

Professional Learning

Session Notes



Teaching Robotics

with Jameson Harvey,
Red Dirt Robotics

Future Sessions:
bitlink.com.au/newsletter/



Background & Context

These notes and lesson ideas have been prepared as an accompaniment to a professional learning session that took place in Launceston, Tasmania on February 27th. At that session, Jameson Harvey from Red Dirt Robotics talked about his experience with the FIRST Lego League robotics competitions and about how these led him to starting his own company called Royal Robotics. Jameson also spoke about his recent endeavours with Red Dirt Robotics and taking his passion for STEM education to regional and remote Australian communities. That section of the presentation was the inspiration for this guide.

More Information

If you would like to access more design and digital technologies supporting materials, or keep an eye out for future events, check out the Bitlink website and sign up for our mailing list.

bitlink.com.au/newsletter/

Why teach robotics?

Teaching robotics in the classroom provides a great way to introduce a wide cross section of STEM concepts for students to determine what it is they are passionate about within the STEM industry.

Robotics allows you to dig into design and engineering, where ideation can become reality through prototyping. You can also look at the electrical and mechanical side of how everything fits and works together, or the programming elements where logic and maths is used to control each part as one.

An exciting robotics program is a great way to engage students who may not find the mainstream classroom, sports or other extracurricular activities the best fit for them. Providing them with a safe space where a project or goal is being worked towards, will allow students to unlock their potential through problem solving, critical thinking and teamwork.

In the 20 years prior to the COVID-19 Pandemic, jobs in STEM grew by 85%, more than double that of their non-STEM counterparts, and are expected to grow a further 12.9% in the next 5 years (National Skills Commission, 2021). Teaching robotics now, at a school level, is essential for engaging students and preparing them to take up a career in the future.

Why use Micromelon?

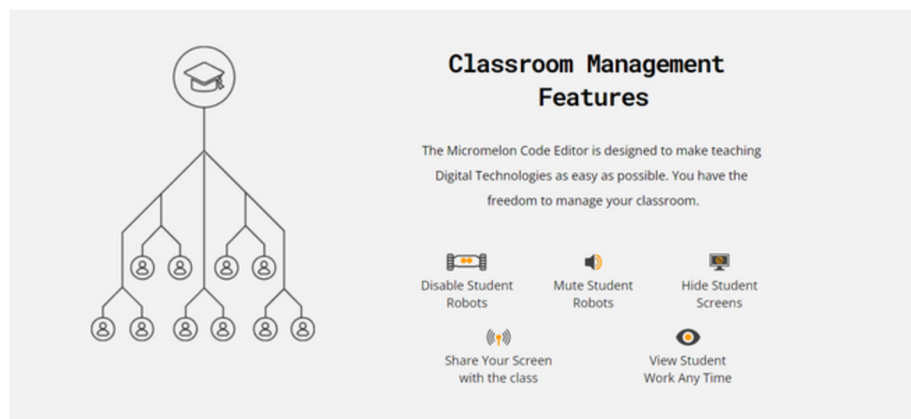
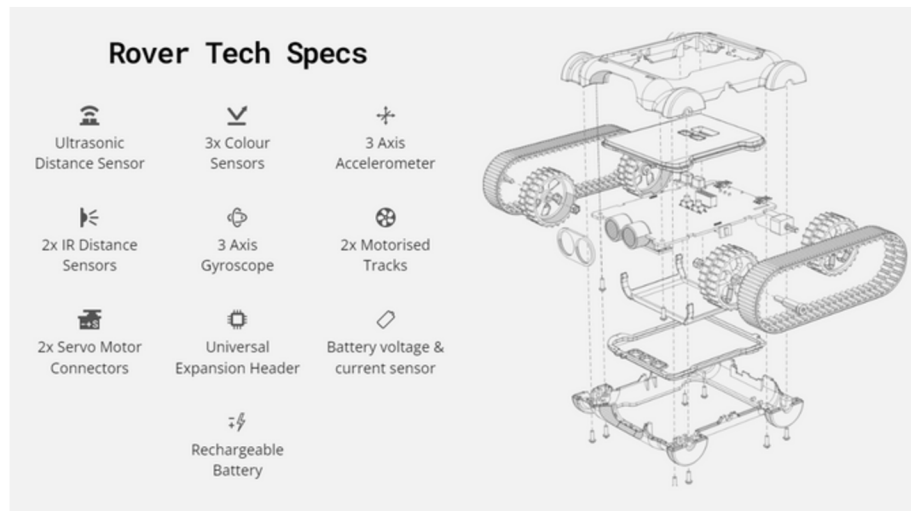
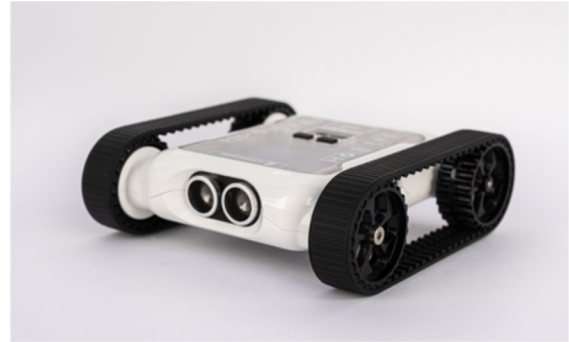
The Micromelon Rover platform provides schools who are looking to get into robotics, or are already teaching it, with a great alternative to the other common platforms you see in education and for a much smaller initial investment.

