

A collage of futuristic and scientific imagery. In the foreground, a young girl with red hair and bangs looks upwards with a curious expression. Behind her, a network of black nodes connected by thin lines forms a complex web. To the right, a globe is visible, along with a rocket ship and an airplane. The background is a light blue gradient with various symbols like plus signs and hexagons.

INSPIRING TOMORROW'S INNOVATORS.

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IMAGINATION IN EDUCATION

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Welcome!!!!

PCS edventures!™

Code Your Future

Why Programming is Essential
in STEM Education

Co-Hosted By:

Randy Jamison

PCS Alumnus & Founder of Curious Media

Robert Grover

CEO PCS Edventures

edventures.com/webinar

October 14th 2015 • 1^{PM} EST



0101001101010100010001010100110100100000111000001101111011101110110010101110010 •••• Can You Decipher This?

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1 Today's Agenda

1. Meet Your Hosts!
2. Formative Experiences in Computer Science Education
3. Why Elementary Computer Science
4. What Companies Need and Hire
5. Computer Science Job Statistics
6. Girls and Boys on the Job
7. Girls in STEM and Coding – The Stats
8. Classroom Approaches to Computer Science
9. Resources
10. Lets Talk - Q & A

2 Meet Your Hosts!



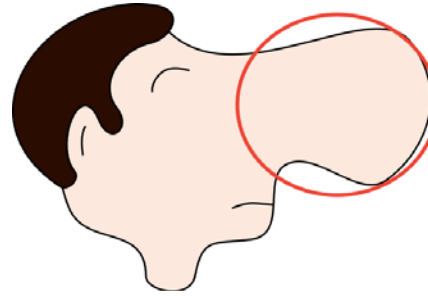
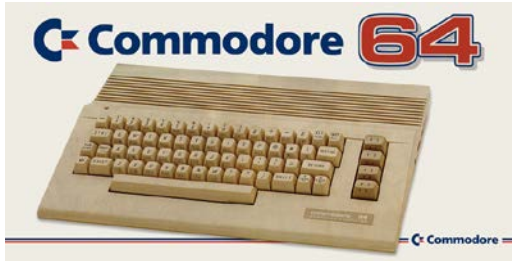
Randy Jamison
Owner, Curious Media
*World Famous Interactive
Media Development*



Robert Grover
CEO, PCS Edventures
*World Famous STEM
Education Company*

3

Formative Experiences: Fun & Comfort



“Having good experiences with computers and being comfortable.”



4

Formative Experiences: Math for a Reason!

$$(x+1)(2x-4)\left(\frac{1}{x+1}\right) = (x+1)(2x-4)\left(1 - \frac{5}{2x-4}\right)$$

$$2x-4 = (x+1)(2x-4) - 5(x+1)$$

$$2x-4 = 2x^2 - 2x - 4 - 5x - 5$$

$$0 = 2x^2 - 9x - 5$$

$$0 = (2x+1)(x-5)$$

algebra.js

```
var expr = new Expression("x");
expr = expr.subtract(3);
expr = expr.add("x");
```

