



Caribbean Science Foundation

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2015 Barbados Junior Robotics Camp FINAL REPORT

30 November 2015

1.0 Introduction

The 2015 Barbados Junior Robotics Camp, a project of the Caribbean Science Foundation (CSF), was planned and run by the CSF Volunteers for Barbados (CSF-VBB). The CSF is a non-profit, non-governmental organization, whose mission is to assist with the diversification of the economies of the Caribbean Region by harnessing science and technology for economic development. Specifically, the CSF aims to do this by stimulating technology-based entrepreneurship, accelerating education reform which supports technology-based entrepreneurship, and providing scientific and engineering advisory services to Caribbean governments via the Diaspora.

Since the inception of the CSF, several individuals have expressed a desire to assist the CSF with its programs and activities. These individuals were brought together as the volunteer arm of the organization, forming the CSF-VBB. The CSF-VBB is a group of enthusiastic Barbadians who are dedicated to ensuring that young Barbadian children have access to the best educational opportunities and practices in the world.

The Camp ran from July 6 to July 31, 2015 on the Barbados campus of the University of the West Indies (UWI). As a full partner in the Camp, UWI-Barbados provided the use of one of its computer laboratories and the services of one facilitator. The Camp was funded by the Barbados Ministry of Labour, Social Security and Human Resource Development, and the City of Bridgetown Co-operative Credit Union, Ltd.

Rationale for Camp

One of the aims of the CSF is to increase the number of Caribbean students pursuing advanced education in STEM. The CSF-VBB felt that younger students needed to be targeted for engagement in STEM, and in particular, students at the primary school level for broader impact. This way, when the students reach secondary school, they are already familiar with STEM and its applications. It is with these aims in mind, that a sub-committee of CSF-VBB conceptualized and staged the inaugural 2015 Barbados Junior Robotics Camp, in close collaboration with UWI-Barbados.

2.0 Camp Planning

Over the course of one year, the planning committee worked together to ensure that all aspects of the inaugural camp would be executed as envisioned. The team met weekly via online meeting platforms to put in place all the necessary logistical requirements. Teamwork, hands-on engagement, perseverance, fun and creativity were key pillars that were incorporated into the Camp.

We were very fortunate to have as part of this group, Mr. David Thorpe, a Barbadian software engineer, based in Maryland, USA, who has extensive experience guiding young children in robotics and preparing them for international robotics competitions. His vision and expertise were invaluable, especially for selecting the specific robotics kits to be utilized and for developing the syllabus for the Camp. Also lending her considerable expertise on the team was Dr. Cathy Radix, then a visiting CSF fellow from UWI-Trinidad. She too has lots of experience in planning and hosting robotics camps for young students, and was an excellent resource. The members of the Planning Committee are shown in Appendix I.



Camp coaches

One major aspect for consideration was the venue for the Camp. The ideal location would be central, and have adequate space to accommodate about two dozen children and coaches, internet access and available computers on which software could be loaded. UWI-Barbados (Cave Hill Campus) was engaged, and with the assistance and support of

the Dean of the Faculty of Science and Technology, Prof. Colin Depradine, permission was granted for the use of one of their laboratories. A UWI staff member was identified and he was available to the Camp staff for troubleshooting and IT support when needed. UWI-Barbados continues to be an extremely valued partner of the CSF, as they lend support to this and other CSF activities and initiatives.

The staff (coaches) of the Camp were all carefully chosen. They are all dedicated educators, with passion for and commitment to STEM. They needed to be familiar with the syllabus and able to effectively teach the material to the campers. In the month prior to the start of the Camp, three all-day training sessions were held, during which the principles of STEM were reinforced and familiarity with the various hands-on activities were developed. Appendices 2 and 3 provide the names and affiliations of the coaches and support staff.

The coaches not only provided supervision, but also mentored and guided the students over the four-week period. Much emphasis was placed on daily evaluation of the students' performances and responses to the tasks and challenges assigned, so that any required adjustments could be done effectively and quickly.