The rover was designed by two University of QLD engineering students who found that there was a big a jump in difficulty in how robotics was being taught between primary, secondary, and university level. The hardware is designed with classrooms in mind.

Micromelon provides a great platform to learn how to program in both Blockly (drag and drop) and in Python (text based), and does it in such a way where you can learn both languages side by side at the same time. This makes learning Python particularly easy, as each block dragged into the code, is reflected in Python in real time. There is also an excellent simulator, so you can program without connecting your robot.

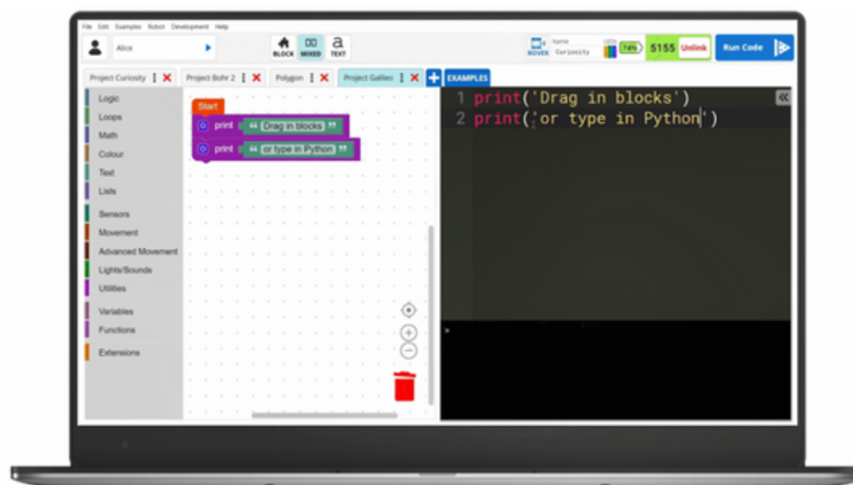
This provides a great scope of usability across all age and skill levels. On top of this, there are ways to extend learning further and create endless projects and possibilities through the use of CAD and 3D printing, to design attachments controllable by external servo motors.

Platform Example: Micromelon Rover



Code Editor & Classroom Organizer

Software that makes coding easier for students and gives flexibility to teachers.



Primary School Activity Ideas:

A fun and engaging introductory challenge for younger students is the A-MAZE-ING challenge, taken from RoboRAVE. I run the challenge a little differently to the competition rules, but the premise is still the same.

In A-MAZE-ING, you have to program your robot to travel through an unseen maze as accurately as possible. The catch is that no sensors can be used in the challenge (and no rulers or measuring tapes either! There's always one clever student!). students have to get from Point A to Point B using only their motor output, accurately programming the best path possible through trial and error.

The challenge can be set up with simple supplies that any classroom should have (e.g. tape. I prefer electrical, but masking or any other coloured tape will do). Design a maze on the floor consisting of some straight drives, right angle turns, and smaller and larger angle turns. Difficulty can be determined by the width of the maze.

Score students on how fast they can travel from start to finish, and add a +5 second penalty when any part of the robot crosses the boundary.

For official challenge rules, visit here:

 <https://youtu.be/qU8GQAwtgDw>

Secondary School Activity Ideas:

One fan favourite challenge for older students is the Sumobot challenge. In this challenge, students learn how to write a 'seek and destroy' code that programs their robot to push an opposing robot out of a ring.

A great way to extend this challenge further is to then add a "Balloon Battle" mode, inspired by Mario Kart. By introducing this new element, we are met with an exciting way to combine advanced programming skills, CAD / 3D printing and strategy / logic all into the one activity. Students will then have to design, prototype and test an attachment that will hold an inflated balloon on one end, and a skewer (or other pointy implement) on the other.

Once this initial attachment is completed, they can design customised armour to protect their robot and balloon as best as they can from their opponent. Once all designs have been completed, run the sumo challenge again, but now with their added attachments and armour. First to pop the opponent's balloon wins.

Additional lines of code can be added to the basic 'seek and destroy' code to make the robot more efficient at finding the opponent, but also avoiding them.



<https://youtu.be/BKm5bTO3lbQ>

Robotics Competitions

Robotics competitions are a great way to engage students in a long term project. For first time competitors, RoboRAVE is the perfect option for schools looking to get into the competitive robotics scene. RoboRAVE is a competition for any robot, person of any age, from anywhere in the world.

RoboRAVE has many different challenges and so within a class or STEM club, you can find which challenge interests each student the most and enter them into that one, but all compete together on the same day.

See the full list of challenges they run here:



<https://roboraveaustralia.com>

If you have access to the various LEGO robotics platforms already, the FIRST Lego League is the next best step to take. LEGO Spike Prime is their new platform, as the Mindstorms Ev3 platform is being discontinued in 2024. FIRST Lego League has various categories that reach from ages 4 - 16, but the competitions are for ages 9- 16 specifically.

The competition has two main elements: the Robot Game and the Innovation Project (in which participants have to come up with solutions to real-world problems that align with that season's theme.)

Find out more here:



<https://firstaustralia.org/programs/first-lego-league/>

Contact:
jameson@royalrobotics.com.au



Stay in touch:
bitlink.com.au/newsletter/

