

INSPIRING PRACTICES |  FINALIST 2024 |  BELIZE

## #HEALTH

## Students create device that translate hand signal and movements into words

Project aims to reduce communication barriers between those who can speak and those who cannot.

**TEACHER**

Ardeth Rudon

**COMMUNITY/CITY**

Ladyville Villagel

**STEM AREAS**

Technology and Engineering

**STUDENTS**

Adaobi Thomas  
Alyssa Escobar  
Aiden Aguilar  
Katherine Portillo  
Christian Gibson

**SCHOOL**

Ladyville Technical High School

**OTHERS AREAS OF KNOWLEDGE**

Languages

**PROJECT NAME**

AODI (Assistance Oral Device  
Interface)

Have you ever seen someone close to you struggling from a health condition and wanted to create a magic formula to solve the problem? When an educator and a group of students from [Belize](#) connected with each other sharing their experiences with stroke patients, they could not make magic, but they found a way to facilitate their lives. The “AODI” (Assistance Oral Device Interface) project developed a device that can translate hand signals and movements into words, improving communication between patient and caretakers.

The inclusive innovation used [STEM](#) (Science, Technology, Engineering and Mathematics) for accessibility and was a finalist in 2024 of Solve for Tomorrow – Central America and Caribbean region, which gathers together 11 countries: Barbados, Belize, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama and Venezuela.

Five students between 14 and 17 years old participated, from 10th to 12th grade, the last three years of compulsory schooling. The [mediator teacher](#) was Ardeth Rudon, who is also the Vice-Principal of Academic Affairs and has been at Ladyville Technical High School for 24 years. It was her first participation at Solve for Tomorrow. The project started with teacher Abraham Flowers, winner of Solve for Tomorrow in 2023, with the project “[SMARTZ](#)”, but he was transferred to another school in the middle of the school year. He was also the founder of the LT Robotics Club, where about 20 students have the opportunity to explore their interests in technology.

The Ladyville Technical High School, where the project was born, is located in a rural area, just outside the main city of the country (Belize City). The school works as a hub for the community and, therefore, intends to help people solve social challenges through the Education, especially at the LT Robotics Club, where “AODI” started. “We did brainstorming, discussing issues that community members face and one of such problems was the health issues. We asked ourselves: how can we have a different approach to it?”, remembers Rudon. Then, one of the teenagers, Adobi Thomas, talked about her aunt, who suffered from a stroke, and Rudon’s husband had also suffered from it. “It was a subject so close to us. We delve into the perspective, decided to do something to help and continued our researching”, narrates the teacher.



Through teamwork and inclusive innovation, students and their teacher from Belize created a device that gives a voice to stroke patients, turning empathy into impact.

The group found out that stroke is [one of the main causes of death in Belize](#). With the data, the personal experience and the broader perspective that impacts the community and the country, they decided to focus on this topic. Then, they discovered that many patients develop difficulties in speaking and not being able to communicate makes them feel frustrated. The information collected matched with what their heard family members were experiencing. “When you live with someone that suffered a stroke, you also feel frustrated and helpless for not being able to communicate. We decided to create something to help”, says the teacher.

In addition, the educator explains that when people have a stroke for the first time, their tongues get heavy and they can have speech disorders, possibly provoking muteness. The first 72 hours after a health episode like that is critical because they can suffer another stroke and the lack of communication can make it even harder to identify signs and prevent any more injuries. “What if we could have this device that you could communicate with just the click of a finger?”, the team

started to ask themselves.

They made a list of materials needed: wires to connect the system, flex sensors, regulator buttons, something to stabilize the invention and an Arduino board, an [open-source](#) electronic prototyping board.



## Eureka moment!

Even though the prototype was already working, the [User Experience](#) wasn't at its best. They had the impression that too many wires were exposed and it did not look safe or appealing to a possible patient. But how could they cover it? The answer was right below them - at their feet. They thought of cutting off some socks to put on top of the wires. "When you need something new, you can start going through your house and think of what could be usable. The socks can be cut, and they stretch and are easy to get. I suggested it and the kids laughed at first, but they tried on and it worked", describes Rudon.



**"Doing STEM projects like this teaches the students to come up with solutions to the difficulties of their lives, so they won't be stuck in the future. If we find ways to solve problems, we will make the world a better place",**

declares the educator.

To use the prototype, the patient put the glove in the hand and would only need to move the fingers to transmit messages through sensors. The algorithms used in the project would translate the signs to words shown on a LCD screen (a display technology that uses liquid crystals and light polarizers to form images). It can decode words and expressions up to 14 characters, such as "good morning", "yes", "no" and "I need my meds [medications]". To give more comfort, they also put velcro and a regulator so that the patient can adapt the glove to its hand.

