



Girls in Robotics

## **Yolanda Nyasha Chigiji, Smith College Class of 2021**

**Proposed Dates: June 2, 2019 - August 9, 2019**

**Bulawayo, Zimbabwe**

### **Project summary**

This project is aimed at providing high school girls (aged 13-18) with access to resources and developing skills that will empower them to make a positive impact in their communities. Students will be introduced to robotics through programming the Arduino & Raspberry Pi. Students will identify problems and come up with solutions to the socio-economic problems facing Zimbabwe using robotics.

**Goal:** The primary goals of this project are to get girls excited about pursuing careers in STEM, to empower the next generation of women leaders in tech, and to create economic opportunities.

### **Objectives:**

- To set up a mentorship program for underprivileged girls interested in STEM.
- To reduce gender disparities by raising awareness on the importance of empowering girls through education.
- To help girls enhance entrepreneurship skills by venturing into solving community problems using robotics.
- To provide young girls with an insight into robotics and inspire them to pursue technical careers.
- To restore peace to Zimbabwe by creating robotics equipment which increases production of food.
- To build peace in the community of Bulawayo by educating girls about gender-based violence, child marriages & promoting equality.
- To create permanent robotics clubs at schools that will be run by the students & mentored by professionals.

### **The Need**

Zimbabwe suffers from hyper-inflation and has one of the highest unemployment rates in the world. Food and cash shortages have resulted in waves of civil and political unrest. Education is also becoming less affordable and the girl child is the most affected as she is the first to be dropped out of school resulting in women constituting only 40% of the adult literate population. Furthermore, with very few women in STEM, it means that only a fraction of the population is equipped with the skills to solve the nation's problems. Educating more girls especially in STEM, will improve equality, reduce gender related violence and increase intellectual and experience diversity: driving innovation.

### **The Solution (Execution of Project)**

The project will be centered at Bulawayo Adventist High School, my former high school. The program will recruit two girls per school from nine surrounding schools and an orphanage. This project will have a significant impact on the Bulawayo community where the number of girls studying STEM related subjects is alarmingly low. Students will learn basic electronics and Arduino programming coupled with hands on experience. At the same time, they will be introduced to entrepreneurship and the process of developing sustainable solutions. At the end of June, I will present to the girls the challenge that they will have to solve, which is designing a robot that will increase productivity in the Agricultural sector. Over the years, the amount of rainfall that Zimbabwe receives has dramatically decreased, resulting in lower crop yields. This has in turn caused price hikes, civil unrest and deaths as people protest. As a way to restore peace to the nation, *Girls in Robotics* will come up with robots that will boost the Agricultural sector and increase the crop yield. After coming up with ideas, we will provide supplies needed to start building the robots and start making the first prototypes at the beginning of July. At the end of July, the prototypes will be tested, and we will get feedback from users. We will refine the designs and present the final products at a Robotics fair at the NUST-American Space on the last day of the project. This fair will be open to the public including farmers and professionals from the agricultural sector. Soon after the project is over, the teachers will each be given kits, lesson guides and electronic components in order to start robotics clubs at their schools. The clubs will each consist of two students, two engineers and a teacher. The Engineers will be the professional advisors/mentors of the clubs while the teachers will be the local advisors who will oversee the day to day running of the clubs. The entrepreneurial skills that the students will gain from the project will enable them to devise business ideas and fundraise for the clubs.

### **Technical Support, Material Content, Lessons Delivery & Resources**

Netro, a robotics start-up company, will be providing the electronic components and kits. Little Geeks, its sister company will provide tutors and a lesson guide. These tutors and I will be responsible for teaching. Additionally, we will get volunteer support from four National University of Science and Technology (NUST) students studying Electronic Engineering, one teacher and two engineers. The Volunteers will help the students with using the computers. Each participant will have a lesson guide which they will use and turn in after the project for redistribution. The participants will also gain membership to Netro which will give them additional learning

tools. The project will have a website accessible to the participants for future reference featuring classes, work progress, final robots, links to other projects, internships & scholarships. Since Arduino and Raspberry Pi are open source products, I will continue posting to the website new & updated material that students they can use for their clubs after the summer.

