

NASA MAA (MUREP AEROSPACE ACADEMY) STEM PROJECT AT YORK COLLEGE: ENSURING FUTURE STEM PIPELINE

KHANDAKER, Nazrul I.¹, SIDDIQUE, Shuayb², Khargie, Matthew³, DHANRAJ, Brandon³, SANICHAR, Zachary A.³, SELBY, Mildred M.¹, RAMNAUTH, Chabenauth³, DEEPAN, Theresa³, SINGH, Yougeeta³, MAHABIR, Krishna⁴, SINGH, Sashi³ and SINGH, Omadevi³

(1)Geology Discipline, Earth and Physical Sciences, York College Of CUNY, 94-20, Guy R. Brewer Blvd, Jamaica, NY 11451,

(2)York College NASA MAA PROGRAM, Townsend Harris High School, 149-11 Melbourne Ave., Flushing,, NY 11367, (3)NASA MUREP Aerospace Academy, York College-CUNY, 94-20 Guy R. Brewer Blvd, AC-2F09, Jamaica, NY 11451, (4)Science and Robotics Dept., Grover Cleveland High School, 2127 Himrod Street, Ridgewood, NY 11385



Abstract

Our ongoing K1-12 NASA-supported STEM activities has served over 6000 children since 2015, largely from groups that are underserved and underrepresented in the sciences. These STEM activities have been successfully delivered for several years and include earth science, meteorite geology, rocketry, aerodynamics, star gazing, EV3 Mindstorm robotics, basic coding exercises, wind tunnel, 3D-printing, etc., conducted largely through our present MAA (MUREP Aerospace Academy) Project (Figure 1- 17). Small groups of students use Lego robotic parts to experiment with designs for a robot. The exploratory activity provides students with an opportunity to try many different designs. Having an end point like this for their designs promote a high level of motivation among the teams. Corporate funding from the Con Edison and National Grid ensures additional STEM dissemination to the students during the summer operation. Significant positive component of the MAA program is the availability and willingness of the former student participants (many of whom are completing STEM majors in college) to extend their helping hands to assist teachers and guide students to fulfill assigned tasks and share their rich experience to reinforce the value of STEM learning. In a way, they validate students' participation and promote meaningful dialog with their parents, mostly first generation Americans, often with English as a second language, and lacking knowledge of the importance of the STEM disciplines and careers built around it. Parents find the program to be very useful for the students as it triggers curiosity and enable them to think critically and respect cultural differences. Recent involvement of the City University of New York's (CUNY) Explorer's Program, a vigorous initiative undertaken by the CUNY to bring thousands of middle school students to the various CUNY campuses, including York College, opened a formidable partnership building opportunity for the MAA to tap into the future pipeline by engaging visiting students with our STEM facilities and educating these young and curious minds about the future STEM potential both in selecting exciting academic and career options. STEM outreach delivered through hands-on, team work, in an experiential and critical thinking environment is becoming a catalyst for motivating numerous students towards earth science and relevant NASA content. This way, MAA Program is creating a STEM conscious young student body and providing a strategic recruitment tool for various undergraduate in STEM disciplines. Early involvement of middle school students in STEM activities can be deemed as a powerful and viable mechanism to overcome an apparent shortage of STEM workforce representing minorities, women and financially disadvantaged groups. An outside STEM consultant assessed the program and commented "The program is reaching target population with activities that are motivating and educational. Students were highly engaged particularly in the hands-on projects taking place in every class and were actually doing science, not just talking about it. The fact that so many of the teachers and assistants were past students in the program means that (1) the program had a major positive impact on them and their career choices and (2) they can serve an excellent role models for the current students"

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Targeted Goals

- Increase the number of historically underserved and underrepresented students interested in NASA-specific STEM careers.
- Provide skills and background knowledge to parents/caregivers to work with and encourage their children in STEM activities and programs.
- Involve community groups, businesses, libraries, museums, and educational and professional organizations, such as the Geological Society of America (GSA), through mentoring, field trips, guest speakers, and other MAA activities.
- Engage students in participatory activities, such as hands-on learning, research, use of advanced technology, peer support groups, science fair, and mentoring relationships with professionals working in STEM fields.



