the facilities are shared with the youth centre, created in 2024 through an agreement between *Fundación Nacional* and the Institute for Children and Adolescents of Uruguay (INAU). The Los Céspedes Annexe is located in Puntas de Manga, Montevideo, about ten kilometres from the premises of the Brazo Oriental Higher Education Institution. It is located within the Sports City of Los Céspedes, which belongs to the *Club Nacional de Football* and is the training quarters of their sports teams. It is a construction of assembled containers that includes three classrooms, two offices, a gallery or eaves and a natural grass pitch. Its location in a sparsely populated area bordering semi-rural areas and framed by three major thoroughfares means that coordination with other institutions is not so seamless.



The Los Céspedes Annexe is attended by 105 students distributed in four groups on the morning and afternoon shifts. Roughly 10% of those enrolled play in *Club Nacional de Fútbol* and another 20% play in other teams. In other words, most of these young people do not directly practise sports professionally.

The school's team is made up of a coordinator, two student support assistants (one of them also in a role supporting management), an educator and two service assistants. At present, a total of 26 teachers serve at the institution. Although the staff is growing in accordance with the course description, the stability of a significant number of those who are joining is remarkable.



The sports and recreation course brings dynamism and action to the institution, which exudes football. In addition, its institutional culture, its small size and the policy of integrated spaces as part of Basic Vocational Training open up opportunities for collaborative and interdisciplinary work between teachers and curricular units.

## *Project* **Features**

### Motivation

The idea began to take shape as a result of the graduation project of a group of Basic Vocational Training students in the Sports and Recreation Workshop. Interest in the subject was encouraged by one of its members, who had been in contact with blind people for health reasons. The aim was to combine football with technology and a focus on the visually impaired.

### Sequence

The initial idea was supported by the former Sports and Recreation Workshop teacher at the Los Céspedes Annexe, Felipe Ledesma, Spanish Language teacher Ana Fábrica, former coordinator Leticia Gismero, and current coordinator and former educator Romina Obregón. In order to research football for the blind, its requirements, and the subsequent testing of the prototype, they contacted the amateur team of the Club Atlético Peñarol and visited them at their training site.

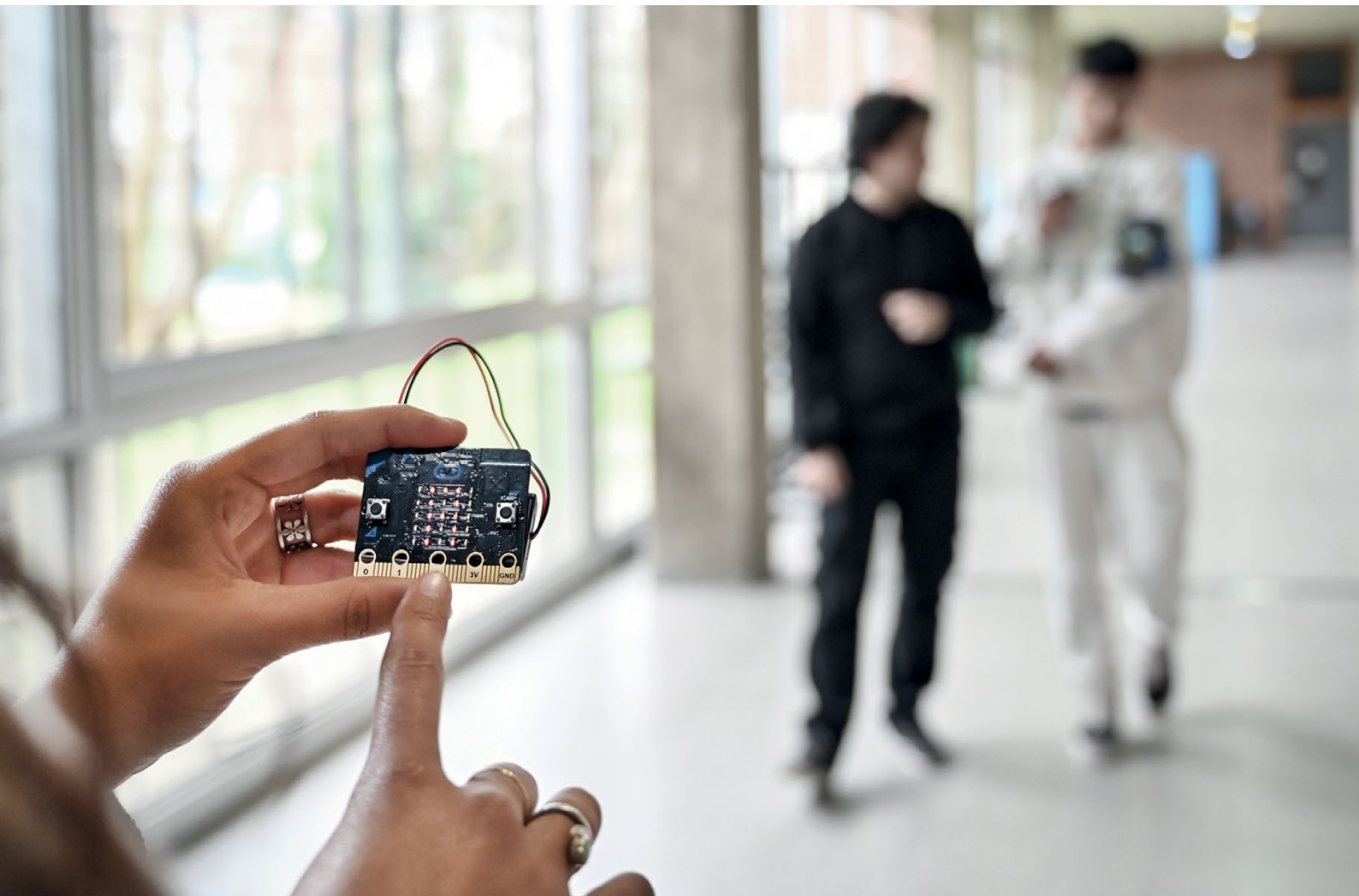
As the Los Céspedes Annexe did not have suitable teachers or technological resources for the implementation of the project, they turned to the IT coordinator at the Brazo Oriental Higher Education Institution, Luis Fagúndez, for support. For a period of two months, he received the students for 4 hours on the morning shift in the PreCeilab laboratory of the Institution. The teacher introduced basic programming concepts, explained the operation of the micro:bit board and the MakeCode program, and supported the development of the prototype. The aim was to create a device that could give blind players a signal when they are at a certain distance from the opponent's goal.