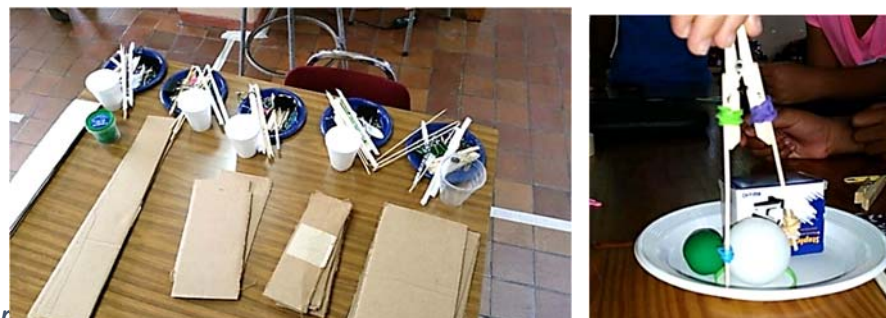
3.0 Application & Selection Process

The planning committee felt strongly that only those students who had a genuine interest in and passion for science and robotics should be considered and accepted into the Camp. Additionally, since this year's Camp was a pilot, the decision was made to restrict attendance to 20 students. Thus, a comprehensive application form was developed, which required input from parents or guardians, the class teacher or principal, and the students themselves. The form was made available at http://caribbeanscience.org/projects/junior_robotics_camp.php starting on June 3, 2015 and applications were accepted until June 21, 2015.

Those students who met the following criteria were accepted: Barbadian citizenship, more than 9 but less than 13 years of age on July 1, 2015, and complete application package with strong recommendations from their teachers. The caliber of applicants was very high, and the committee determined that 21 students should take part in the pilot. It was hoped that equal numbers of girls and boys would have applied, but the actual distribution of accepted students was 16 boys and 5 girls, likely due to the limited advertising methods employed. The planning committee had decided that word of mouth and the use of social platforms would be sufficient to garner interest and satisfy the quota. Students and parents were then notified, and each received an information package which outlined the rules and expectations of the Camp, along with the syllabus and other information. Appendix 4 provides the names of the students, their gender, and the schools they attend.

4.0 Camp Operations

The Vex© robotics system was chosen as the tool to facilitate this Camp. Vex© is internationally recognized as a leading robotics classroom platform, which utilizes both classroom teaching and hands on building. It was via this medium that the students were introduced to robotics. They learnt about the basic components of robots and saw examples of how science and math are applied to engineering. They were exposed to concepts such as simple machines and motion, mechanisms like pulleys and gear ratios, sensors and the basics of programming. Readily available, familiar materials were used to teach and reinforce the concepts to the students. PowerPoint presentations, videos, indoor and outdoor games, puzzles and various challenges were incorporated to keep the students engaged. Appendix 5 provides an outline of the Camp schedule and the course material covered.



Simple, familiar items used during the Camp

Apart from the content of the core syllabus, the campers were engaged also in the administration of the Camp. On the first day of the Camp, they were divided into groups and were given their first assignment. Each group was asked to conceptualize a list of rules and guidelines that all campers thought were fair and reasonable. Each team

then presented their list to the entire camp body, and promised to adhere to them for the duration of the Camp. Respect for others, agreeing to encourage each other and commitment to persevere in challenging circumstances were common themes which emerged.



Students at work during the Camp

By the end of the four weeks, each team of students worked together to create fun devices and to build an autonomous robot which was capable of performing specified tasks such as navigating a ramp, negotiating a maze, and picking up items. The students were made aware of how these robotics and engineering skills are applied in real-world scenarios via PowerPoint presentations, videos and self-exploration.



Assembling and testing the robots: Teamwork in action

5.0 Camp Challenges

- Clearing the robotics kits from the Bridgetown Port in the midst of industrial action by Port staffers, meant that the kits were available much later than originally planned. This shortened the time which the coaches had to familiarize themselves with them. To compensate for this, once the kits arrived, each coach was assigned a kit at the beginning of the Camp, which he/she could take home for additional hands-on familiarization.
- The ratio of campers to facilitators was sometimes inadequate, as staff members occasionally had other commitments which forced them to be absent. A revised roster was developed, and the facilitator team was supplemented with additional interested persons. For future camps, larger numbers of coaches will be trained to improve the delivery of course work and supervision.
- Some of the campers themselves were more sophisticated and advanced than initially anticipated. In a few cases, they knew more about robotics and programming than the coaches. This meant that the coaches had to constantly re-evaluate their grasp of the syllabus and delivery methods to keep up with the pace at which material was delivered. This in turn forced the coaches to adopt a more proactive approach and improved their effectiveness.
- The make-up of the Camp was not as gender diverse as anticipated, with 16 boys and 5 girls participating. Division of the class into 5 teams meant there was at least one girl per team, for some measure of equality.
- Since this was a pilot, it was decided in advance that no widespread advertising would be utilized. Word of mouth and the social platforms of the committee members were the methods used. For future camps, it is anticipated that a more rigorous advertising campaign would be put in place. This coupled with endorsements from the parents of the students who have already experienced the Camp, hopefully will attract greater numbers of applicants, especially girls.