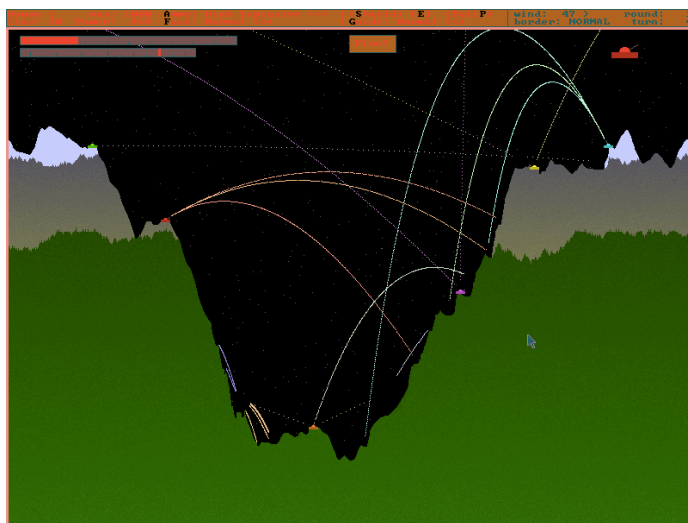
```
console.log(expr.toString());
```

2x - 3

jquery-plugins.net

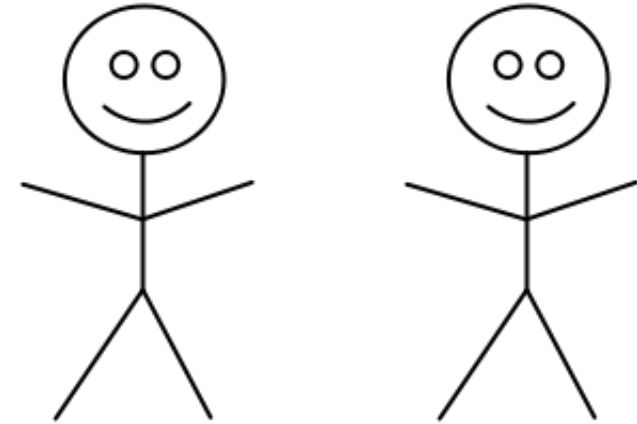
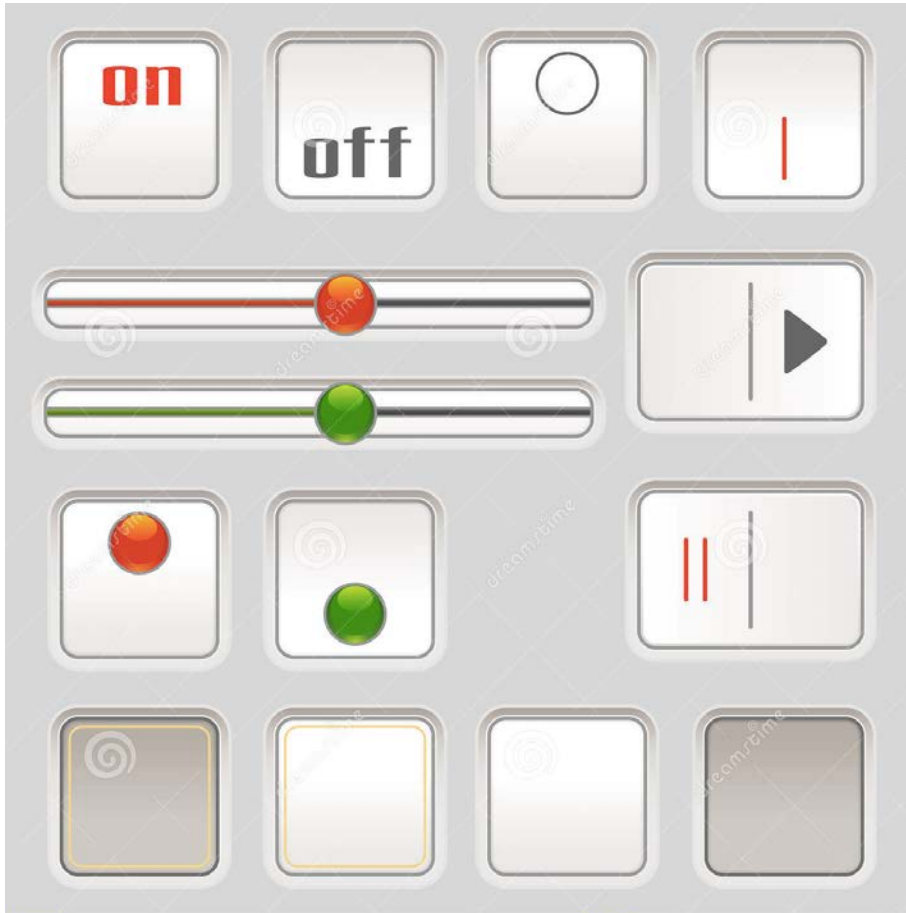
```
var eq = new Equation(expr, 4);
console.log(eq.toString());
```

2x - 3 = 4



5

Formative Experiences: Interactive? No Way!



“My first interactive animation – something I could control - really lit up my neurons!”

Download from
Dreamstime.com
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35905039
Mjak | Dreamstime.com

6 Formative Experiences: I can make a living at this?!



7

Why Elementary Computer Science?