The team had to train the machine with [programming](#) to set some finger movements and their respective meanings. But what makes AODI even more of an inclusive innovation it's the customization that suits the individual's needs. The patient might be not speaking at all, while others may get to say some words but need another set of expressions. For instance, the movement of the thumb means "I need medication" for one person, it could be reset to mean "I want water".

Another advantage is that this [prototype](#) can get ten times cheaper than those from the market: while it might cost up to 500 american dollars for a device like that, with customization AODI can cost up to 50 dollars.



Powered by Arduino and flex sensors, this inclusive innovation translates finger movements into words displayed on an LCD screen—bringing low-cost assistive tech to life.

## Overcoming challenges to make an inclusive innovation

During the project, the group faced multiple challenges. Some wires burned because they were using too much voltage and had to switch for new ones and learn how to regulate it properly. Besides that, some days before they traveled to Finals of Solve for Tomorrow, in Guatemala, almost the entire team got sick. “I saw them studying even in the hospital, they didn’t want to give up on the final moment”, Rudon recalls. “We had hard times, but rather than getting frustrated, we laughed, took a timeout, ate something and went back to work”, adds.

Even with the difficulties, they tried their best. To test AODI, one of the students even tried with his aunt who suffered from a stroke. She was excited to know something new that could make a difference in her communication with family. They tested between themselves and with some teachers, but did not have the time to test it with more patients, which is something they’d like to do in the future.



# SAMSUNG

Rudon also sees many other possibilities to improve AODI, such as expanding the amount of phrases and words and customizing the device in different colors and materials, and making it waterproof. The group wants to add Bluetooth capabilities and an audio version of the messages that already appear on the LCD screen in text format.

The educator recognizes that the community played an important role as well. She recalls that when parents found out that the school was representing this entire country in Solve for Tomorrow, they were excited and engaged with the process. “They came out to support, offered to help with transportation. They were making sure kids participated even when we had floods. They always figured out a way to get them there”, adds.

With the success of AODI, the Ministry of Education of Belize is now excited to invest in the idea and has already contributed financially so the group would make 10 more prototypes to be replicated in other communities. “This is really important for the school as well. It puts us in a spotlight for future projects. Put us on the map”, finishes.



## Advice for teachers!

Looking back to all the journey, Rudon leaves an advice for educators that would like to start a project like this: listen to what the students have to say. “They can always shed light on what’s happening in their families and communities and this is the best focal point to start brainstorming. When you listen, you learn. And from doing that, you could make a difference”, believes.






## Focus on the practice!

Take a look at the teacher's guide on how to develop a communication device for stroke patients that translates hand signs and movements into words.




### Empathize

 The AODI project began with personal stories shared by students and educators at Ladyville Technical High School, a rural school located just outside Belize City. During a brainstorming session at the robotics club, the group discussed social issues affecting their community, and one topic stood out: health challenges related to stroke. A student shared the experience of her aunt who had suffered a stroke, and teacher Ardeth Rudon added that her husband had gone through the same. These stories revealed a common frustration: the inability to communicate effectively after a stroke.




### Define

 As the team researched further, they learned that stroke is one of the leading causes of death in Belize, reinforcing the importance of addressing this issue that deeply affects both families and the broader community. Besides it, they discovered that in the critical hours following a stroke, communication can be vital in detecting early signs of another episode. But many patients lose their ability to speak, leading to confusion and distress for both them and their families.



### Ideate

 With a better understanding of the problem, the team defined their project goal: to create a device that helps stroke patients communicate more easily with caregivers. The objective became to design a simple, low-cost, and adaptable tool that could translate hand movements into words, giving voice to those who temporarily or permanently lose their speech abilities.



## Prototype

During the prototyping phase, the team faced technical obstacles. Some wires burned due to incorrect voltage, requiring them to learn how to adjust and manage electrical inputs. They programmed the device to recognize specific finger movements and display corresponding phrases—up to 14 characters long—such as “good morning,” “yes,” “no,” and “I need my meds.” They put a glove to give a better User Experience and included velcro and a strap so people could adjust it to fit their hand comfortably.



## Test

Initial testing took place among the students, teachers, and one student’s aunt, who had suffered a stroke and was excited about the possibility of improving her communication. Although the team lacked time to test with a larger group of patients, they identified future opportunities to expand trials and gather more feedback. Now, the Ministry of Education in Belize later supported the initiative by funding ten additional prototypes for use in other communities.