Robots in the 2016 Australian Classroom

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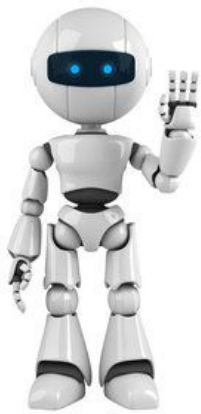
More and more robots are appearing in Australian classrooms. This document should guide teachers interested in gaining an overview about robots in the Australian classroom and at what age the technology could be introduced. It isn't the last word or a shopping guide.

It was inspired by response posted to the OzTeachers list by Ken Price to Damien Kee asking what is working well (and perhaps what isn't). It was a labour of collaboration across Australia and is shared on with a creative commons licence.

It is my hope that we can later publish and share these thoughts and organise a survey about the use of these robots in our classrooms.

Edited by Roland Gesthuizen



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What should I get for my school?

This is a common question yet it really doesn't really matter all that much. In the education realm, we never 'Teach Robotics', instead we use 'Robots to Teach'. Use these platforms to teach programming, computational thinking, problem decomposition, mechanical engineering, branching statements, directional terminology and so on, and so on. The robot itself is just a platform that is used to teach these concepts so it doesn't really matter which one you choose.

The best robotics platform is the one that teacher feels most comfortable using. If they are comfortable with it, then they will teach with it, just like any other tool at their disposal. If the desire is for all students to be involved, then the classroom teacher must feel confident with what they are using. It has to be simple and work every time.

Choosing a Robotics Platform

There will be a bunch of factors that will guide teachers in to choosing a platform that suits their school best and they should include;

- Price. If there is a robot platform that is amazing, but it costs $5000 / robot, is that a better investment than a great platform that is $200 / robot? For the same amount of money, a cheaper robot can engage more students.
- Availability: Are spare parts or add-on easy to source from overseas?
- Age appropriate Programming Language: Graphical or Text based? Do you need a platform that can span across both to appeal to a wide range of ages?
- Curriculum Resources: Are educational based activities easy to come by? While it would be awesome to have the time to use robots in class because they are fun, in reality everything we do needs to be meeting some parts of the Australian Curriculum. Are those activities affordable/ adaptable / assessable?
- Teacher support: Often the 'robotics' teacher/s at a school might be only one or two teachers which makes it a little more difficult to bounce ideas around. Many robotics platforms have good extended Educator communities in the form of mailing lists, forums etc.
- Professional Development opportunities: Are your staff comfortable in using the equipment in class. Too often I've seen cupboards of equipment sitting idle in a classroom because the teacher who originally used it has now moved on and no-one else at school knows how to use the gear. Is the equipment easy to use and it is just missing a teacher willing to take it on?
- Reliability: If you are spending too much time just getting the platform up and running, then that is time that could have been time spent solving challenges.
- Control Platform: The command interface, IDE or development space is really important - ideally it should visibly surface algorithmic components of the control solution rather than hide it among esoteric and/or clumsy visual symbology. Wherever possible it should encourage code-reuse, enable defined sub-programming and be extensible with the inclusion of external libraries.

The Big List

BeeBot / BlueBot

Homepage https://www.bee-bot.us/bee-bot.html

Simon: We started with these in yr6 but quickly moved them to JP area. This friendly little robot is a perfect tool for teaching sequencing, estimation, problem-solving, and just having fun. They are easy to use and quick to setup. Coding is completed by button presses on device itself.

Michael: We have used these very successfully in PP-2 for developing sequencing skills and an introduction to algorithms (representing instructions using arrows). The beebot resources from Barefoot Computing UK (need to sign up) are brilliant.

Vickie : We have used this as a concrete introduction to computational thinking for Primary teachers as an introduction - non threatening to teachers and can see uses for cross subject use in higher primary years - ie the Australian Money Mat; World Map; Australian Map can be used for challenge tasks at Years 3 - 6 level if they have no prior intro to coding/robotics.

Damien: I love these for Prep-2. They are very user friendly and great for teaching Sequence and directional language. By time you get to Grade 3, they tend to lose a bit of interest as the challenges are usually solved quite quickly.