The project was implemented simultaneously at the Brazo Oriental Higher Education Institution and the Los Céspedes Annexe. In the latter case, the activities were undertaken mainly in the Sports and Recreation Workshop. Indirect teaching roles such as the coordinator and educator supported the team with other necessary activities (such as summaries, presentations, putting up stands, coordination, transfers, authorizations), and provided emotional support.

The students carried out field tests at the Institution and then with the *Club Atlético Peñarol* team. These tests allowed adjustments and improvements to be made to the programming. The process was recorded in a field notebook. The students also participated in the Science Club Departmental Fair, in which they qualified for national competitions. By the time they presented their graduation project, they had completed their portfolio and were able to defend it proficiently thanks to their previous experience.

It was possible to make the device give out an audio signal, but that was not useful for the players. The initial idea of producing a vibration was not possible because there were no vibrators powerful enough to be perceived by the athletes in a real match situation. In any case, the programming remained in operation for adaptation to this type of device if the project kept moving further.







## Strengths of the innovation

- **Student development at the academic and personal level:** Access to new technology and programming knowledge.
- **Crossing the territorial boundaries of the Los Céspedes Annexe:** To access learning opportunities, those involved in the project had to go out to other institutions and spaces inside and outside the city.
- **Promotion of meaningful, contextualized learning:** The project had a positive potential impact on the lives of visually impaired people.
- **Collaborative work at the level of students and the school's team:** Bonds were strengthened through greater trust and closeness.
- **Networking with other institutions:** Making the implementation of the project possible meant contacting *Club Atlético Peñarol's* amateur blind football team and the Brazo Oriental Higher Education Institution.
- **Operational prototype:** The output was a prototype with opportunities for development.

## Main challenges

- The students have new responsibilities related to their upper secondary school studies, and some of them no longer attend the institution.
- The Sports and Recreation Workshop teacher and the former coordinator are no longer with the institution and have heavy workloads in distant schools.
- The necessary resources for an improvement of the device are not available (Arduino boards, more powerful vibrators).
- A more advanced version of the prototype would call for more complex electronics and computing knowledge and tools. It would be necessary to bring in people with qualifications in this area, or coordinate with other institutions specializing in the subject.





# Key points of the innovation according to those involved

## ➔ An original, multidimensional proposal related to an actual problem

"The idea is good. It's unprecedented, and it managed to go beyond what could be expected from a graduation project by combining technology, disability and football," Romina Obregón, coordinator at the Los Céspedes Annex.