Fig. 1. Well-attended NASA MAA Family Café members are not missing out on NASA STEM Contents! 75-125 parents are engaged in STEM and other critical socio-economic aspects each week. MAA is enabling infusion of community and STEM via exciting, hands-on learning activities.



Fig. 2. Jasmyne Jean-Remy, past SEMAA student and currently member of the Black Girls Code, standing in front of the StarLab. As part of the STEAM core, Jean-Remy teaches coding to the kids and she is learning Python and JavaScript.



Fig. 3. Narendra Gurcharan (pre-service teacher) shaking hand with NASA judge (NASA 2017 Robotic Mining Competition). 2017



Fig. 4. York team (from the right: first, Angeles Oyervide, pre-service teacher) and Narendra Gurcharan (2nd from the right, pre-service teacher) at the 2017 Robotic Mining, Kennedy Space Center.



Fig. 5. Wow! That's great. Students from Peninsula Preparatory Academy got the answers related to constellation and soon will be entering the StarLab. (Community Outreach Event: StarLab On the Move)



Fig. 6. Martian Habitat from 2nd grader's point of view. Quite neat!!



Fig. 7. 4th graders are learning about geological materials by using beach sand. They were utterly amazed to see numerous minerals within the tiny sand fraction.



Fig. 8. Robotics by using EV3 Mindstorm tools. Students (K7-9) are demonstrating their finished task connected with fine motor skill, coding, and coordination.



Fig. 9. It's not so bad! 4th graders are quite happy to build a solar car from scratch.