Ken: BlueBot allows editable stored programs, which makes them more usable for older students.

Yvonne: Our Kindy and Pre-Primary teachers are using these to introduce the idea of how the robot works - in the context of the community map, directional language, counting and the required step sequence. I love the hands on aspect of these robots.

ProBot

Home page https://www.bee-bot.us/probot.html

Ivan: The Probot is a more advanced version of the BeeBot built as a small car (approximately 30cm in length). The programming options on the Probot are more advanced than the Beebot, for instance, year 6 students quickly discovered they could program the Probot to advance a specific number of centimetres using the inbuilt LCD screen. The Probot can also be programmed using an application from a computer, but I haven't tried that option out yet.

Edison Robot

Homepage https://meetedison.com

Roland: Have used with year 9 and 10 Robotics. Good price, especially if you are looking to buy a class set. Novel approach using an audio-optical connection so that it connects any device to an Edison Robot. This can also be used to program using a bar-code reader. Programming interface is free to download and similar to the Lego Mindstorms layout. Seems to be tough but we have had some wheels jam. Can be programmed for basic line tracking. Keep a supply of batteries handy

Michael: We are roadtesting V1 Edisons in Year 5 this term. The Edware programming language is very complicated, but they are working on Blockly and Python coding tools. v2 is supposed to have fixed the reliability problems with faulty gears and sticky wheels. Cheap, compatible with Lego, but not a huge fan.

Vickie : We have a kit of 15 that travels around to schools on a 5 week loan basis. Teachers have found them easy and from 15, only 2 have been issues. Looking forward to v2.

John: It's early days with Edisons in DBB. We would have 40+ units that have been purchased by schools. We have found that, despite the notice that advises that units manufactured/purchased after a certain date contain the latest firmware, a firmware update is required. Whilst a range of methods for completing this update have been documented, we find that the procedure involved a direct update via the web interface is the easiest. Unfortunately, we have found that this update sometimes needs to be repeated several times after which time the robots operate efficiently. A number of small issues related to correct sound settings for Windows Devices and Chromebooks have been identified with workarounds developed. We have found that the iPad App will not work at all. Also found several faulty cables. These prevented Edison from receiving the Code. There is a wide range of pricing difference between various vendors so please shop around.

Nick: So far found the Edisons to be unreliable. Wont scan/ take programs on regular basis. At the moment, they are back with the creators - Microbric to hopefully get them repaired
Geoff: I had laminated some of the supplied barcode sheets and found that the Edison didn't reliably scan. When students hold the Edison and run it over the barcode the reliability improved.

Geoff: I found the Edisons V1 to be a bit challenging with their initial reliability but on updating latest firmware the problems seemed to disappear. Updating firmware using the Chromebook was by far the easiest platform to use. Battery life was a bit of a concern but I have started using Powertech 900mAh rechargeable batteries from Jaycar (@$2.30 each) and I can run an Edison using a Sumo program continuously for over 6 hours. When batteries of any type lose their "oomph", I find the Edison will start to do random things. Putting in charged batteries almost always

fixes the problem. Given that one can purchase a set of 10 Edisons for the cost of 1 EV3, the decision on what to purchase can be around ratio of students to robots and whether their use is for integration across the curriculum for whole classes or for extension groups. Certainly the coding concepts are very similar. The improvement with V2 I think will extend the use of Edison's well into the secondary curriculum.

Geoff: Ed.Py: I've been having a play with new Ed.Py for Edison which is based on the widely used industrial programming language Python. This will certainly develop students' coding skills from probably Year 5 onwards.

