

INSPIRING PRACTICE |  WINNER |  MEXICO, 2022

#HEALTH

Device warns of gas leaks and prevents fires

Sensitized by a local tragedy, a pair of young people used programming and electronics knowledge to prevent gas leak accidents

TEACHER

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SCHOOLNational College of Technical
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Tamaulipas**STEM AREAS**

Engineering, Technology

OTHER AREAS OF KNOWLEDGE**NAME OF THE PROJECT:**

Alerta Fire

A tragic fire in a small convenience store that took the lives of two college students. This was the starting point for Alerta Fire, a device developed by two teenagers from the National College of Technical Professional Education (Conalep) Tamaulipas, in Matamoros, in the extreme north of Mexico. The proposal was conceived in the school's entrepreneurs' club, supervised by teacher Graciela Guadalupe Montellano, who is also an electrical engineer.

Like the teacher, Emily Villanueva and Alejandro Torres, 2nd year electronics students, were deeply moved by the tragedy in the community. "They wanted to respond to the problem of domestic and commercial fires, and they wanted to do it from an innovative perspective", justifies the professor.

To respond to the social challenge, it was necessary for the students to better understand the problem, since they had, as a community, experienced the impacts of the gas leak on people's lives and daily lives. "We knew that our solution lay in not only qualifying the ways to prevent gas leaks, but in presenting a solution that would allow us to more assertively prevent fires", she says.

Entrepreneurs club

The entrepreneurs' club is a didactic proposal that invites young people to get together for 1 hour a day, accompanied by Professor Graciela, who acts as a tutor for the group. The idea is that they can implement authorial projects that materialize the knowledge learned in their training.

Prototype with many features

The first prototype, then, was conceived as a device that could not only measure air quality and detect gas leaks from bottled or piped gas and the presence of fire, but also produce different alert responses. The first as an audible and visual alert, which indicates to the person present in the room that there is a leak. This same alert is then sent by SMS to a registered cell phone and as a phone call to the user in case he is out of the environment. “We know that we hardly look at messages right away, and that’s why we added the idea of a phone call to notify the emergency”, she explains.

The device, which was made from an ESP 32 programming board (from the Arduino family, which is related to the Internet of Things – IoT), is equipped with solar panels and a SIM card. “In case there is a failure in the electricity or internet network, it continues to work, and maintains the same functionalities”, says the teacher. To measure the quality of the air in the environment, the device was equipped with sensors for the presence and proportion of gasses in the environment, such as oxygen, carbon dioxide and butane, temperature, and humidity.

“With this first version of the prototype in hand, we understood that we still had the challenge of reacting in the event of a gas leak, in addition to communication strategies”, explains the professor. As a proposal, then, the young people developed an electronic mechanism that automatically opens and closes any type of window, supporting the dissipation of gas in case of leaks.



Eureka Moment!

“When we understood that we wanted Alerta Fire to produce a mechanical response, opening and closing the windows, we also understood that we had a big challenge at hand, since there are many different types of windows”, justifies the professor. For her, when they found a motor that responded to horizontal and vertical rails, for sliding windows, and that operated the movement of moving back and forth, they realized that they had achieved something truly innovative. “Then we saw the potential of what we had proposed and that our dream was really feasible”, she adds.

Entrepreneurship

After successive tests and improvements, the prototype was able to materialize the set of responses as an integrated solution for dealing with gas leak accidents. And today, it is a concrete proposal for an entrepreneurial activity by youngsters, which aim to continue the initiative.

They, in addition to participating in **Samsung Solve for Tomorrow**, were also awarded in an international initiative, and are receiving significant recognition. “The hope is that they can take the idea forward, but for us, as a school, the objective is that they can, from the club of entrepreneurs, experience working with projects in practice”, identifies Graciela.

The teacher explains that the Entrepreneurs Club, which can be attended from the 2nd semester of technical training, aims to stimulate, through Project Based Learning, the real experience of innovation. Although the college has this nature, the initiatives do not necessarily need to involve technology. “We are in an area bordering the United States, with many companies and firms working in technical and technological work, but the club goes further, encouraging sensitive initiatives that respond to the needs of the community”, emphasizes the professor.

For her, the focus of Alerta Fire was on responding to a concrete pain in the city, without losing its universal character, directly supporting the achievement of the 3rd Sustainable Development Goal (SDG), which seeks to ensure a healthy life and promote well-being. for everyone, at all ages.

With the support of the **Samsung Solve for Tomorrow** program, the group developed the solution and a strategic plan for its continuity, with cost sizing and future projections. For the teacher, mentoring was strategic to support young people in building and implementing the pitch, supporting them with techniques and knowledge of oratory and objectivity in the message..

Focus on social and soft skills

Graciela highlights the other skills developed in the process, especially the students’ creativity. “They find incredible solutions to problems that affect all of our lives”, she celebrates, highlighting the youth’s innovative capacity as a stimulus for their own practice as teachers. “I learn from them. And they learn from me; there is an exchange, a dialogue,” she reflects.

The educator indicates that the club is concerned with evaluating learning processes, especially soft skills. “First of all, we are concerned that our minors have a positive attitude in the way they behave at the club, respecting the values, ideas and positions of their colleagues, but also knowing how to express their own”, she says.

As a second point, Graciela indicates that she establishes rubrics with young people, highlighting the milestones of the project developed. “The idea is that they can formalize an idea, structuring it, scientifically grounding it and, later, that they manage to make it viable, materializing it in a proposal that can be tested in fact”, she concludes.



Focus on practice!

See the teacher's guidelines on how to support students in creating devices for gas leak alerts.



Problem identification



In the case of Alerta Fire, the problem arose from a recent tragedy that left its mark on the community. The gas leak was understood as a tragedy that could have happened in any home.



Definition



For the teacher, this phase is fundamental. According to Graciela, it is not enough to identify the community's pain, but it is necessary to understand what the problems and causes are linked to it. In this case, it was necessary to understand how to qualify the gas leakage devices.



Ideation



According to Graciela, the ideation was almost a continuous process, because with each new functionality of the prototype, the students went back to the planning board - trying to bring up the various possibilities to solve that question or add a functionality.



Prototype



Graciela argues that the way of thinking in STEM is fundamental, seeking collaboration between areas of knowledge in an applied way in a practical problem.



Feedback and evaluation



The teacher understands that the assessment should be procedural, and with expectations or rubrics built and detailed together with the students, highlighting learning and points to improve.