"Thinking a little outside the box – rather than "This is what I have" – was what really contributed to winning the award; proposing an idea that is truly different from the things that, in a way, come about by default. It was necessary to go out and search, investigate, come up with ideas," Luis Fagúndez, IT coordinator at the Brazo Oriental Higher Education Institution.



## ➔ Social impact and opportunities for development

"It has a lot of potential for further growth. It's a diamond in the rough which can be polished much more. A base was created that is like a springboard; it would be great if they continued working on it. In addition, it brings social benefits for other people, and that's very good," Felipe Ledesma, former Sports and Recreation Workshop teacher at the Los Céspedes Annexe.

## ➔ Interinstitutional coordination

"We are an annexe of the Brazo Oriental Institution, but if we hadn't sought them out and contacted them, it would have been impossible to carry out the project," Florencia Souza, Upper Secondary Education Sports student and member of the team that implemented the project.

"It was a project that got us out of here [the Los Céspedes Annexe]. We were able to learn about other projects from other institutions." Isaías Tárdaquila, Upper Secondary Education Sports student and member of the team that implemented the project.

## ➔ Collaborative work and the teaching team's strong support for the students

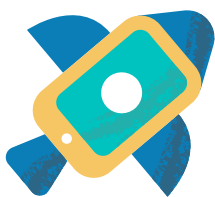
"The teachers and the students put on the school's hat. The work flowed. It was a joy," Ana Fábrica, Spanish Language teacher since 2022.

"This project was presented at the Science Club, and that meant that its development was backed and emotionally supported from outside the classroom. We became role models for the students: we supported them, we were there for them, we helped them get to know Montevideo," Leticia Gismero, former coordinator.

## ➔ Promoting the comprehensive development of students, thus removing disciplinary, social and territorial barriers

"One of the things that changed was the way they referred to them. They always used to talk about "the blind", but now they talk about "the visually impaired". The students now felt confident enough to ask a blind person how they play football. And they weren't embarrassed to ask", Romina Obregón, coordinator.

"I think that's great, because it gave them something that is much more important than IT knowledge: knowledge for life; everyday life", Luis Fagúndez, IT coordinator at the Brazo Oriental Higher Education Institution.





## *Technological resources* and scientific instruments

- + **Dupont wires:** also called jumper wires, they are used to connect hardware such as sensors, Arduino boards and breadboards.
- + **Sensors:** devices designed to pick up a stimulus from the environment and translate it into specific information to be measured or monitored.
- + **Micro:bit:** a small 4x5 cm programmable board. It has a large number of sensors with multiple uses. It has its own graphical programming environment: MakeCode, a simple online, open-source code editor that gives the user access to the world of programming intuitively through the visual or block-based programming language. <https://ceibal.edu.uy/plataformas-y-programas/microbit/>
- + **MakeCode programming platform:** a free, open-source platform for creating engaging IT learning experiences that help support a progression path into real-world programming. <https://www.microsoft.com/es-es/makecode>
- + **LED resistors:** device that limits the current to the LED and regulates the difference in voltage drops between the LED and the power supply.
- + **Ceilab:** digital laboratories inspired by the makerspace concept and design thinking that are set up in educational institutions for the implementation of research projects addressing real-life situations in their context. <https://ceilab.ceibal.edu.uy/sobre-el-programa/>





# Voices of the education community

**Luis Fagúndez**, IT coordinator at the Brazo Oriental Higher Education Institution

What I really value about these boys and girls is that they were so looking forward to acquiring knowledge. It's not usual in education for a pupil studying sports to say that they want to learn computer science to truly apply it on a project.



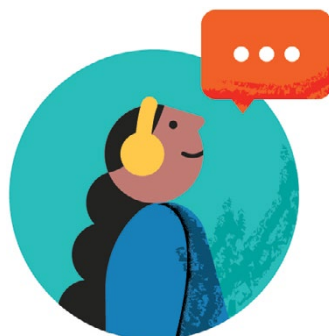
**Florencia Souza**, Upper Secondary Education Sports student and member of the team driving the project

I grew up a lot as a classmate, as a person. I got to know Montevideo, new people, this UTU (technical school) which I never thought I'd ever set foot in. It was a radical change. It's rewarding to know that you're doing something right; those things move me. I like to create something that goes beyond me: after I've died, that project will still help people.