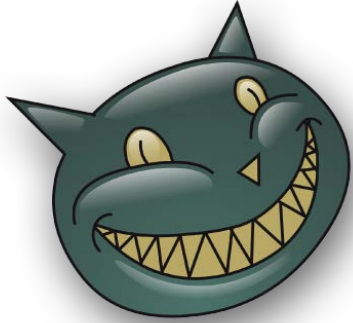
CS Promotes

- Creativity
- Exploration
- Comfort & Awareness
- Problem Solving
- Computational Thinking
- Persistence
- Abstraction
- Applied Mathematics



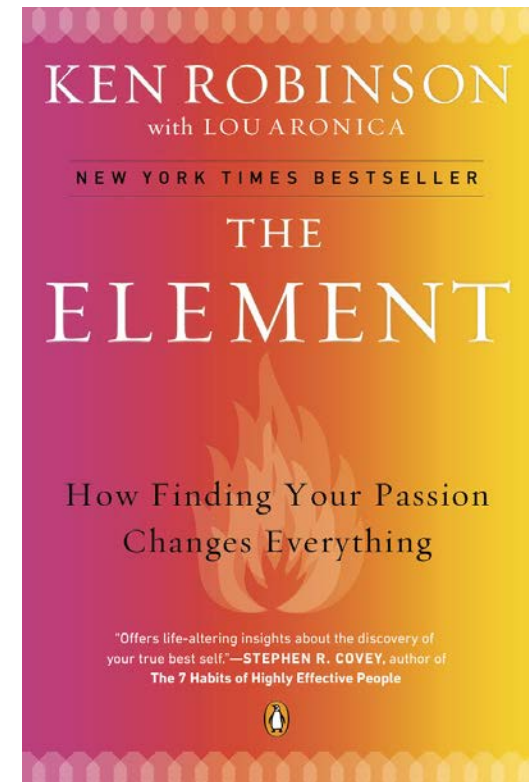
8

What Companies Need and Hire

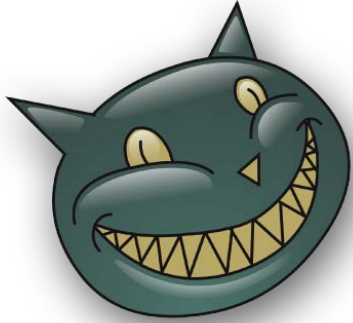


The Curious Media Recipe

- Talent – not necessarily a degree.
- Passion – something that you truly enjoy.



9 What Companies Need and Hire



The Curious Media Recipe

- Timeliness
- Clear & Organized Code
- Quality Production
- The Interview – Working Examples

