

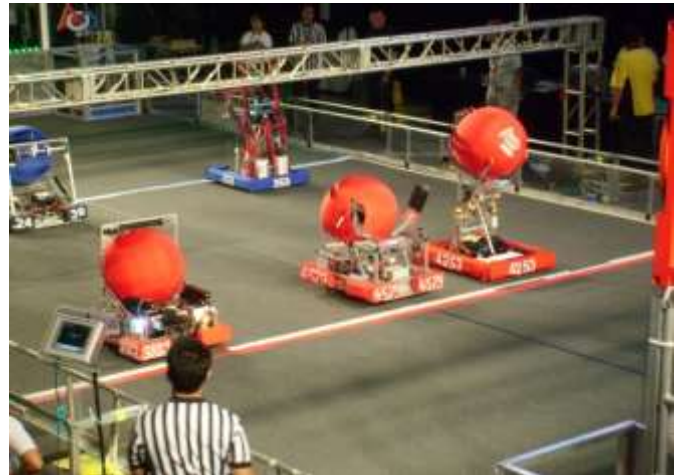
FIRST Robotics and Google's Robots in the Outback Program

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FIRST, *For Inspiration and Recognition of Science and Technology*, is a non-profit global organisation that runs a suite of four robotics programs for primary and secondary school students year round. Its flagship program is affectionately and widely referred to as, the FRC. The FRC is quite literally a 'sport for the mind', and challenges high school students to design, build and program a 50 to 60 kg robot using industry hardware and software. One of the most impressive aspects of the FRC is its compressed six week design cycle, which starts in January and concludes mid-to-late February. It's difficult to fathom that the entire robot, with its integrated mechanisms and control systems are conceived, built and programmed during this time period.



2013 brought the ultimate game of Frisbee to FRC teams. Pictured is Unaipon, the FRC robot named in honour of the indigenous Australian inventor David Unaipon.



The FRC competition sees two opposing alliances (red vs blue), with three robots per alliance. Each match starts with a 15-second autonomous period, with student drivers controlling the robots during the remaining 2 minutes and 15 seconds.

Throughout the build season each team has been supported by engineers and technology experts from industry (e.g. Ford, BAE Systems, Salesforce, Boeing, Rockwell Automation) and the tertiary sector (e.g. Swinburne University, Macquarie University). At the conclusion of the build season, which ends just as abruptly as it started, all teams 'bag and tag' their robots before placing them into crates for shipping to their nominated competition tournaments.

Macquarie University who brought the FRC to Australia and oversaw its rapid expansion, developed the 'Robots in the Outback' program as a way of engaging students from under-represented groups, such as those schools from rural and remote communities. RITO was a way of providing a unique STEM program to students in these communities that they would otherwise not have had the opportunity to experience.

Substantial financial backing was provided by Google Australia, with Ford providing its 4WD vehicles to the RITO teams to travel to the remote communities. Since 2015, RITO teams have been helping schools in rural and remote communities to kick start their robotics programs; spending on average 2 to 3 days with each group. It has been hugely successful in helping to expose more under-represented young Australians to STEM; equipping these students with skills that will prove vital for their future, and their community's future. Additionally, these students are able to provide an alternate perspective, as lack of diversity in STEM is seen as an important issue needing to be addressed; after all, new perspectives tend to contribute to the generation of fresh ideas, which can subsequently breed innovation.

After the Ivanhoe FRC team attended the Australian Regional FRC tournament in Sydney in 2015, over half the team are keen to attend university. This compares with only one student in the past 20 years having gone onto university. These thoughts were echoed by students from other RITO schools, so stories such as students intending on leaving school and going to drive excavators, trucks or work on the land as farmhands, have been replaced with notions of attending university and completing studies in engineering or in a STEM-related field.



RITO Team West visits Ivanhoe Central School



Assembling drive motors and attaching robot wheels



Ivanhoe's completed robot drive base with a simple ball dispatch mechanism

The opportunity to be a part of the RITO program, travelling to rural and remote areas in Victoria, WA and NSW has been personally a very rewarding experience. We enter the teaching profession because we do want to make a difference in the lives of our students and help them achieve their full potential. It has also provided a rich opportunity for RITO team members, including a visiting NASA engineer who gratefully donated his time to work with Aussie kids and teachers, to engage in discussions and exchange ideas.



RITO mentor and NASA engineer Tyler Todd-Evans working with Willyama High School students on prototyping a ball intake system for the 2016 Stronghold challenge



Ulladulla High School students representing Australia at the 2016 World Championships



Wee Waa High School's Bush Bots FRC Team



RITO Team WA visit Southern River College

I have been very grateful to my school, The King David School (KDS), who have not only provided me with generous time release to be a part of the RITO program over the last couple of years, but who this year have incorporated a version of RITO into the school's inaugural Year 8 indigenous camp. This camp allowed our students to spend a week with the indigenous students of the Jabiru Area School (JAS) run by the Mirarr people. For the KDS students this was an opportunity to broaden their understanding of indigenous Australia and gain an appreciation of kinship, learn some of the local Gundjheimi language and foster a meaningful connection with the Mirarr people. For the JAS students this was an opportunity to gain some exposure to Robotics and other STEM activities (e.g. water rockets) during our five day stay. With future visits we'll be aiming to build upon the STEM activities started this year; and hopefully be able to emulate the success of RITO by inspiring more of the JAS students to progress onto Year 12 and beyond.



Water Rockets at Jabiru Area School

A Final Few Thoughts

Reports, such as those produced by PwC (2015) indicate that Australia is experiencing a grave shortage of STEM skills, which will be further exacerbated over the next 20 years when 44% of current Australian jobs are expected to succumb to “computerisation and technology” (PwC, 2015). This same report adds that 74% of Australian CEOs indicate that a lack of key skills (e.g. technical skills) are a threat to their businesses (PwC, 2015), and by extension to Australia’s future prosperity. Similar concerns are also being raised in the US. The US’s National Education Association (NEA) have been strongly advocating for teachers to include and integrate the “Four Cs” of critical thinking, communication, collaboration and creativity, into their classrooms (NEA, 2011). One of the exemplars provided by the NEA is the FIRST robotics program.

Not surprisingly, of the more than 3,000 FRC teams participating from 24 countries (which equates to roughly 75,000 students) in last year’s season, the overwhelming number came from the USA, which is in the process of overhauling their education system. It’s obvious that Australia needs to do the same, and work has already well and truly started in this regards. We can’t afford to be complacent, as our current students need the critical thinking and problem solving skills to not only deal with the challenges of today, but to be able to meet and adapt to the challenges presented by tomorrow’s problems and opportunities.

The aim of the FRC is not to see which team can accumulate the most points on a competition field. Instead, it is dedicated to changing the way that students think about their world, and to create for them a pathway to pursue further study and rewarding careers in a variety of STEM/STEAM disciplines. As part of RITO we are working to transform the culture of the classroom into one that recognises the value and importance of science and technology in our advanced world. While FIRST robotics teams enjoy the on-field competition immensely, they also thrive on transforming their community; which is particularly evident with the RITO teams from remote and rural schools. The FRC is not about students building robots, but really, the robots building the students into the next generation of thinkers, problem solvers and innovators.

For more information on FIRST, the FIRST suite of programs and the FRC, please feel free to email me or check the following website for more information:

www.firstaustralia.org.

References

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