**Romina Obregón**, current coordinator at the Los Céspedes Annexe and educator at the institution between 2022 and 2023

“ It's not miraculous, because in fact [the students] have problems like misbehaviour, truancy. Their realities haven't changed, and that causes them to keep struggling with things. But they definitely have more tools, and now they're strong enough to rise to the challenge. What has changed is their connection with study. ”



**Leticia Gismero**, former coordinator at the Los Céspedes Annexe between 2021 and 2023



“ When we hear the students speaking and reflecting, it’s important to see how we gradually become their role models, and how important positive role models are. They’re always watching us. ”



**Felipe Ledesma**, former Sports and Recreation Workshop teacher at the Los Céspedes Annexe

“ In fact, that achievement was bigger for them [the students] than we thought. Doing something and getting it right, going up on stage to be given the award, being applauded, playing the leading roles. ”



THE PUBLIC'S RECOGNITION

# Gamified recycling station

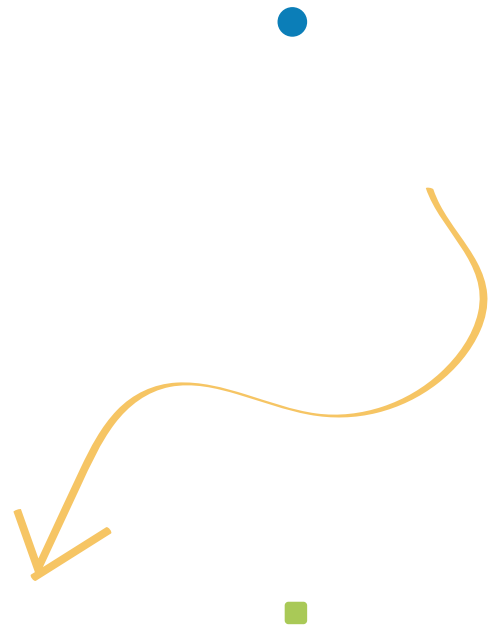
*Dr Juan Belza Secondary School, Canelones*





## THE PUBLIC'S RECOGNITION

# Gamified recycling station



Dr Juan Belza Secondary School in San Ramón, Canelones, won the NODO 2023 Award in the category *The Public's Recognition* for the "Gamified Recycling Station" project. Through voluntary and after-hours activities, students and teachers from the institution designed and set up four bins for waste classification, designed containers for the collection of cigarette butts in coordination with other schools in the area, and recycled paper that was used for different school activities.

The project involved a set of initiatives that combined the use of technology, gamification, and environmental care. It was made possible by the time and collaborative work put in by a group of leading teachers, and the motivation and commitment of students interested in the topic, which is treated as a cross-cutting theme of the institution.



## *Characteristics* of the school



Dr Juan Belza Secondary School belongs to the General Directorate of Secondary Education (DGES). It is located in San Ramón, a city with just over 7,000 inhabitants on the banks of the River Santa Lucía in the north of the department of Canelones. The town provides a wide range of learning spaces and environments, which is why it was officially declared an Educational City in 2007. Together with Primary



School No. 117, this secondary school is one of the first institutions to have been established there: it was opened in 1939 and given official status in 1944.



This secondary school is attended by 485 students divided into three shifts. In the morning and afternoon, courses are taught under the 2006 Plan, both at the level of Integrated Lower Secondary Education and Upper Secondary Education in the Humanities, Science and Biology branches -for 2nd year- and the Biological Sciences, Social Humanities, Social Economy, Physics and Mathematics and Mathematics-Design options for 3rd year. Although most of the students live in the city, there is a significant number that commute from nearby towns such as San Bautista, Santa Rosa, Tala, and other areas near routes N° 63, N° 6 and N° 12.

The facilities are spacious and provide many spaces in a green and open environment, since there are no other buildings on the premises. This has contributed to sensitivity to environmental care and sustainability.



The kindness, commitment and stability of the teaching staff, which is maintained even when many of them do not reside in the town and commute from Montevideo, Florida, Canelones, Tala or Santa Rosa, are trademarks of this institution recognized by its own members. The busy and bubbly atmosphere that characterizes this school crosses its boundaries and is shared with the whole community.



# Project features

## Motivation

The initiative was prompted by the arrival in the school of the Ceilab laboratory in 2022, and the award obtained as part of the Competitive Funds of the Municipality of San Ramón. The kick-off was an institutional project focusing on work based on the Sustainable Development Goals (SDG). In this context, the situation of excess rubbish in the town was discussed with the students. They thought of how to address the problem and then how to instil recycling habits in people. Apart from that, the funds received from the Municipality made it possible to buy materials – such as acrylics and sensors – necessary for the implementation of the project.