### **Mentorship**

We have identified 20 Women Engineers (WE) who will be mentoring the girls during the project and beyond. They are experienced in career guidance, counseling, and mentorship. Each WE will be assigned a student to guide through career development for a year. Before the project begins, students will fill out a survey about the field of STEM they are interested in to match them with their interests. We will have an hour session each week for mentorship. During this time, two WEs will give talks about their careers and have time to answer related questions. They will also stay for the whole four hours for technical support. Some of the topics to be covered include writing resumes, career guidance, leadership, time management, entrepreneurship, and scholarship opportunities. There will be a time for the student engineers like myself & the girls from NUST to share experiences and facilitate a discussion about being a woman in STEM in higher education. A local tech startup company will be invited to share about their company for entrepreneurial inspiration. Food will be served during a 30-minute lunch break and games will be played to facilitate bonding, and to create a sense of belonging among the girls.

### **Future Impact & Sustainability**

This project envisions the invention of specialized robots that will solve Zimbabwe's agricultural problems consequently bringing peace and stability to the country. This work will raise a group of young girls who are willing to go against the status quo and pursue careers in STEM, increasing their competence when applying for jobs through their gained practical skills and helping to curb child marriages by offering an alternative to idleness (Robotics clubs). We hope to start an annual challenge for the clubs to solve various problems in their communities and fund the best solution. The girls will be expected to compete in the *Robo Girl* challenge which is a nationwide robotics competition run by Netro and Women in Tech. Our hope as *Girls in Robotics* is to become an annual program where a new group of girls from other schools is empowered every year to empower their peers until we have many women in STEM, to extend into the rural areas and recruit girls from there to raise awareness about the importance of educating the girl child and to have more robotics clubs being formed. With this grant, *Girls in Robotics* hopes to bring peace & hope to the lives of the young girls who want to continue with school & those who want to pursue STEM but have hurdles in their way.

### **Timeline**

End of May: Meet with Netro to buy the components, make the kits, print lesson books for participants.

1<sup>st</sup> week of June: Meet with the Netro to have training for volunteers and teachers.

2<sup>nd</sup> week of June: Teach the students basic coding skills and electronics.

3<sup>rd</sup> week of June: Teach the basics in robotics.

4<sup>th</sup> week of June: Teach the more advanced topics in robotics.

1<sup>st</sup> to 3<sup>rd</sup> week of July: Brainstorm ideas of robots that can be used in farming and start working on them.

4<sup>th</sup> week of July: Present the first prototype at BAHS.

1<sup>st</sup> week of August: Meet every day to work on the final prototype and present it at the robotics fair.

### **Inspiration and personal drive**

I am a Sophomore Engineering Science Major at Smith College, where I am empowered to be an agent of change. Currently, I am working on an Electronic and Electrical Engineering project on demand response programs for the US. I am using the Arduino, a microcontroller, for home automation. The Arduino can be programmed, to make things move or be connected to sensors to record heat, light or sound. My introduction to the field of engineering was through an eye-opening robotics class that showed me the endless possibilities that can be achieved by the Arduino. I realized that students do not need to be in college to be able to grasp the concepts of using microcontrollers. As a result, I became passionate about introducing young girls to robotics. I also enjoy mentoring young girls who, like myself, have the dream of pursuing careers in STEM but may be otherwise inhibited by economic or social hardships. My vision is to see young girls being given equal opportunities in the education sector. As a role model for most girls in my community, I intend to help them achieve their goals and dreams. Having a strong impact in these girls' lives means a lot to me because I grew up surrounded by a lot of strong women who helped me realize that the girl child is as important as the boy child. I wish to see a world in which the birth of a girl child is celebrated just like that of a boy child, and I long for a society that can make women feel appreciated not only in the kitchen but in many other aspects of life.