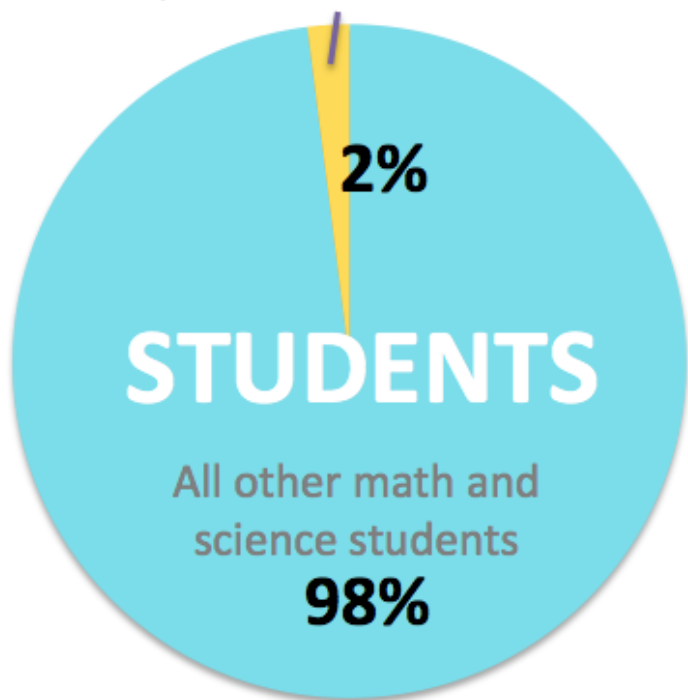


10

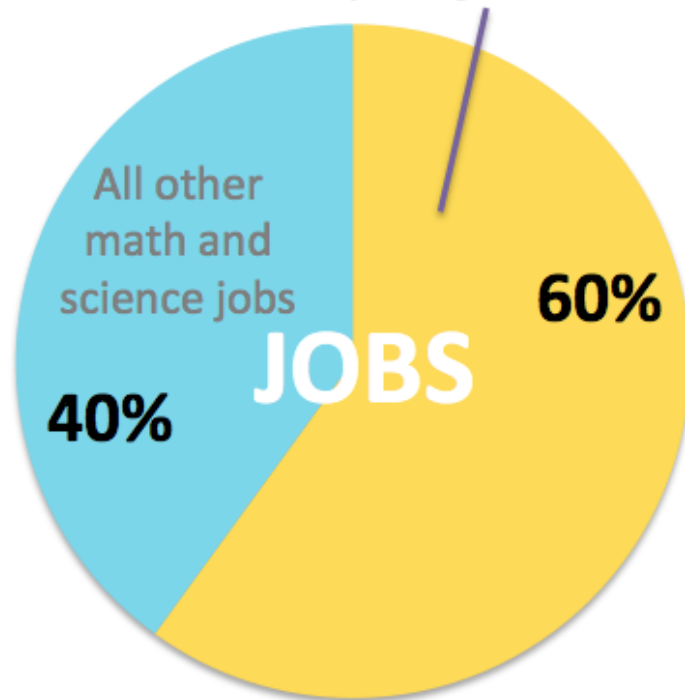
CS Job Statistics

The Job/Student Gap

Computer Science Students



Computing Jobs

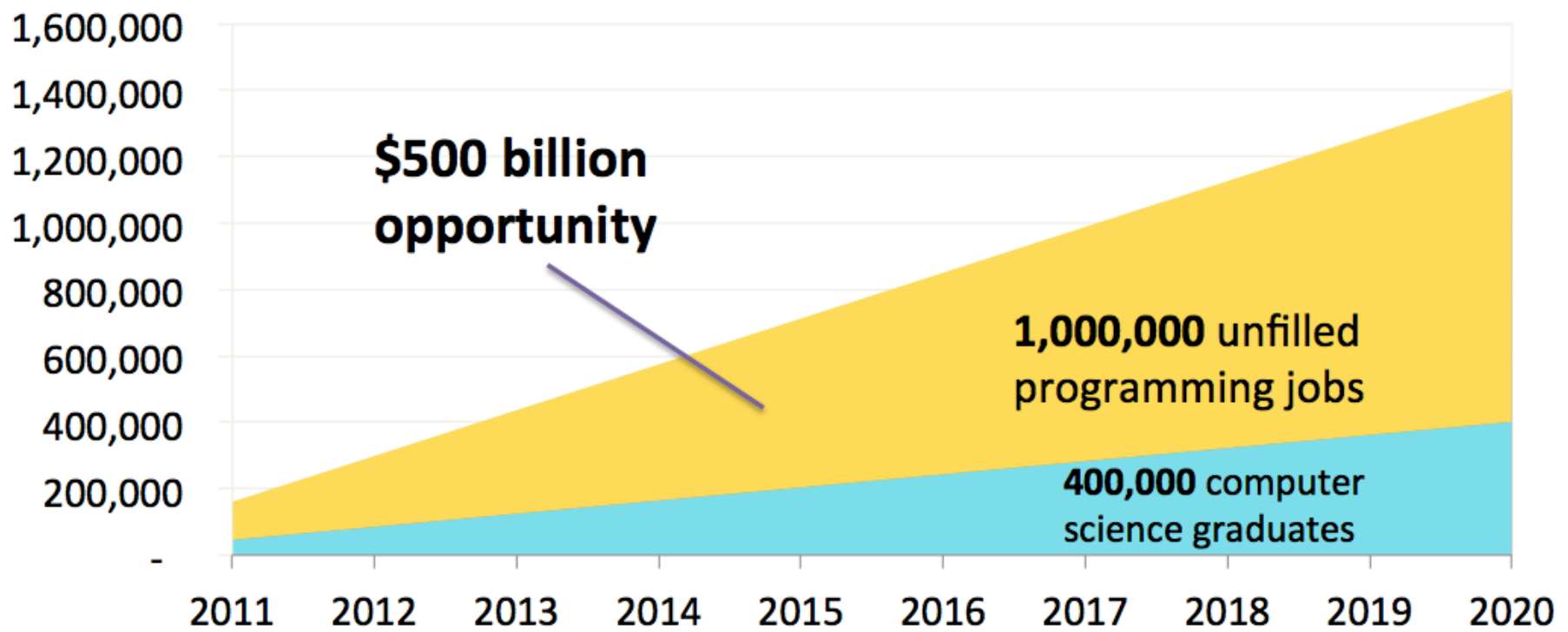


Sources: College Board, Bureau of Labor Statistics, National Science Foundation

From the Code.org Website

11 CS Job Statistics

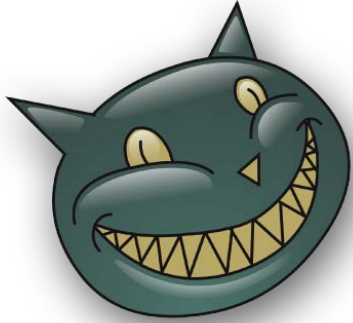
1,000,000 Unfilled Jobs by 2020



Sources: BLS. NSF. Bav Area Council Economic Institute

From the Code.org Website

12 Girls and Boys on the Job



The Curious Media Mix

30 Employees

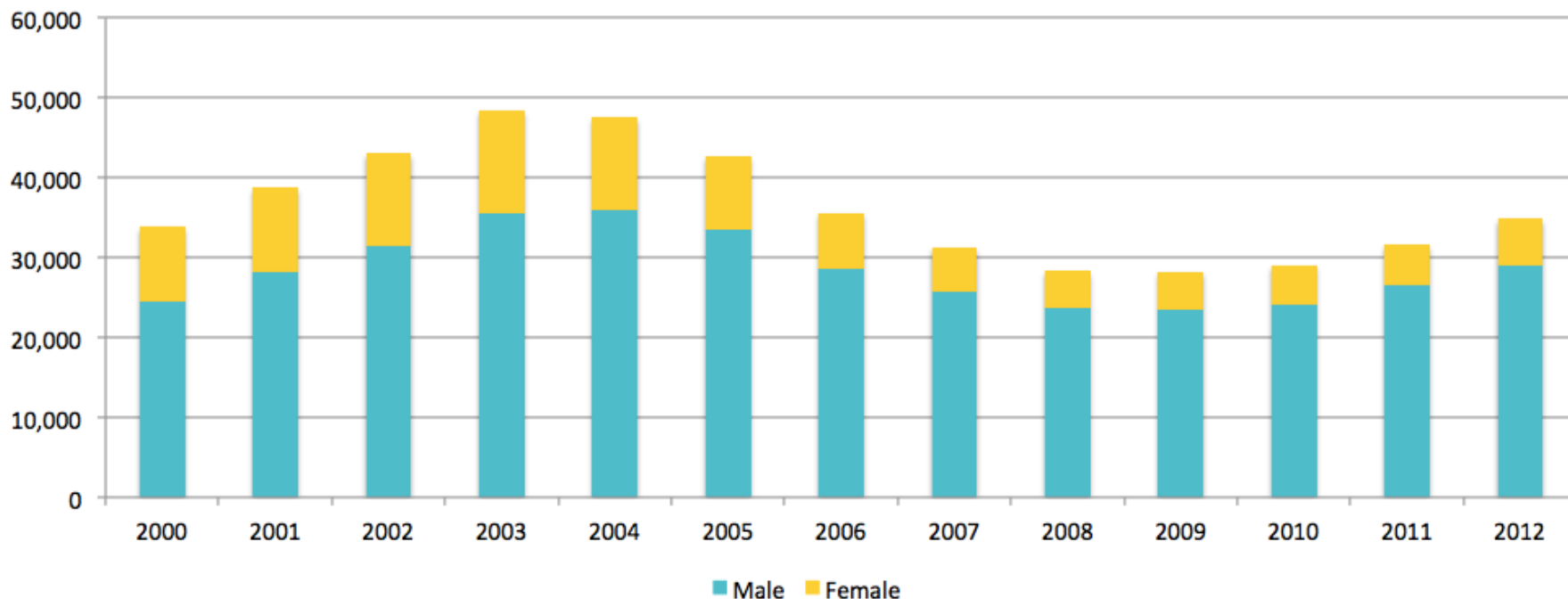
- 24 Male
- 6 Female



13

Girls and Boys on the Job

*Fewer CS majors than 10 years ago
(and a shrinking % are women)*



Sources: National Science Foundation

From the Code.org Website

14 Girls and Boys on the Job

How Do We Encourage Girls in STEM?

1. Let girls “play.” Math and science should be about experimenting, and learning by doing.
2. Teach girls the history of science, and give context as to why it’s so important.
3. Genuinely encourage girls to pursue an education in STEM. (“Ask them, ‘Are you taking computer science?’” says Smith.)
4. Let girls see themselves in the STEM fields by giving examples of women already in these jobs.

