

Robot Makerspace Classroom Proposal

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Principles of Education Leadership

Makerspaces, are being incorporated into schools across the country. Creating a Robot Makerspace at Randolph Middle School is an excellent setting to provide an environment for students to be creative, become more engaged in their learning and develop an appreciation for STEM careers, which are in high demand. I have visited the Makerspace in Hoboken, NJ to see what these types of facilities are like. A discussion of my dialogue with the Hoboken Makerspace members can be found at www.scienceclassonline.com/njcu/hoboken_makerspace . Classrooms 137B, 141A, 142, 143 or 144 could easily be converted to a Robot Makerspace since they have: access to water, large floor space, flexible work stations, and ample storage for tools and projects.

Makerspaces use hands-on, creative ways to inspire students to plan, research, build and create as they participate in science, technology, engineering, and mathematics (Cooper, 2013). STEM education is extremely important. According to the National Research Council 'more than half of the tremendous growth of per capita income in the 21th century can be attributed to

U.S. advances in science and technology' (NRC, 2011). In addition, businesses in the United States have voiced concern over the supply and availability of STEM workers, and experts are concerned that the demand for STEM labor will only increase with time (U.S. Department of Commerce, 2011, 2012).

Engaging students in exciting activities is an excellent way to motivate them to achieve at high levels. Research demonstrates that students who learn science or technology through immersed activities report that they find it more engaging than traditional instructional techniques (Geier et al., 2008; Yazzie-Mintz, 2010).

The central theme of the class will require students to compare and contrast three different robotic systems that they build and test themselves. This real life skill will require students to use higher order thinking skills in order to be successful. The fast pace world of technology is ever changing and students need to be able to adapt to variations in the market place. Students will need to assess how each of the robot systems fulfills a task they design. The objective and rubric can be found at http://scienceclassonline.com/njcu/robot_lab.html.

The class is designed to address skills listed in the National Common Core Content Standards (Common Core Content Standards Initiative, 2014). Students will learn how to use mathematics to solve problems such as; calculating the power needed to obtain a specific speed, calculating the distance traveled for a robot to complete a task and take measurements of the robots they built. English Language Arts/Literacy standards will also be covered. Students will be required to express the design and functionality of their projects in fulfillment of these standards (Common Core Content Standards Initiative, 2014). These combined skills will make the students robot experts and ready to tackle the variety of projects they will face in the future.

The materials requested for Robot Makerspace include three different robot platforms that students will build, program, test and compare. The platforms combine software and hardware to challenge students. The products are Lego EV3, Arduino, and VEX.

Lego EV3 was chosen for the Robot Makerspace because it is a proven education tool that has projects ready for the students to learn. It comes complete with many motors, sensors and software allowing students to create an assortment of technologies (shop_lego.com, 2014).

The MAKE Rovera 2WD Arduino Robot Kit was selected for its versatility and ability to grow. This robot is capable of obstacle and edge detection and also line following. Students can enhance their robot further with their own code by taking advantage of the ultrasonic ping sensor, IR sensors, and LEDs (Maker shed, 2014).

The VEX robotic system was selected because the software applies powerful technology and simplifies it for educational use while keeping a high ceiling. There are many combinations of up to twelve Smart Port devices which can then be programmed. VEX IQ robots can be pre-programmed, or be controlled by drivers using the controller (VEX IQ, 2014).

Also needed for the Robot Makerspace is set of Windows based laptop computers with wireless internet access, blue tooth, Windows Operating System, Microsoft Office, EV3, ModKit, Robotic C, Python, antivirus software, and a 3D printer.

Table 1.0 below depicts the costs associated with the Robot Makerspace. Fortunately the classrooms listed above have the infrastructure to allow easy implementation.

Table 1.0 Robot Makerspace materials list

Item	Supplier	Quantity	Cost	Extended Cost
Lego EV3 core set with charger	Lego Education PO BOX 1707 Pittsburg KS 66762	12	\$330.67	\$3,968.04

MAKE Rovera 2WD Arduino Robot Kit	Maker Shed 877-306-6253 or 707- 639-1355 Email: help@makershed.com	12	\$169.99	\$2039.88
VEX IQ classroom bundle	VEX Robotics, Inc. 1519 Interstate 30 West Greenville, TX 75402 United States	12	\$249.99	\$2999.88
Lenovo Flex 10 Laptop	Microsoft	12	\$329.00	\$3948.00
Office Home & Student 2013	Microsoft	12	\$139.99	\$1679.88
Virus Protection	Microsoft	12	\$99	\$1188.00
MakerBot Replicator Mini Compact 3D Printer	Microsoft	1	\$1375.00	\$1375.00
Other software listed above is free				

A Robot Makerspace can provide relevant, engaging and cross curricular education to the children of Randolph Middle School. Providing students with these materials will connect them to the technological advances being introduced today and to careers that will exist in their future. Children will be motivated at a higher level and will be able to apply the concepts they have learned in core content subject areas.

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