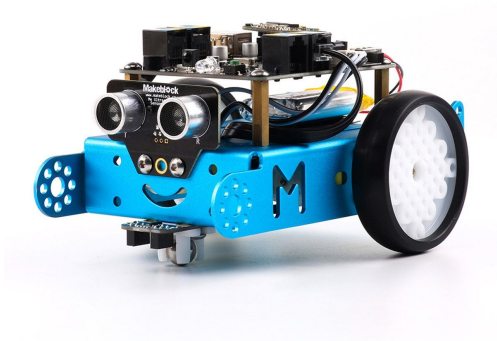
Yvonne: Our Department just provided us with a set of 15 which takes our total to 25 V1 robots. My colleague and I used the 10 we purchased during Term 3 with our Year 5 and 6 students in a combined Science/Digital tech project. The bar code lessons were fun and the kids really enjoyed that aspect - we used those to introduce the kids to the idea of a system and why/how this system works. The remainder of the sessions (400 minutes across the term) were taken up with firstly introducing the students to the Edware software and helping them to get the basic idea of programming (we related the loop, if/else and event time aspects to Scratch so that those students who had already used Scratch understood what the yellow icons were all about). Then time was spent on developing an understanding of timing and speed and timing for turns. This proved challenging as did the final activity which involved developing a "map" which related to a specific purpose for which they designed a robot. The design thinking and systems thinking aspect came into play within this particular challenge. The students had a really good go - though some of the Edisons didn't perform well - specifically the wheels not turning was an issue. However, one robot which I had tried to update Firmware using our Windows & laptops and desktops at school was brought out of the stuck cycle once I used my Mac laptop. Not sure why that proved more efficient - it just worked better!

The Edware software was challenging for the students as they thought just pulling the event icons into sequence would work. We will be working on this again next year with our Year 5 and 6 students and hammering the use of variables within each event so that their programs work. Also thinking of taking these down to Years 3 and 4. Year 3 will use the barcodes and we will discuss systems and how they work as well as continuing their programming mathematical shapes with Turtle Blocks. The Year 4's we will do the barcodes and then the first 5 lessons with Edware like we did this year with our Year 5 and 6 students. Plan is to strategically have these in place in Years 3 and 4 and move on to something else in Years 5 and 6.

mBot

Homepage http://www.makeblock.com/mbot

Roland: Have used these with year 9 and 10 Robotics. Very easy to assemble, keep an eye on regularly tightening the screws. Assembled Robot fits nicely back into the original box. Tricky coding the first time. Many sensors including line tracking, collision detection, Infrared communication, etc. Remember to start with the mBlock software, install the arduino driver, then attach USB lead. mBlock software permits programming with a drag-and-drop block interface but it also permits directly coding the arduino chip.



Michael: I love the mBots! I bought a mBot and MBot Ranger for my gifted Year 5 coders. Makeblock are working on developing online tutorials, which you really need to read to get your head around how to program them. Highly recommended for coding extension from late Year 5 up. They are harder to program than EV3 Mindstorms. Price range around $140-230 depending on model.

Carlin: These are used as an introduction to robotics for all students at Year 7 level. We have 13 which makes a class set (1 between 2). This allows a class set, which made it achievable in terms of cost, but students responded extremely well to the collaborative learning. With a small amount of initial scaffolding (Specifically how Scratch/individual blocks work) students are able to assemble code for small tasks. Within the first lesson (72 mins), Students are able to connect, program and control an mBot using the arrow keys on the keyboard, turn on flashing lights, and have a basic siren sound. Differentiated Learning is also easily managed, as students complete at their own pace, completing a variety of activities that can include make an automatic xylophone player or even building a 3D Printer with this ecosystem

Promo Video: https://www.youtube.com/watch?v=-hQtdYd5i-Y

Programming Examples*: http://learn.makeblock.com/en/mbot-programming/
*These coding examples would be at the end, just prior to assessment (Except music example)

Learning Path: to provide the skills and knowledge needed for VCE Computing.

Year 7	mBot	Drag & Drop Coding Allows for Direct Arduino coding for extension
Year 9	mBot / Arduino	Combination, ensures that the transfer occurs Similarities & Differences highlighted. Basic Projects
Year 10	Arduino / Unity3D	Coding via Arduino C or elective C# (Unity3D)
VCE	C# Programming	Probable base language

LEGO Mindstorms (EV3/NXT/RCX)

Chris W: RoboCup Junior is an awesome resource for those wanting an excellent place to start and to continue down the path of structured learning where students are driving the learning and pushing the boundaries. It is a very easy path to start down (resource packs are available from MTA - they cost a lot of money, but are not expensive as they last a long time and very reusable).

