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INSPIRING PRACTICES | FINALIST 2024 | ARGENTINA

#FAIRSOCIETY

From cigarette waste, students create ecological bricks for housing

The project uses 60% recycled material and is based on four pillars: simplicity, scalability, economic accessibility, and sustainability.

TEACHER
Agustin Pascua

STUDENTS
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COMMUNITY/CITY
Olavarría

SCHOOL
Escuela Nacional Adolfo Pérez Esquivel

PROJECT NAME
Bastet Haus

STEM AREAS
Science, Technology, and Engineering

OTHERS AREAS INVOLVED
Social Sciences or Sociology, Environmental Education, and Chemistry

Turning cigarette butts into ecological bricks for building homes might sound far-fetched. But what if those bricks were also designed like toy blocks, making construction even easier? For a group of teenagers and their high school teacher in Argentina, this innovation not only seemed possible but also became a reality. With knowledge in STEM (Science, Technology, Engineering, and Mathematics) and a lot of dedication, they brought to life the project "Bastet Haus," a finalist of Solve for Tomorrow in Argentina, Paraguay, and Uruguay in 2024.

The cellulose is extracted from cigarette butts and mixed with cement to create lighter, more affordable bricks. The goal is to offer a strong yet simple material to build housing for people in need. The project builds upon "Collisafe", the 2022 winner of Solve for Tomorrow in the same countries. At the time, the team reused cigarette butts, removing all chemicals and toxins from the cellulose through the action of the Pleurotus ostreatus mushroom, also known as the oyster mushroom.

The cigarette butts were sealed in a container with the fungus and, in just 25 days in the dark, the toxic substances were broken down. "The impact of Solve for Tomorrow was huge in our school, and our idea was to take the project a step further," explains the teacher. "Collisafe" even led to the founding of a local cooperative focused on collecting and recycling cigarette butts.

The ecological bricks were tested in a lab and showed promising results, with equal or better resistance than traditional market options.

The new team included four students from the fifth year of secondary school—the penultimate year of compulsory education. The mentor teacher, Agustin Pascua, has a background in Business Administration and leads the Economics and Management Department at Escuela Nacional Adolfo Perez Esquivel. Pascua was also the mediator for "Collisafe" and says that with the final product in hand, there were many possibilities. "The students began analyzing. I told them to

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consider the community's needs so this new project could offer a solution," he notes. By examining local data, they discovered that around 4 million people were homeless in Buenos Aires, where the school is located. That motivated them to focus on ecological bricks. They chose the name "Bastet Haus" to represent "the protector of the home": Bastet is the ancient Egyptian goddess of protection, and "Haus" means "house" in German.

Eureka Moment!

After confirming the feasibility of brick production, the students considered how to reduce labor costs. They tested several prototypes at the Faculty of Engineering at the National University of the Province of Buenos Aires (UNICEN), to which the school is affiliated. With reference research and support from university students, the idea of interlocking bricks—like LEGO blocks—emerged. "The results from the interlocking designs were very positive; we confirmed that our bricks are as strong or stronger than standard ones," the teacher shares.

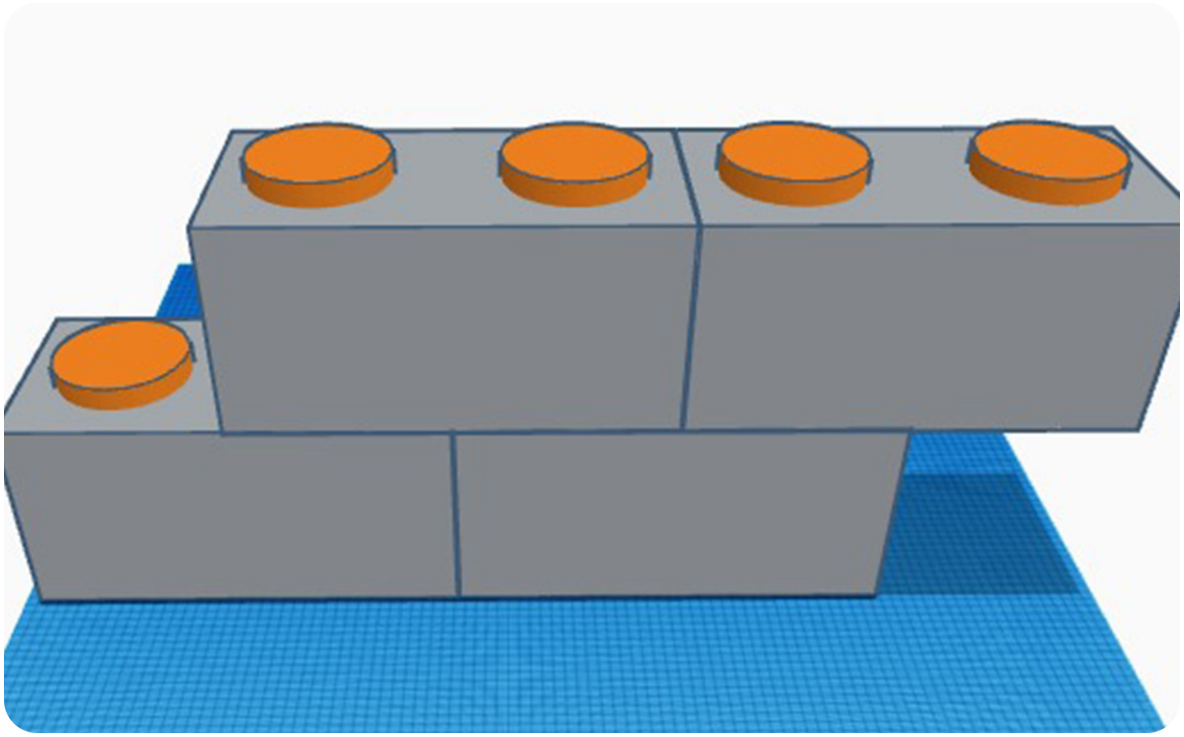
"That's the magic of Solve for Tomorrow. Whether you win or not, you need commitment - and that changes the traditional classroom dynamic,"

says Pascua.