6.0 Final Robotics Demonstrations

On July 31, the last day of Camp, participants all got the opportunity to showcase their newly developed skills to an appreciative audience of parents, guardians, sponsors and supporters. Representative students from each team spoke to the audience, explaining what task each robot was to perform, before putting their robots into action. Prizes were awarded to the teams who won the various challenges set to test their robots. A team from the City of Bridgetown Co-op Credit Union Ltd, one of the sponsoring organizations, was present, and in addition to delivering remarks, the Credit Union team presented each camper and coach with a gift certificate.



Students at the final robotics demonstrations

7.0 Plans for Future Robotics Camps

It is the goal of the CSF to stage another Barbados Junior Robotics Camp in 2016, for a new class of campers. Ideally, in 2016 we aim to stage two camps: both an introductory camp, and an advanced version for campers who would have already experienced the introductory Camp. International robotics competitions are popular forums where students compete against their peers for substantial prizes and exposure, and gain real-world engineering experience. It is envisioned that within five years, Barbadian teams would participate in such competitions.

The CSF also plans to invite more teachers to participate in its future workshops, with the near-term goal of getting a few after-school robotics camps started in selected primary and secondary schools. Further, it is planned that some of the kits from this inaugural camp will be made available to the Erdiston Teachers' Training College. Our hope is that robotics will one day become a standard part of the curriculum in primary and secondary schools in Barbados. For the CSF, effecting education reform is key and the promotion of STEM-focused activities like this camp is expected to improve awareness and create and ignite passion for STEM in our young people.

8.0 Summary/Conclusions

The objective of the Barbados Junior Robotics Camp was to engage young children in fun-filled, meaningful STEM-based activities via robotics. Specifically we used the VEX® robotics system to teach basic technology, engineering and programming skills, and to foster teamwork, cooperation and creativity. We are confident that these aims and objectives were met. The students progressed remarkably over 4 weeks, from little or no experience in programming and building structures, to understanding basic STEM principles and producing automated robots.

Feedback from the campers indicated that they thoroughly enjoyed the experience, especially the hands-on components of the Camp. Parents stated that they found the Camp to be well-planned and executed. The coaches expressed surprise, pleasure and satisfaction at the speed and accuracy with which the campers were able to grasp and implement the new concepts that they were taught.

Many of the students did not miss a day of camp, and many arrived early and stayed late. The students worked effectively in teams. Each brought their own skill set and developed new ones. Now, there is a cohort 21 students who have greater insight into STEM and robotics, and their applications in real world scenarios. It is hoped that these students will serve as ambassadors for advertising and promoting the Camp, and function as peer support for future campers.

9.0 Acknowledgments

The CSF is extremely grateful to our sponsors and partners, whose support made this inaugural camp possible.

Sponsors:

- The Ministry of Labour, Social Security and Human Resource Development
- The City of Bridgetown Co-operative Credit Union Ltd.
- UWI-Barbados (Cave Hill Campus)

Support:

- CSF-VBB planning committee
- Camp staff
- UWI staff

10.0 Appendices

Appendix 1. CSF-VBB Robotics Camp Planning Committee

NAME	TITLE
Mr. David Thorpe	Senior Software Engineer, Intelligent Automation Inc., Rockville MD, USA
Dr. Ramona Archer-Bradshaw	Tutor- Science, Erdiston Teachers' Training College, Barbados
Dr. Cathy Radix	Lecturer, Dept. of Elec. and Comp. Engineering, UWI-Trinidad & Tobago
Ms. Irene Stephney	Attorney at law, Barbados
Mrs. Gail Niles	Co-owner, Indigo Stationery & Gifts, Barbados
Ms. Lois Oliver	Assistant Director, Caribbean Science Foundation, Barbados
Ms. Geralyn Walkes	Word Works Inc., Barbados
Mr. Hallam Hope	Managing Director, CARITEL/Hope Communications Inc., Barbados
Prof. Cardinal Warde	Interim Exec. Director, CSF; Prof of Electrical Engineering, MIT

