Robotics and Coding [STEM] – applicable to both Secondary and Elementary Teachers

If you are starting from scratch, one approach to teaching students coding and robotics is to use the Arduino UNO microprocessor. This microprocessor runs on a version of the computer language C++.

Even if you have never coded, the tutorials are well documented and both you and your students will readily learn the basics.

The UNO, shown below, sells for about $30 and the software needed to operate it is readily available from the open source site, Arduino, and great learning tools along with the needed coding can be found at Arduino Tutorials .

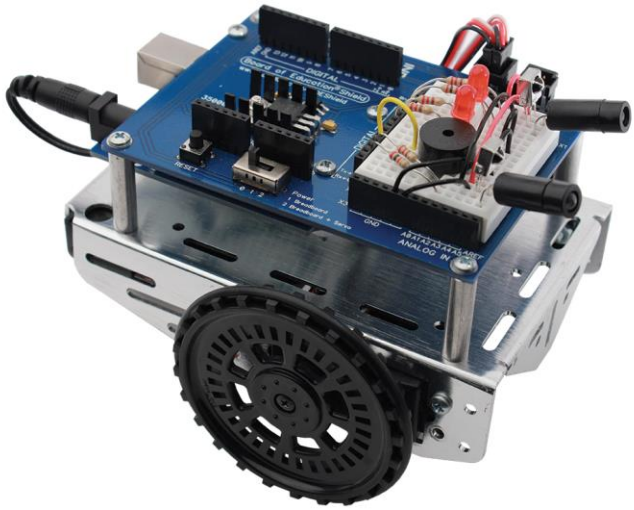
A quick internet search will show you that there are numerous suppliers of the UNO R5 board [microprocessor] both on line and throughout the province. In addition to the UNO you will have to invest in some electronic components such as light emitting diodes [LED's], resistors [500 ohms up to about 1 kiloohm] and as your students get more adventurous, items such as piezo speakers and servomotors.

The UNO requires a motor shield, if it is to be used to power any motor – at an additional cost of about $30. Servomotors sell also for about $30, DC motors much less.

Note: all of these items can be purchased online at much lower prices than quoted above, and the microprocessors and shields from China or Taiwan are generally of good quality.

Start with one or two boards and let students experiment with the equipment – Arduino boards are quite robust. You will need to have at least one computer that is not networked, to load the Arduino software , called Arduino IDE, needed to run the programs [called sketches], as most network administrators will probably not be enthusiastic to network the program. The IDE is actually not a large one and runs well on any computer.

Students, of course, want motion – this next step will require a greater investment. A complete Arduino robot is available from Canada Robotics. This robot was originally developed as the Parallax product BoEBot [**B**oard **o**f **E**ducation] by educational authorities in California.



The Parallax Shield Robot with Arduino [shown to the left] comes as an easily assembled kit with a Student Manual and all of the tutorials needed to run it are freely available as pdf downloads from Parallax .

As the purchase of this robot is a big step, financially [as each kit costs approximately $190 before taxes and shipping] you should first download the tutorials to see whether or not the activities are suitable for your students. Numerous attachments are available to carry out the tutorials, but most of these can be purchased from any electronics hobby store or online.

If you want speed and you still have funds available, you might want to purchase the Zumo robot. It also runs on an Arduino microprocessor but has DC motors which allow it to zoom past the BoEbots with their geared servomotors. There are several suppliers of the Zumo robots and once again, tutorials are available online for this robot from the manufacturer polulu.com.