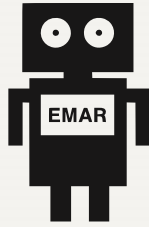# A ROBOT confidant

Meet EMAR, a robot being developed by UW researchers to better understand teen stress and emotional well-being.

By Chelsea Yates

"How many of you feel stressed at school?" When Elin Björling asks a group of Seattle high school students this question, every hand shoots in the air.

Björling, a human centered design and engineering (HCDE) research scientist who studies teen stress, is not surprised.

"Teens experience stress more so than any other age group, and that stress can negatively impact their mental and physical health," she says.

Yet when it comes to stress research, more studies are needed to understand vulnerable adolescents. According to Björling, researchers lack quality data to understand how, when and why stress occurs in teens or what normal, healthy stress looks like.

Enter EMAR (Ecological Momentary Assessment Robot), a friendly little robot being developed by UW researchers with big hopes of disrupting this data void. Björling is leading this research team with UW Tacoma Interdisciplinary Arts & Sciences assistant professor and HCDE alumna Emma Rose, '11 PhD, and Maya Cakmak, an assistant professor in the Paul G. Allen School of Computer Science & Engineering.

Known as Project EMAR, their team is creating a social robot that will help schools better measure stress. Their goal is to design a robot that would live in a high school and collect data on students' emotional well-being. The project is supported by the National Science Foundation's National Robotics Initiative.

Why use a robot?

Although there is a great deal of research on human-robot interaction, including focused studies on specific age groups like children and seniors, little exists on teen-robot interaction. EMAR's researchers see this as an opportunity.

"Today's teens will likely be the first generation to spend a lifetime interacting with robots," explains HCDE junior Wesley Muthemba. "So in addition to gathering important data related to stress, our project will help fill in some human-robot interaction research gaps, which is exciting."

Muthemba is one of approximately 30 students who have helped shape Project EMAR through independent studies and directed research groups. Students from across the College of Engineering, the Information School and UW Tacoma have participated in all stages of research, design and robot prototyping.

The team is designing EMAR to use a research methodology called Ecological Momentary Assessment to gather real-time data.

"The team realized early on that if we're going to ask teens to share real-time feedback, we needed to provide them with a cool, interesting way to do so," says Muthemba. "So why not give them a social robot to interact with?"
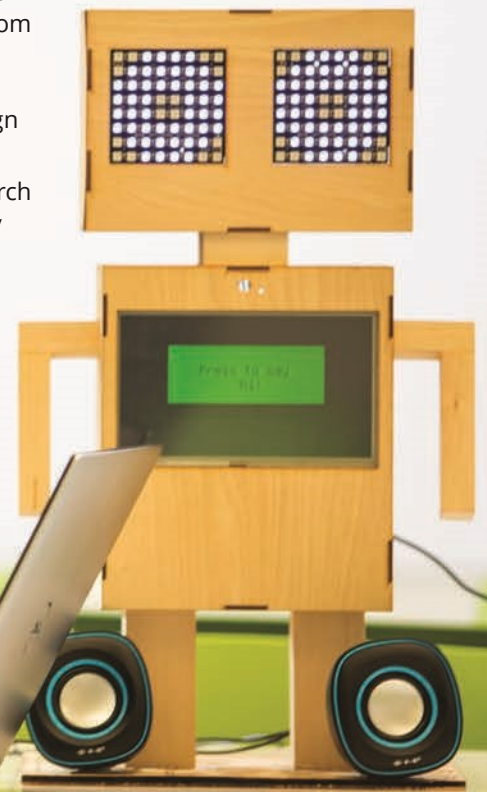
Cute, not creepy

To ensure that high school students will feel comfortable engaging with EMAR, the team has held multiple user-focused sessions with teens.

"High school wasn't that long ago for me, and I thought I had a good idea of how teens would respond to EMAR," says HCDE junior Rachel Ren, the project's undergraduate research assistant. "But one of the first things we learn in HCDE is to let go of our assumptions and listen objectively, and I'm glad we've taken this approach because we've learned so much!"

For example, the team discovered that the students over-whelmingly preferred simple, approachable robot designs to sophisticated models, which could seem intimidating.

"Over and again, we've been told that EMAR has to be cute, not creepy," says Rose.

Based on teen input, the team has created two robot prototypes and is working on two more. EMAR's first iteration, a squatty, boxy robot, has large round static eyes and a simple, hand-drawn smile. The second is taller with dynamic, digitally responsive eyes. Both feature a touch screen for information gathering.

Teens also reported a desire to know that EMAR cares about them. To convey awareness and expression, researchers have scripted EMAR's eyes to move and blink. They've also programmed EMAR to respond verbally to teen input and are exploring the best types of verbal responses for it deliver.

"Do students want EMAR to suggest solutions that might help them feel better, or do they just want to be heard? What should EMAR's voice sound like? These are some of the questions we're exploring right now," says Rose.

The researchers have also learned that students are curious about EMAR's race and gender.

"It never crossed our minds to design for race or gender, but it's been interesting to observe how soon students want to know if EMAR is a boy or a girl," says Björling. "This has prompted us to think about how race and gender are communicated and, as designers, how mindful we need to be about our roles in that process."

Potential for impact

Using a robot to collect information about students raises privacy concerns. To address this, the data will be collected and stored anonymously.

"EMAR is an assessment tool," explains Björling. "It isn't intended to single out specific individuals but to compile and aggregate data that schools can use to better understand their student body as a whole."

Keep up with EMAR at blogs.uw.edu/emar

School administrators and teachers will be able to use EMAR's data to determine ways to implement change — introduce new after-school programs, host wellness events, increase counseling services, reduce students' academic workload — and measure the effectiveness of their interventions. The data can also help teens develop more self-awareness and a deeper understanding of their school environment.

"EMAR will serve as a good reminder for teens to take a minute and pay attention to their stress, to talk to their friends or a counselor about it," Björling adds.