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UNCOVER INNOVATIONS THAT MATTER

Conversations
FOR TOMORROW

Quarterly review
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Voice of Generation Next...

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Conversations FOR TOMORROW

GITANJALI RAO

Inventor, scientist, and
Time Kid of the Year 2020

INNOVATION HAS NO MINIMUM AGE

Photo credit: Sharif Hamza

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Gitanjali Rao
Inventor, scientist, and
Time Kid of the Year 2020

Gitanjali Rao is an inventor, an aspiring scientist, author, speaker and an active promoter of STEM around the world. She was recognized as America's Top Young Scientist and was a recipient of an EPA Presidential Award.

She was honored as Forbes "30 Under 30 in Science" in 2019 and Time's "Top Young Innovator" and "Kid of the Year" for her innovations and STEM workshops she conducts globally.

She was also appointed as a UNICEF Youth Advocate 2021 for using science for solving social problems such as cyberbullying and developing solutions for environmental protection.

In 2020 you were named the first Time Kid of the Year. Can you give us more background on Tethys, the device you created to detect contamination in water?

— When I heard about the water crisis in Flint, Michigan [in 2014-16], that's when I started thinking about how to detect contaminants in water. The lack of knowledge of the nature and extent of contamination is a huge problem in many countries, including some parts of the US. On top of this, in many countries, there are no specific regulations that require testing of drinking water. Tethys is a simple and inexpensive tool for detecting lead contamination in water. My ambition is to put a cheap tool in everybody's hand, so people can act at source and save lives in their communities. While Tethys focuses on lead in drinking water, the technology could easily be adapted to detect other contaminants. Tethys uses carbon nanotubes with chloride dopants to detect lead; the combination of nanotube and other dopants with the right resistance signatures can be used to detect other contaminants.

"I imagine a world in ten years with personalized medicine and home kits for everything from disease diagnosis to cures for degenerative diseases."

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You have also developed an AI-based anti-cyberbullying service, Kindly. Can you expand on what the service is and how it works?

— Kindly is an AI-based service designed to detect cyberbullying at an early stage and prevent it from escalating. It uses developments in machine learning and natural language understanding/processing to identify words and phrases in everyday interactions that could be construed as bullying. The service can be seamlessly adapted to work with a variety of front ends. While I created a beta standalone app and browser extension as an example, it is now powered by UNICEF and has been rolled out worldwide.

The solutions currently on the market, while effective in some contexts, are limited to fixed vocabularies. In reality, the informal language typically used in bullying, as with all spoken language, is continuously evolving. Kindly's self-learning service adapts to this, including learning about the latest emojis, memes, and slang. Kindly attempts to be non-punitive and encourages self-moderation by allowing users the option of rephrasing or editing their messages.

Anyone, anywhere in the world, can contribute to its self-learning algorithm on the UNICEF website: https://www.unicef.org/innovation/kindly

You conduct innovation workshops for organizations across the world and you have mentored tens of thousands of students. What are your key recommendations for organizations/students?

— To date, I have conducted innovation workshops for over 68,000 students in about 40 countries, and this figure continues to grow.

Using my own experience in product development, I have codified the innovation process into five steps which are observe, brainstorm, research, build, and communicate. In my workshops, I elaborate on these steps using examples. Students are encouraged to use this process as a template to help them find solutions to problems local to them. Some students come up with great, workable solutions there and then that they can take away to scale up but, more importantly, all go away with a sense that they can be true innovators and problem-solvers in their communities.

FORTY COUNTRIES

68,000 STUDENTS

"I have conducted innovation workshops for over 68,000 students in about 40 countries."

From portable spacesuits to robotic companion dogs, to shoes that can call 911, the ideas that these students have come up with prove to me that innovation has no minimum age and that important ideas can be developed without a huge R&D budget. All students need is a mentor to guide them and give them the confidence to share their ideas.

To sustain the impact of the workshops beyond my personal contact with students, in 2021 I published a book: A Young Innovator's Guide to STEM, which is now available around the world and translated into five languages. My dream is to lead an innovation movement in early education. With an army of inspired and passionate students solving problems in their communities, we could make a massive difference to society.

> **"Innovation has no minimum age."**

My recommendation to organizations is to invest in students: open your labs / maker spaces / R&D departments to elementary- and middle-school students; allow them to shadow you and, if you can, offer them mentoring. My only advice to students is to dive in! Many students reach out to me wanting to know how to gain recognition for their ideas, but my advice to them is that recognition will follow hard work. Failure is the first step in learning, so develop your ideas without fear.

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How can we make STEM subjects more attractive to and inclusive for girls?

— I clearly remember science and programming camps a few years back, where I would be the only girl. It made me want to run away! I would be alone during lunch or would sit with the instructors. It made me feel that I did not belong there. However, when I realized that I really did want to be there, I relaxed and started to make friends. The boys were happy to include me in their chats and games; they just hadn't thought to do so before. They made an effort and included roles for me when I asked them to. You just need to have confidence in yourself.

That changed my perspective on the idea that someone is stopping women or girls from doing science. At some point, we have started to presume that, because we don't always see role models, this is not for us. Today, there are several girls in STEM organizations, but few are staying in research or developing products. Science and technology are about more than coding and research; they are about having a real impact on the world we live in and the people around us. Gender should not stop you from solving problems in the real world and everybody should be able to be part of it. Most girls lose interest in science after middle school; this could be because we are stereotyped, and society has decided a role for us, but also because we make a choice to exclude ourselves.

"Science and technology are about more than coding and research; they are about having a real impact on the world we live in and the people around us."

We need to recognize that we all learn differently. Coding and programming with robots and machines all around may not be a great introduction for all girls. I usually start my workshops by finding out what everyone likes to do and finding problems to solve in those fields, whether it is sports, nature, animals, food, etc., and then look for new solutions that use some of the latest technology. Technology can be combined with art and music in solving problems, as well.

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We need to introduce girls to a variety of topics and let us pick and choose or mix and mash them. I have had girl students who came up with ideas to help dyslexic students and wanted to find a way to allow their teachers to understand how they see letters differently to most students. The point is girls can bring a different perspective.

5. Is there a specific technology that you are particularly excited about?

— I believe that the future is personalized medicine. This is based on the genetic makeup of every individual and living organism. Diagnosis techniques and traditional drug-based treatment will, in most cases, be replaced by gene-based methods. My belief is that these solutions will be more powerful when developed using a combination of several technology disciplines that are traditionally separate.

I imagine a world in ten years with personalized medicine and home kits for everything from disease diagnosis to cures for degenerative diseases. Thinking about possibilities like this makes me feel excited about the future.

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