## Sequence

Students and teachers from Dr Juan Belza Secondary School participated in the project voluntarily and after school hours according to three main lines of work: the gamified recycling station; the cigarette butt collection and recycling campaign; and collecting and reusing recycled paper.

With the idea of building a gamified recycling station, a group was put together comprising eleven lower secondary students who were interested in technology. They worked in the Ceilab space with the support of the Physics teacher, Matías García, who oversaw the proper use of materials and tools. The team was also supported by the then Computer Science teacher and IT and Educational Technology Guiding Teacher, Eliana Avogadro. The work dynamic was relaxed and focused on research, trial and error at the instigation of the students. Four containers were built and programmed for better waste management: compostable or organic; paper and cardboard; plastics; and mixed waste. The first of them opened its lid automatically using an ultrasonic sensor and closed after a few seconds without detecting movement. The second one randomly turned on a light when it detected waste, assigning points that were shown on the screen of a micro:bit board.

Another of the initiatives implemented as part of the project involved collecting and recycling cigarette butts. A group of between 10 and 15 high school students was set up, led by the Chemistry teacher, Ana Gutiérrez. The work required coordination with other educational institutions in the area and with the community to build the containers necessary for the collection of cigarette butts. Once there was a sufficient number of them, they were sent to *No Más Colillas* (No more cigarette butts) —a voluntary group working to reduce pollution through awareness and collection throughout the country—, where they turned the cellulose acetate from the cigarette butts into paint. With this, a group of students from Dr Juan Belza Secondary School painted a picture that is currently on display in the building's large assembly room. They also performed their own laboratory experiments, treated cellulose acetate with a solvent, washed the cigarette butts and obtained some plastic.

In addition, paper was recycled as part of the winning project by grade 7 students from Dr Juan Belza Secondary School together with Geography teacher Ana García. The students collected paper and cardboard in their homes and in the container of the gamified recycling station. Twice a year, they shredded the paper, and using grids and blenders as instruments, they worked in groups to make sheets of recycled paper and used them to make new objects such as bookmarks, mock-ups or noticeboards for the institution.





## Strengths of the innovation



- **Promotion of learning-while-doing spaces:** Different disciplines and levels were combined.
- **Promotion of voluntary and after-school activities:** The project resulted from local sustainability-related challenges.
- **Collaborative work with other schools in the area:** To carry out the project, visits were made to schools No. 148, No. 275, and No. 117, Santa Margarita School, and the Technical School.
- **Use of different methodologies and learning spaces:** This included gamification (game-based work), project-based learning, and collaborative thinking.
- **Opportunity to redefine ties:** This redefining occurred both between teachers and students and between students from different groups and levels, which strengthened teamwork and the support of older students for younger students.
- **Impact on the community:** The actions carried out left a mark, as they promoted greater awareness and the adoption of environmentally responsible practices.





## Main challenges



- In the case of the collection of cigarette butts, the group disbanded when the upper secondary students graduated and has not reunited.
- Regarding the gamified recycling station, its implementation exposed the need to solve some issues, such as the maintenance of the devices or the work of emptying the containers.
- Although those involved have not specifically considered how to keep the recycling station in operation, some students are working on rebuilding the waste bins, which were rendered unusable when water flooded the institution during a spell of heavy rains.

## *Key points* of the innovation according to those involved

### ➔ School management open to work spaces for the implementation of projects based on a common line

"Around here, we come up with an idea, we propose it and they let us go ahead with it. We have freedom to work," Ana Gutiérrez, chemistry teacher at the school since 2009.

"Whenever we ask the school management for space for anything, we get it," Santiago Domínguez, English teacher at the school since 2018.

### ➔ Collaborative institutional culture and teacher stability

"We're a nice group of teachers working in many different roles and helping as much as they can," Santiago Domínguez, English teacher at the school since 2018.

"We have teachers who've been working along the same lines for several years. It's easy to coordinate activities. Colleagues forge bonds with each other and you become a member", Eliana Avogadro, IT and Educational Technology Guiding Teacher and Computer Science teacher between 2015 and 2023.



## ➔ Availability of spaces and materials, especially Ceilab

"Having the Ceilab is a motivator. I've visited classes while they're working. You see the students here, and they are somebody else. They move, interact and conduct themselves differently than in the classroom," Ana Laura Pereira, deputy principal since 2022 and a teacher at the school since 2001.