Chris W: We have had a long experience with RoboCup, and then linking to World Robot Olympiad to expand students' horizons in many areas. The competition is strong, but also very collegial and supportive. It is a growing community of learners.

Chris W: We are starting to use some of the older Lego devices (NXT and even trying to get the old Yellow bricks working) as the brains behind simple controlled or controllable devices. Eg Camera sliders, camera following device, controlling an old electric wheelchair. Sometimes linked to remote control gear.

MIchael: The LEGO EV3 can be used from Year 5 up. We currently have five for our FIRST LEGO League robotics teams. FLL is a fantastic competition to be a part of, but it is a lot harder than RoboCup Junior! Highly recommended, but pricey!

Vickie : We have 5 EV3s that form part of a loan kit that is borrowed by schools. We find they lend themselves, as Michael suggests, to Year 5 onwards, and as a second stage - currently using Edisons as the step between these and BeeBots/We Dos.

Damien: I've been using these for 15 years now and I still love them. The construction element to them really ties into the STEM ideas, but if you are only interested in 'programming' there are other cheaper options. That being said, they are an extremely robust platform and I have robots that are 10 years old and still going strong. You can program in Graphical or Text based languages making them suitable for a wide range of age groups. I teach with them down to Grade 3/4 and all the way up to Grade 12 and beyond (university level). The datalogging aspect is an added bonus allowing the platform to be used for Science as well as Technologies.
There are plenty of resources available and the learning curve to get up and running is very easy. These would be my pick for a robotics platform that can cover a variety of age groups and subjects.

Yvonne: Would love to use our old RCX bricks but I need to find a way that will work. Thought about the EV3 software but people tell me it's not compatible. Used to use the RCX's for Robocup from around 2003-2009 with Year 4-7 Talented and Gifted students for an extension program. Can't afford to upgrade.

Peter: We have been using NXT-based kits for over 6 years with year 10 robotics and junior robotics club. In year 10 we abandoned the Mindstorms development platform in favour of Enchanting - a scratch-like programming language that requires flashing the BIOS of the brick. We prefer Enchanting because, like scratch, the programs make visual sense, naturally use variables, functions etc and have found kids pick up the control aspects really quickly.

LEGO WeDo 2.0

Michael: We are testing the 2nd generation of these kits in Year 5, programming them with Scratch. It is a bit tricky to get it connected, but well worth it. We will program the robots on iPads in Year 2 and 3, and then with Scratch in Year 4. They are much simpler than EV3, and I'm looking forward to learning more next year.

Tip: To get Australian Curriculum Pack on iPad, you need to change the language settings to English- Australia.

Home page https://education.lego.com/wedo-2

Damien: Even though you cannot buy them anymore, I continue to use version 1.0 in class. I use it at a grade 3 and 4 level and the software is very easy for students to pick up. There are plenty of good activities and support for teachers available.

Yvonne: I'm interested in these! Apparently One Education sold the kits as they used to connect WeDo to the XO Duos with Scratch - don't know if that will work now. Would love to know if anyone has experience with this.

VEX IQ

Homepage http://www.vexrobotics.com/vexiq/

Roland: Seen used by http://DATTAVic.edu.au with Victorian secondary students. Perhaps more for challenges

Damien: The VEX IQ platform is relatively new to Australia but has a big following in the US. Similar to LEGO, it is a modular building system which means you can use the elements to build countless different types of robots. The controller is fantastic, with 12 ports that can be configured as either input or output. The sensors and motors are easy to work into your system which makes building quite easy. Software is available in either Graphical or Text based allowing it to be used in a wide range of classes. The IQ system also comes with a remote control unit, which means it is easy to have things working quickly if you want to focus more on the 'Engineering' side of things instead of 'Programming'. Availability in Australia is limited but no doubt will become more accessible in time. I've seen them used from grade 7 and above.

Ozobots

Homepage: http://ozobot.com/

Grant: I have used Ozobots and really like them. I find they are useful as you move from a line following robot, with the students creating the tracks, to drawing codes and then moving into the programming side - with http://ozoblockly.com/editor. The way the program transfers the code to the Ozobot is amazing - just place the Ozobot on the screen and click ***load***. The screen flashes and the Ozobot gets the program!