Ecological bricks are also interlocking

The interlocking format allows the bricks to be assembled by modules. This means someone can start with a smaller house and expand or modify it later, similar to prefabricated homes but much easier to assemble. "We're taking a material that would be wasted and turning it into something extremely useful, which also helps reduce pollution on the planet," he emphasizes.

To reach a sustainable prototype, they tested different material compositions and found that the best formula was 60% acetate (a chemical compound derived from the reaction of acetic acid with cotton cellulose) and 40% of other materials like cement. "We reduced cement use by more than 50% compared to a conventional brick. We ran about 10 to 15 different mixture iterations," Pascua summarizes. The cost savings were significant: while a regular brick costs around 700 Argentine pesos (U$ 0,65), "Bastet Haus" bricks cost only 350 pesos (U$ 0,33). Although the tests were supervised by scientists and engineers at the university, the students learned about material resistance and cellulose structure.



The interlocking bricks feature a simple design to make the prototype lighter and more cost-effective

With a tested prototype ready, the team faced another challenge: presenting their idea to the public at the Solve for Tomorrow final. They practiced delivering a strong pitch. Their strategies included Neuro-Linguistic Programming (NLP), using kinesthetic stimulation (physical experience and body movement) to shape their message. They also applied nonverbal communication (NVC) techniques, adjusting gestures, posture, and vocal tone. “We saw incredible moments, like 16 and 17 year-old students meeting at 8am on a Saturday to rehearse for an oral presentation,” the teacher recalls.

The students also dedicated time to thinking about how to manage the business: “On one hand, we could serve municipalities interested in offering social housing to citizens. On the other hand, we can sell to individual clients who want to build a simple home, not just those experiencing homelessness,” the teacher explains.

For the future, the team plans to continue working on the project, eventually using the bricks to build full walls and houses.

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Explicando!

The school submitted dozens of projects to Solve for Tomorrow, and eleven reached the semifinals. To manage all those teams, teacher Agustin Pascua encouraged student autonomy. One tool introduced at this stage was the Gantt chart, a graphic used to track the progress of each phase in a project. “Everyone knew their deadlines for each]task. It worked like a dashboard, also identifying who was in charge of each part,” the teacher notes.

Focus on practice!

Take a look at the teacher’s guide on how to lead a project for creating ecological bricks in school.

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1 Empathy

The “Bastet Haus” project began with concerns raised by a group of fifth-year students at Escuela Nacional Adolfo Pérez Esquivel in Buenos Aires, Argentina. Alongside their teacher Agustin Pascua, they identified two main issues in their environment: pollution from cigarette butts and the urgent need for accessible housing solutions. Building on their previous experience with the “Collisafe” project, which reused cigarette butts with fungi to eliminate toxins, they decided to explore further uses for this waste.

2 Definition

By analyzing local data, they found that over four million people were living without adequate shelter. This reinforced their goal to turn a polluting waste into a concrete housing solution. Their main objective became developing a sustainable, lightweight, and affordable brick suitable for modular housing. The challenge was to use toxin-free cellulose extracted from cigarette butts (biodegraded by the Pleurotus ostreatus mushroom) and combine it with accessible materials like cement. The project’s name, “Bastet Haus,” was chosen to link the idea of protection (represented by the Egyptian goddess Bastet) with the concept of home, using the German word “Haus.”

3 Ideation

With their focus set, the students began exploring different ways to apply the new material in construction. They reviewed modular construction references and consulted with specialists at UNICEN’s Faculty of Engineering. From that process, they developed the idea of creating interlocking bricks inspired by LEGO-like building blocks. This would allow structures to be assembled without complex tools, saving time and money. They also explored the various potential applications of the brick, from social housing projects to do-it-yourself home construction.

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4 Prototype

The technical development involved testing various material mixes to find the ideal composition. Between 10 and 15 iterations were carried out, concluding that the best formula was 60% acetate derived from recycled cellulose and 40% cement and other ingredients. This reduced cement use by more than half compared to traditional bricks. Prototypes were tested at the university, where they evaluated structural resistance and ease of assembly. Results showed that the interlocking bricks were equal or superior in strength to standard options. Economically, the unit cost was halved—from 700 to 350 Argentine pesos.

5 Testing

In the final stage, the team focused on validating their product and preparing for their Solve for Tomorrow presentation. In addition to physical performance tests, they worked on communication skills to effectively pitch the project to the jury. They rehearsed using NLP and nonverbal communication strategies, even meeting outside of school hours. The process helped refine their prototype while also building valuable public speaking and management skills. In the end, they explored different business models, considering sales to both municipalities focused on social housing and individual buyers seeking a simple building solution. The team intends to continue the project with hopes of real implementation in the construction field.