## ➔ Students committed to the proposals and a strong sense of belonging to the institution

"They are motivated by work; by everything that involves projects. They get excited about working and go through the process. They collaborate with the institution. That's why we have so many activities going on," Ana Laura Pereira, deputy principal since 2022 and a teacher at the school since 2001.

"They don't want time off work. They don't want to leave early. They want to stay on. They come after school hours," Matías García, physics teacher at the institution since 2017.

## ➔ Commitment and sensitivity to the environment and sustainability

"Environmental care is deeply rooted in this school. Teachers and students have followed the same line for several years," Eliana Avogadro, IT and Educational Technology Guiding Teacher and Computer Science teacher between 2015 and 2023.

"It's a cross-cutting thing for the institution. The motivation is to educate the student along that line", Ana Laura Pereira, deputy principal since 2022 and a teacher at the school since 2001.

## ➔ Coordination with other educational institutions

"It's an open institution; always committed to projects and to working with the community", Santiago Domínguez, English teacher at the school since 2018.

"The school writes social media posts on what it is doing. It holds exhibitions attended by other institutions. Families are invited to become participants", Ana Laura Pereira, deputy principal since 2022 and teacher at the school since 2001.







## Technological resources used

- + **MakeCode programming platform:** a free, open-source platform for creating engaging IT learning experiences that help support a progression path into real-world programming. <https://www.microsoft.com/es-es/makecode>
- + **Tinkercad:** used to design 3D models of the containers and circuits. A tool that allows users to project objects and parts by combining simpler elements. <https://www.tinkercad.com/>
- + **Micro:bit:** a small 4x5 cm programmable board. It has a large number of sensors with multiple uses. It has its own graphical programming environment: MakeCode, a simple online, open-source code editor that gives the user access to the world of programming intuitively through the visual or block-based programming language. <https://ceibal.edu.uy/plataformas-y-programas/microbit/>
- + **Arduino:** open-source electronics platform allowing the user to build an infinite number of single-board microdevices for a wide range of uses.
- + **Lego:** a practical and intuitive, inclusive and extremely adaptable learning system for playful, hands-on STEAM learning. <https://education.lego.com/es-es/>
- + **HC SR04 ultrasonic sensor module:** ultrasonic distance sensor capable of detecting objects and measuring distances to them from 2 to 450 cm.
- + **RGB Led:** 5 mm light with three LEDs inside the same package; one emits red light, another green, and the other blue.
- + **USB type "A" cables:** cables for connecting devices.
- + **Servomotor:** electric motor that operates parts of a machine with high efficiency and precision. It works together with a sensor that constantly sends a signal for exact position and speed feedback.
- + **Loudspeaker** for producing sound.
- + **PIR sensor module:** passive infrared (PIR) sensors used for motion detection by measuring the infrared light radiating from all bodies.
- + **Ceilab:** digital laboratories inspired by the makerspace concept and design thinking that are set up in educational institutions for the implementation of research projects addressing real-life situations in their context. <https://ceilab.ceibal.edu.uy/sobre-el-programa/>



# Voices of the education community

**Eliana Avogadro**, former IT and Educational Technology Guiding Teacher and Computer Science teacher between 2015 and 2023

“ In San Ramón there's little to do after school when they leave. It's like a rendezvous – especially for meeting classmates or other groups – where they create and are part of that something. It kind of makes them feel important. ”



**Martín Gutiérrez**, student who participated in the implementation of the gamified recycling station

“ Apart from having to explain the experience in the final exhibition, we had trouble with the circuit of the wastepaper baskets. We couldn't understand why they would stop working when we moved them. It was the first time we'd shown them operating in public. We had some trouble at the beginning, but then everything turned out just fine. ”





**Ana Gutiérrez**, chemistry teacher at the school since 2009

When we started to put together the cigarette butt holders, we used magazine clippings. It was their [the students'] idea to do it with the primary schools. So we started to establish a network with what was done here and shared it. In addition, we needed to raise awareness, so the students would take the cigarette butt holder home, and their smoking uncles, aunts and parents would throw away their cigarette butts there, and they would then bring the bottles.





**Matías García**, physics teacher at the school since 2017

“ The wastepaper baskets for bottle tops involved encouraging people to take the top off the bottle, and then the top would fall down a board with screws. If it fell into a certain hole, they scored. Getting the sensor to detect bottle tops took many months of many tests with different kinds of sensors. As bottle tops are so small, they emit hardly anything in the infrared spectrum, so most sensors failed to detect them [...] It was the most challenging part: trying out different technologies to see which was the most suitable as a solution. ”



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