START – addressing underrepresentation in STEM careers

When US neuroscientist Dr Luke H Bradley at the University of Kentucky helped design a STEM education programme for underrepresented students, his bold approach of interdisciplinary collaborations, near-peer mentoring, and teacher coaching promised to reshape a culture of negative reinforcement. The START Program embraces authentic research and training through direct contact between underrepresented students and teachers and network of STEM professionals and mentors. When COVID-19 threatened the nascent programme, the reimagined programme achieved an even broader reach.

STEM subjects – science, technology, engineering, and mathematics – are increasingly important in any school education focused on the future. These subjects are the foundation of the myriad new and developing sectors needing the input of young people with the right skills and a passion for application and innovation. It is, therefore, disconcerting that so many young people are either denied access to these subjects or, for reasons beyond their realm, feel cut off from them. These underprivileged populations are critically in need of access to tailored mentoring and coaching to unlock barriers to further study and careers in STEM. Yet, STEM educational support and outreach programmes have varied results. However, one programme based at the University of Kentucky helped design a STEM education programme – STEM through Authentic Research and Training. The programme aims to address the shortage of such underrepresented populations in the STEM pipeline by improving the recruitment and retention of these key demographics. The brainchild of UK neuroscientist Dr Luke H Bradley, START stands out from other STEM education development programmes because of its principle of multiple reinforcing touchpoints.

POSITIVE REINFORCEMENT TOUCHPOINTS

START reinforces the multiple touchpoints for influence in the system, rather than simply trying to plug education and training gaps.

STEM OPPORTUNITIES THROUGH START

According to the US Department of Commerce Economics and Statistics Administration, employment in STEM occupations continues to grow much faster than in non-STEM occupations. This is helped in no small part by the numerous new sectors developing out of STEM-focused research. However, a snapshot of these growing sectors shows a glaring anomaly: underrepresentation in the workforce by populations such as for example, low-income, people of colour, women, and people with disabilities. To address this, the UK has established a programme called START – STEM through Authentic Research and Training. The programme aims to address the shortage of such underrepresented populations in the STEM pipeline by improving the recruitment and retention of these key demographics. The brainchild of UK neuroscientist Dr Luke H Bradley, START stands out from other STEM education development programmes because of its principle of multiple reinforcing touchpoints.

SUCCESS OF such a programme, Bradley reached out to Space Tango, an aviation and aerospace company based in Kentucky. It was a good choice. It helped direct the START team to choose an inspiring theme for the students from underrepresented populations to ignite early interest in STEM: exomedicine – the study of medicine-related science in microgravity environments. Students would gain useful transferable skills, such as academic skills, social integration, and professionalism, which would lay a solid foundation for a future career and further studies. The original idea was that students would continue participating in in-school and out-of-school programming, such as tours, demonstrations, and networking/invitations to campus STEM events throughout the year. Importantly, all those on the programme would carry the title ‘START Ambassadors’. Underrepresented student participants were engaged in-year-round authentic learning laboratory experiences on campus at the university as ‘START Apprentices’. They would work directly with undergraduate students through a process of near-peer mentoring.

ADAPTING TO COVID-19

For a nascent programme relying on mentoring and direct contact between students and STEM professionals, the coronavirus epidemic could have been a disaster. But Bradley and his team came up with several clever workarounds that would ultimately prove beneficial for the programme’s reach. Firstly, the planned laboratory tours and demonstrations became virtual events. Without physical space limitations, these events could embrace larger audiences and tours could take place wherever a camera

The best way to break this negative reinforcement is to generate a sense of belonging in STEM for underrepresented students.
Tackling diversity issues in STEM means helping underrepresented students see themselves in STEM careers from a young age.

The START Program was stuck at home,Bradley and his team arranged at-home learning kits focused primarily on exomedicine and space exploration. This was made possible through close collaboration with Higher Orbits, a non-profit that uses spaceflight to inspire exomedicine and space exploration.

The idea behind the START Teacher-Scholar Program is to support STEM teachers through the workshops where they can gain authentic research lab experiences, attend customised training, and gain access to a variety of additional opportunities for professional growth and networking within the STEM community. Importantly, those on the programme near-peer mentor others, developing positive reinforcement to help break the ‘melt’ effect of underrepresented students losing interest in STEM subjects. Quick thinking and creativity in the face of COVID-19 restrictions saved the START Program team pivot to online training. Mentors were always on-hand via Zoom and other online platforms to guide teachers through the programme and to become mentors themselves.

The University of Kentucky START Program could have failed in the face of COVID-19. It wasn’t for the creativity and determination of Bradley and his team and their seamless shift to a hybrid model. Importantly, teachers and students from underrepresented populations in STEM will additionally be integrated into tailored university support programmes, supporting their professional development and helping overcome potential barriers they may face. In the end, START not only managed to reach more students in the community than possible with face-to-face interactions alone, but also produced a programme that can be adopted by other institutions locally, regionally, and nationally to address this critical gap in the STEM pipeline.

The first START Apprentices graduated from high school and all plan to attend the University of Kentucky in the fall to study STEM-related fields.