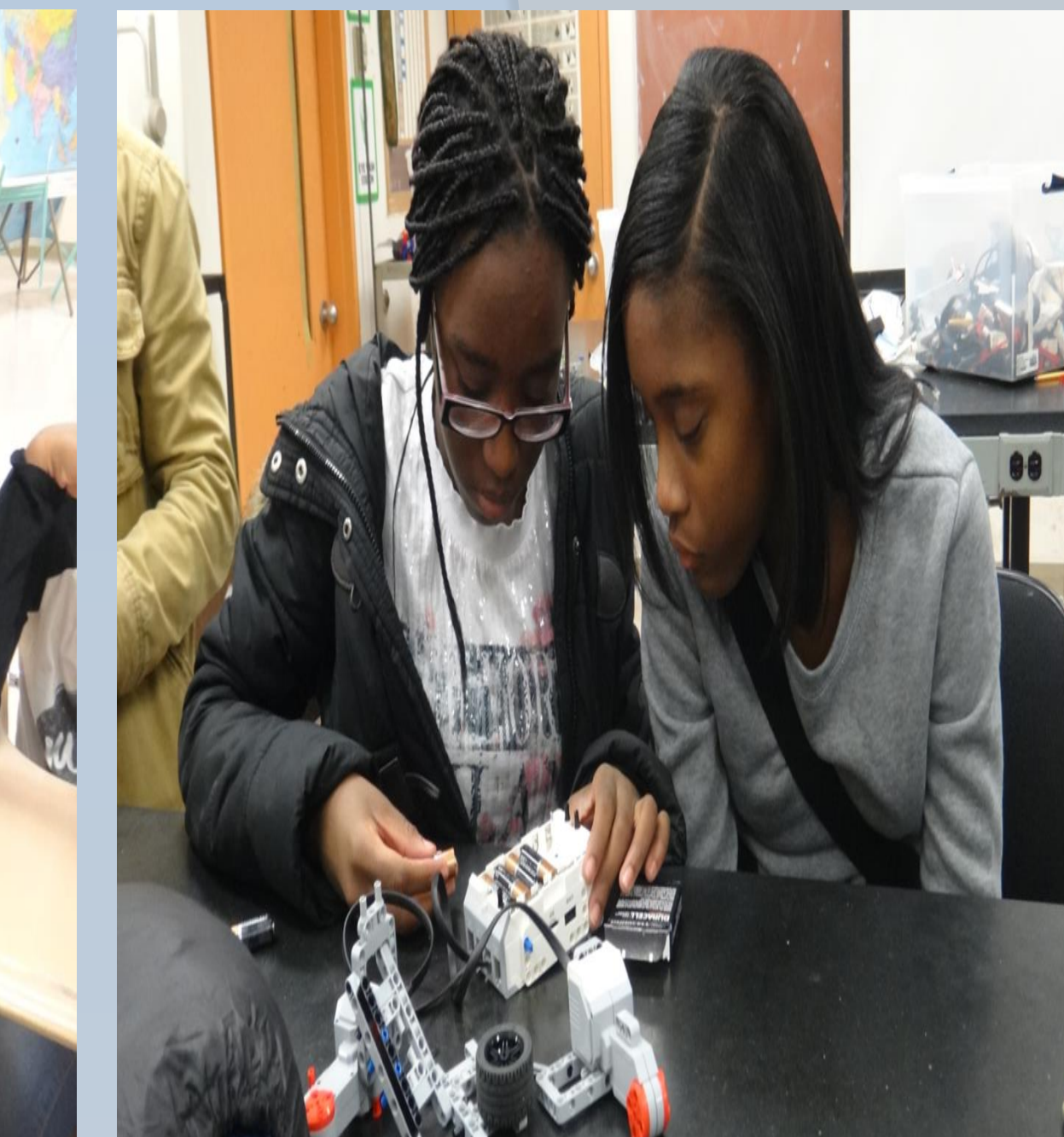


Fig. 10. Let's see how we can fix the problem. 8th graders taking up on a challenging robotic task.

The inclusion of robotics inherently relates to **all facets of STEM**, and when students learn through exploration, it increases motivation and desire to succeed. VEX Robotics embraces this model of explorative STEM learning. The magic a student experiences the moment they create something with technology is certainly rewarding and brings joy to them. MAA wants kids to learn how much fun it is to solve challenging problems. VEX Robotics are providing tools which are easy for beginners to master, but will expand with the imagination and experience of their users.



Fig. 11. It is always a great deal of excitement to use flight simulator and fly a plane. 8th graders are getting a flying lesson inside the AEL.