There are also apps for the Ozobots on iOS and I presume Android, although I haven't used them on Android.
They are really flexible to use. I have targeted them at Grade 3 and 4, but used them equally as well with 5 and 6.
Good price for 6 robots (with some extras) - about AU$550.

Yvonne: I will be looking at these for Year 1 and 2 students as I think patterning and systems thinking can be developed through firstly using the coloured lines and then gradually introducing them to block coding.

Programmable minidrones and droids

Ken: A series of affordable drones and related devices has been developed to be programmed through the Tickle app https://tickleapp.com/ for iOS (iPads). This is a comprehensive programming environment which adapts to the selected hardware (and also allows programming with no specific device selected) The supported hardware is listed at https://tickleapp.com/devices/ and includes various devices from Parrot and devices like Sphero, LEGO WeDo, Dot, Ollie, BlueBean etc. We've successfully used the Parrot Rolling Spider and Hydrofoil. The Rolling Spider is very suited to classroom environments, including collisions. The Hydrofoil is a boat powered by a drone that can be detached and used on its own.

Sphero / Ollie

Home page: http://www.sphero.com

Ivan:The Sphero is very engaging for students as it can move quite quickly, has a bright RGB (programmable, colour changing) LED inside it and is of course reminiscent of BB8 from the new Star Wars movies. The Sphero includes an accelerometer so it can detect running into obstacles or falling off drops. The Sphero typically costs $AUD200.

Roland: Water proof, totally sealed and robust. It is worth looking up how to reboot and factory reset these devices, not intuitive but easy to do and listed on the website. The bluetooth name gives a clue about the flashing colour of each sphero. Very fun for younger kids. If you are buying one, get the transparent SPRK+ or education version. Consider customising by 3DPrinting a chariot.

Make sure you get the SPRK+ edition as it has some subtle advantages and comes recommended for classroom use, for instance, a transparent shell so you can see how it works, and also information in the box for getting started with classroom activities. A variety of apps allow students to engage in different ways, including:

- Simple remote control, change light colour & mode, etc.
- Drag & drop style programming using Tickle
- Code using “Oval”, a Javascript like language using the provided apps (Oval can also be displayed next to your blocks of code to guide students into the language)

There are many resources around using the Sphero in classrooms, especially year 5&6, e.g. this YouTube video from the United States provides some examples: https://www.youtube.com/watch?v=0yQYr7CIxBc
Here is just one good example of the sort of information that can easily be found by Googling “Sphero challenges” (meaning challenges for students to undertake, not problems working with Sphero robots!) http://www.coolcatteacher.com/super-sphero-teaching-methods/

Yvonne: We have been provided with three of these by the Department. I’m looking at the SPRK Lab software and thinking probably useful in a design/digital tech context for trying out some kind of challenge relating to theme parks or something like that. There are so many blocks of code and some of them are beyond the comprehension of the younger students - I see this as another robot for older students who have a knowledge of coding.

Sean: For further resources, look at the SPRK (Schools, Parents, Robots, Kids) blog: https://medium.com/@SPRK This blog is useful for ideas about how to use Sphero in the classroom, as well as suggested apps for programming Sphero on a range of platforms. (I particularly like the photos of Sphero in underwater locations https://medium.com/@SPRK/sprk-like-youve-never-seen-before-a5d91a66c663)

Dash and Dot

Home page: https://www.makewonder.com/dash

Dash is a robot, charged and ready to play out of the box. It responds to voice, navigating objects, dancing, and singing, You can use Wonder, Blockly, and other apps to create new behaviors for Dash.

Damien: These guys have so much personality and really engaging for kids. They have 'personality' built in so that as soon as you turn them on, they look around and act like curious little kids. You can drive them around from a tablet app which is a great way to introduce them to kids before moving on to the programming. Programming is done through the Blockly App which is very similar to Scratch which makes it easy to introduce to kids. There are a good range of sensors built in which allows for programming for lots of different behaviours. Best use in the Grade 2-7 age group.

There are lots of teacher resources available on the website.

