SCO-Young Scientist Profile

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Details of research work carried out in S&T (*limit to 200 words*)

Social innovation and maker education: I began working at AMMACHI Labs, Amrita Vishwa Vidyapeetham from December 2018 as a maker education researcher. I have designed and conducted several workshops for school children and college students on creative making with limited resources. From a workshop on emergency preparedness and response using design thinking principles and everyday materials such as PVC pipe and rope, to a workshop with sensor-based soft circuit kits in the context of embodied learning combined with Yoga instruction, in 2019, I designed and conducted workshops to engage rural children especially girls, in constructionist activities. Children attending the workshop reported increased 21st-century skills, including a greater sense of adaptability, collaboration, and self-confidence. Two of my research articles on these workshops were presented and published at the FabLearn Asia 2020 Conference, Thailand.

Associated SCO-YSC Theme: After the pandemic struck in 2020, I have been working with the doctors at the Amrita Institute of Medical Sciences (AIMS) to create a low-cost, indigenously designed Powered Air Purifying Respirator (PAPR) for protecting health workers against COVID-19. A research paper on the design and development of this PAPR has been accepted for presentation at IEEE Region 10 Humanitarian Technology Conference, Malaysia.

Statement of Innovation ***(Brief information on new innovative ideas including startup / entrepreneurs-limit to 150 words)***

PAPRs provide health care workers' higher protection and are known for higher compliance with respiratory protection guidelines as compared to other tight-fitting alternatives or N95 respirators. Despite this, PAPRs are not widely used in India by health workers because they cost ₹ 50,000 - ₹ 1,50,000 per kit. My work with AMMACHI Labs team focuses on the design and development of a low-cost open-source PAPR for medical professionals which costs less than ₹ 20,000 while complying with the National Institute for Occupational Safety and Health (NIOSH) standards for loose-fitting respirators. Our PAPR provides >11 CFM airflow, has HEPA filter protection, weighs less than 1.4 Kg, has noise level <70 dB inside the hood, and delivers operating time >9 hours of uninterrupted use. We made our design cost-effective, easy to assemble and disassemble for cleaning, comfortable to use, and aesthetically pleasing. We are now conducting a usability testing study with 20 PAPRs at AIMS.

Major awards/ Achievements ***(Upto 3 awards)***

- The research paper titled "Design and development of a low-cost powered air-purifying respirator for frontline medical workers for COVID-19 response" has been accepted for presentation at IEEE R10 Humanitarian Technology Conference 2020, Malaysia in Dec

2020.

- Presented two research papers on "Constructionism in Disaster Preparedness Education: Cultivating agency in children to tackle emergencies" and "Yogic Circuits: Making Tangible Embodied Learning Environments with Soft Circuits and Yoga" at FabLearn Asia 2020, Thailand.
- National champions, National Solar Vehicle Challenge (NSVC) 2016-17. Our team of 18 bachelor students won the national level competition of design and development of solar cars and completing different challenges posed in the competition. This later evolved into a research paper "Side Stick Control of Vehicles for Physically Challenged People" which was presented at 2018 3rd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), India.

Possible collaboration with SCO countries ***(limit to 100 words)***

Some of our ideas include:

1. Conduct further research studies on evaluating the PAPR design with the wider diaspora from SCO member countries and incorporate research findings for further design refinements.
2. Develop multimedia training content on infection control and form partnerships with SCO members to productize the design and make it market ready.
3. Open source the PAPR design so as to maximize its reach. We would like to partner with SCO member countries to come up with design variations that source all components from within member nations and make every nation self-reliant for their internal infection control needs.

Key words ***(relevant to research work conducted as well as proposed innovation, 5-6 words)***

Powered Air Purifying Respirator (PAPR)
Low-Cost Biomedical Device
Frugal Innovation
Respiratory Protection
Personal Protective Equipment (PPE)