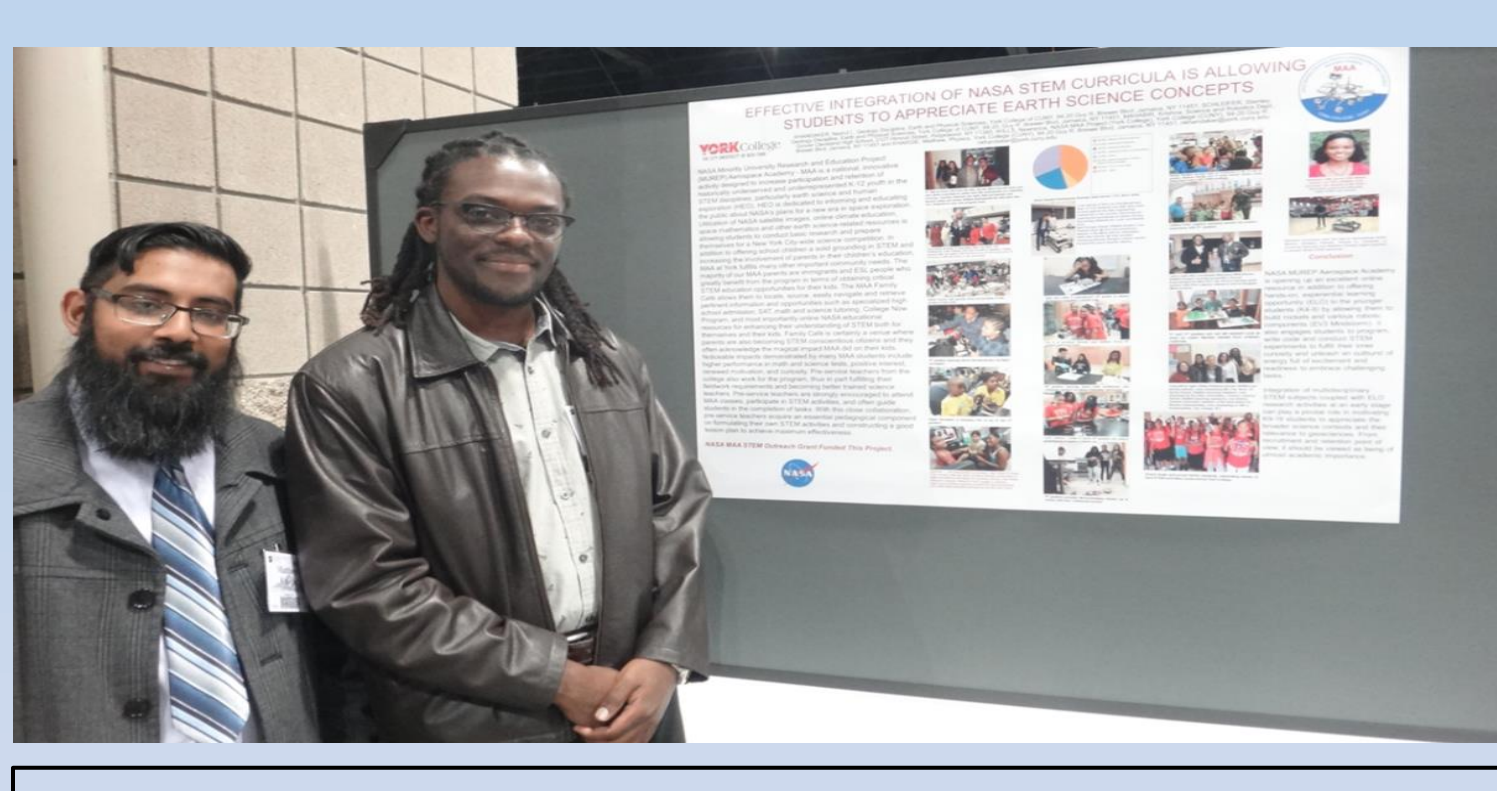


Fig. 12. Matthew Khargie (left, physics major and pre-service Robotics teacher) and Newrence Wills (right, AEL Coordinator) presented STEM research mentored by Khandaker at the annual meeting of the GSA. It is the first time ever NASA students made their debut at the prestigious national meeting from York College thus fulfilling undergraduate training – one of the core missions of NASA MAA.



Fig. 13. Nicole Corbin of JCAL (Jamaica Center for Arts and Learning), Board Member, enjoying a flight simulation lesson in the AEL. She visited MAA to gather information about creating partnership. Jamaica Center for Arts & Learning is a multidisciplinary urban arts center located in the diverse community of Southeast Queens. More than 35,000 people of all ages and backgrounds participate in our wide array of education, performing arts, and visual arts programs annually.



Fig. 14. Jamaica Read Now brought sixty 5th graders to York College and students were informed by Dr. Khandaker about the unique NASA STEM program where they can earn additional STEM hours during the fall 2018 session.



Fig. 15. VR GOX is drawing attention from the participants and students are exposed to 3D viewing and controlling drone flight as well.



Fig. 16. Matthew Khargie, past NASA STEM participant, physics graduate and now employed. (COENTERPRISE-IBM supported; Data Analyst).



Fig. 17. Far left: Teishawn Florestal-Kevelier, past NASA STEM Program participant, now doing an MS at Cornell University.