Appendix 2. Camp Coaches

Name	Titles/Place of work
Camille Pounder	Math Teacher/ Ellerslie Secondary School
Philip Moore	Physics Teacher/Queens College
Roydon Richards	Lecturer/ Samuel Jackman Prescod Polytechnic
Othneal Adamson	Physics Teacher/ Harrison College
Ryan Sisnett	Teacher/ Roland Edwards Primary
Beverley Moore	Teacher/St. Mary's Primary
Shedeur Parris	Physics Teacher/ Combermere School
Catherine Gibson	Tutor Erdiston Teachers' Training College
Trudy Carter	Teacher

Appendix 3. Camp Support Staff

Name	Titles/Place of work
Maurice Beckles	UWI Campus Support - Lab Assistance (Wk 1)
Petra Mccollin	UWI Campus Support - Lab Assistance (Wk 2)
Alison Williams	UWI Campus Support - Lab Assistance (Wk 3/4)
Wavney Weekes	Admin. Asst. - Dept. of Comp.Sci., Maths and Physics, UWI Cave Hill
Charles Clarke	UWI Campus Support - Physics Lab Equipment
Ramona Archer- Bradshaw	Off-Site Erdiston Teachers' Training College
Lois Oliver	Off-site – CSF
Cathy Radix	Off-site - UWI St. Augustine
David Thorpe	Off-site - Maryland, U.S.A.
Jonathan Ramlochan	Guest Speaker - Computer Science Society - UWI Cave Hill
Hallam Hope	Guest Speaker - Barbados Renewable Energy Society

Appendix 4. List of students in 2015 Barbados Junior Robotics Camp

NAME & GENDER OF CAMPER	SCHOOL
Albert, Khajon (M)	Barbados Seventh Day Adventist Primary
Austin, Maia (F)	Charles F. Broome Primary
Bham, Antonio (M)	West Terrace Primary
Bradshaw, Terricka (F)	Westbury Primary
Forde-Bynoe, Damani (M)	Wesley Hall Primary
Clarke, Christopher (M)	St. Angela's
Collins, Sebastian (M)	St. Winifred's
Francis, Ian (M)	West Terrace Primary
Greig, Jordan (M)	St. Gabriel's
Griffith, Harrison (M)	St. Lawrence Primary
Hickey, Cian (M)	Providence Elementary
Jackman, Dominic (M)	St. Gabriel's
Jordan, Dominic (M)	St. Gabriel's
Jordan, Marcus (M)	St. Gabriel's
Marshall, Yaa (F)	Providence Elementary
Moore, Kayode (M)	Wesley Hall Primary
Paul, Sebastien (M)	St. Gabriel's
Steinbok, Russell (M)	St. Angela's
Stevenson, Arin (F)	St. Paul's Primary
Stevenson, Daniel (M)	Harrison College
Weekes, Kayla (F)	Wesley Hall Junior

Appendix 5. Camp Schedule: JULY 6 –JULY 31, 2015; 9:00 AM – 3:30 PM

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
WEEK ONE: Mechanical Structures				
Introduction to Scratch VidLog: Pre-Camp	How do robots move? Robotic arm	Simple Machines (Part I) Surgical Robot	Simple Machines (Part II) BasketBall Robot	Robots in Society Robot Car
WEEK TWO: Tele-operated Robots				
Introduction to VEX IQ Kit Key Concepts: Friction	Key Concepts: Centre-of Gravity Demo: Raspberry Pi	Key Concepts: Speed and Torque	Key Concepts: Power Demo: Renewable Energy	Key Concepts: Mechanical Advantage
WEEK THREE: Autonomous Robots				
Introduction to MODKit Sensors and Outputs: Switches & Motors	Sensors and Outputs: Touch & Messages	Sensors and Outputs: Color & sound	Sensors & Outputs: Distance & Drive-Trains	Sensors & Outputs: Gyro & Timers
WEEK FOUR: Smart Robots				
Mini-Competition: Avoiding Collisions	Mini-Competition: Collecting Blocks	Mini-Competition: Finding Home	Final Competition VidLog: Post-Camp	Public display: - Presentation(s), - final ceremony - T-shirt Day!