Yvonne: Strategically I'm thinking Year 1-2 as the Department also supplied us with iPads loaded with apps. I'll be looking for an App that is similar to Kodable or Scratch Junior to drive Dash and Dot as they are the apps our Kindy and Pre-Primary students will be familiar with. I can see lots of scope for cross-curricular projects with these robots.

Finch Robot

Home page http://finchrobot.com

Roland: Similar to the robots that can be built using the Hummingbird Robotics kits. Requires a permanently connected USB interface with the computer. Provision for adding a pen to the back of the robot. Some sensory monitoring for collision avoidance, LED, motor and sound controls, Interesting controller using an Arduino board that can be programmed directly or flipped over and programmed using the drag-and-drop Birdbrain software.

Peter: we have a few Finch robots that have been used with years 5+6 as part of an introduction to coding activity. They are fairly simple, require a computer with live USB connection and have limited functionality but if you have BYO or laptops, they represent an interesting platform so long as you do not mind carrying a laptop around with the moving robot.

Arduino (raw)

Chris W: Much of our experience in robotics other than Lego has been through our Student Opportunities Week program called “Hi Tech Toys” (think Outdoor Education with student choice). During this time students choose their high tech project, many choose Lego, but we have encouraged the use of Arduino, and some of the more adventurous have chosen to design and start to build a robot of some kind.
Some of them are more applications, and less robotics.

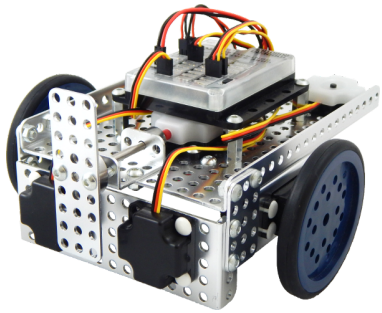
E.g.
WeHub - Remote Weather Station) - Arduinio based with weather measuring sensors and Bluetooth updates, made from laser cut acrylic.

Chris W: Others have been more about control and interaction. Some examples are:
Wifi controlled robot: An Arduino based vehicle that is controllable via wifi. The theory was wifi allows control of the robot from anywhere in the world or universe.
FireDrone 3000 - Modified Parrot AR Drone for fire monitoring purposes. A mini Arduino mounted on the drone to simulate monitoring of back burning operations.

Arduino (Deal Extreme, Ebay)

Mark: Another approach is to build the robot from the ground up. As Seymour Papert put it, “hard fun”. This kit can be purchased from around $aus10 off Ebay. The students can then add Arduino, sensors and actuators to make line followers etc. We found we needed extra power so replaced 4 AA battery pack with 6. You also need a switch to turn off and on. But for $10 plus say another $15 for incidentals, a perfect, low cost solution. Incidental teaching involved the Arduino IDE, soldering, using a screwdriver and problem solving. We had a couple of girls turn up to just learn these skills.
After a while, some students independently went down to manual arts and learned how to use CAD software and the laser cutter. The arrival of a 3D printer also generated some excitement. This robot fits in nicely to a makerspace approach and involves reals STEM.

Peter: We are going down this route. We plan to do a trm of arduino programming, circuits and sensors, lights and bits and bobs then the next term we will velcro the arduino onto a robot chassis and use it to control the physical robot. We will also get the kids to build the rig. There are lots of this sort of stuff available, I bought my test rig from Jaycar but will order class sets from somewhere like AliExpress as the cost difference is breathtaking. No idea if this approach is a good one but we have to replace our aging NXT systems and cannot afford to replace them with like.



Arduino variant

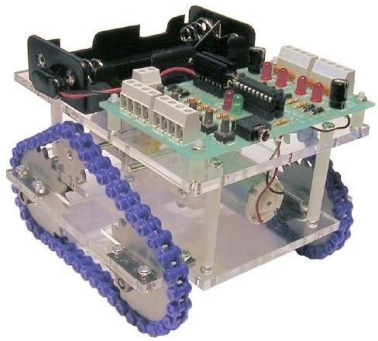
Home page Modern Robotics http://modernroboticsinc.com/

Ken: One product is the Spartan robot, based on an Arduino controller and a well-engineered aluminium frame machined with a matrix of holes that are compatible with a well-known metal toy building system. The Spartan has proprietary sensors, switches and motor modules, which is both a plus (assembly is easy) and a minus (not easy to add cheap sensors, expensive, single source). Tasmania has received a generous donation of a large number of these robots. A block-based coding environment (ModKIt) is under development by the parent company but is (at time of writing) incomplete - in particular it has no Save facility and has “blocks” written for a small number of input and output devices. This limits the current use of the graphical coding environment. It can still be coded in Arduino as normal.

Laser Cut it Yourself Tank Kit

Available from Kitronik in the UK

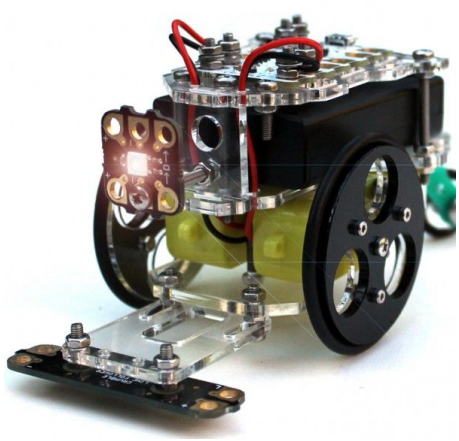
Mark: Just started to build these today with year 10. Will provide more info as we progress.



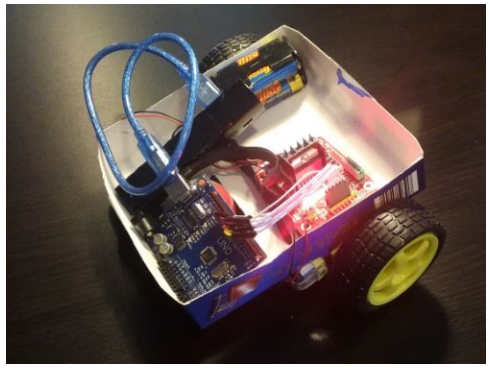
Crumble Robotic Vehicle

Available from Redfernelectronics in the UK

Mark: Just started to build these today with year 10. Will provide more info as we progress. Very cheap.



RoughBot



Sean: The intention of the RoughBot was to compile the simplest starter-kit for an Ardiuno-based wheeled robot. You will find a shopping list of parts that you can order from an electronics retailer like Jaycar. Alternatively you can order a pack directly through the Rough Science website.
The page also includes basic Arduino code for programming the RoughBot, as well as extensions to the original project, such as Bluetooth control via an Android phone/device. http://www.roughscience.net/roughbot

Feature Summary Table

	Blue Tooth DL	Water proof	Scratch friendly	Block coding	Touch	Light	Sound	Distance (IR & US)
BeeBot								
BlueBot	x			x				
ProBot								
Edison Robot Python version online				x	x	x	x	x
mBot			x			x	x	x
LEGO Mindstorms	x			x	x	x	x	x
LEGO WeDo 2.0	x		x	x	x		x	x
VEX IQ	x							
Programmable minidrones droids								
Sphero/Ollie		x						
Ozobot (also line following)	x			x				
Dash & Dot	x			x		x	x	x
Finch Robot								
Arduino (raw)	Possible				x	x	x	x
Arduino (Deal Extreme)								
Arduino variant								
RoughBot	x				x	x	x	x

Recommended Age Group Table

	P-1-2	3-4	5-6	7-8	9-10	11-12
BeeBot	x	x	x			
BlueBot	x	x				
ProBot		x				
Edison Robot		x	x	x	x	
mBot			x	x	x	x
LEGO Mindstorms		o	x	x	x	x
LEGO WeDo 2.0		x	x			
VEX IQ			x	x	x	x
Programmable minidrones droids			x	x	x	
Sphero/Ollie			x	x	x	
Ozobot		x	x			
Dash & Dot		x	x			
Finch Robot			x	x	x	
Arduino (raw)				x	x	x
Arduino (Deal Extreme)				x	x	x
Arduino variant				x	x	x
Laser Cut it Yourself Tank Kit			x	x	x	

Crumble Robotic Vehicle			x	x	x	
RoughBot			x	x	x	x

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