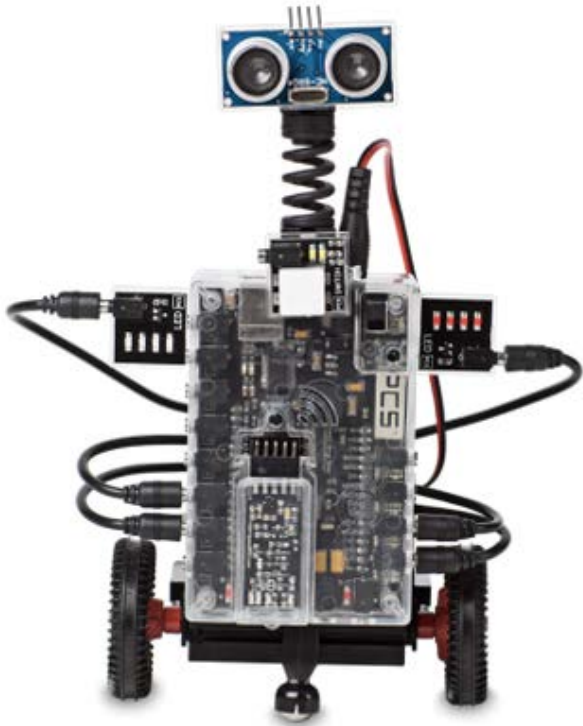
-- Fortune, October 13, 2015



Megan Smith US CTO

15 CS in the Classroom

Tips for Success



Preparation

- Plan
- Organize
- Test
- Practice



PROGRAMMING

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SKETCHUP

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SCRATCH

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3D PRINTING

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UNITY

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16 CS in the Classroom

Tips for Success “Engagement”



Begin Gently...

- Robotics! →



- 3D Design →



- Multimedia →



- 3D Printing →



- Gaming →



17 CS in the Classroom


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Granular in Nature

Programming for Robotics

P2 Switch the polarity/direction of motors.

- Switch the red and black ends of your motor cables between MOTOR(s) A & B and run the same program again.
- This changes the polarity and thus the direction of the motor. You can use this to adjust motors in order to achieve your goals; for example, if you wish to make both wheels default to forward.



C1 Make RIQ drive in a straight line 50 cm and then return to its original position. Adjust the power on one motor and (if needed) the polarity of one or both motors.

C2 Program RIQ to drive in one complete circle, starting and ending in the same place. Go for the glory: try to figure out how to make it work exactly on the first try, by experimenting with RIQs speed and rotation. Be sure to save your program.

DP Now that you have taught RIQ to drive perfectly straight, program RIQ to trace out a polygon with more sides and/or trickier angles. Also, try to do this as efficiently as you can.

Key Terms

- Program: A collection of code that performs a certain function.
- Polarity: The direction of current flow. Which is why your motor changes direction when you change its motor cables.
- SET PWR: Sets power level on selected motor (s). Global command, so motors are set at that power unless otherwise specified.

Check For Understanding

- How do you create a program in Cortex?
- What do MAIN & END do in your program?
- What new commands did you use in this level?
- If RIQs wheels are running in opposite directions, what should you check?

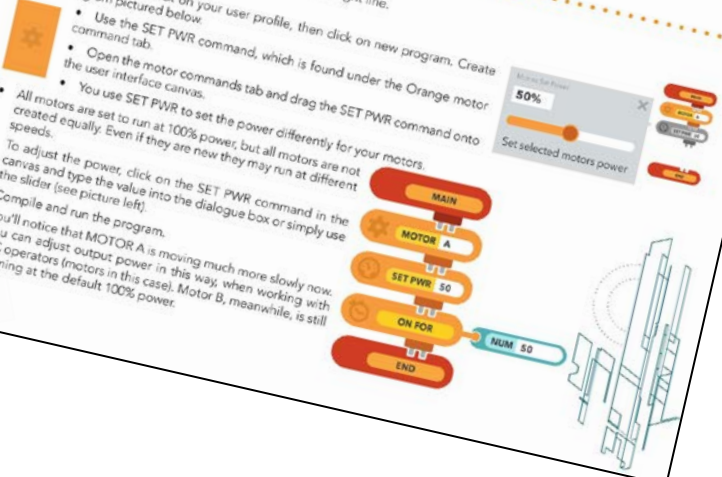
PCS edventures! LABCards

Programming for Robotics

Badge Overview
Robotics incorporates mechanical engineering, electrical engineering, and computer science, which deals with the design, construction, operation, and application of robots. The world of robotics is vast, and provides endless possibilities for those who pursue it!

P1 Use set power command to drive RIQ in a straight line.

- Open Cortex and click on your user profile, then click on new program. Create the program pictured below.
- Use the SET PWR command, which is found under the Orange motor command tab.
- Open the motor commands tab and drag the SET PWR command onto the user interface canvas.
- You use SET PWR to set the power differently for your motors.
- All motors are set to run at 100% power, but all motors are not created equally. Even if they are new they may run at different speeds.
- To adjust the power, click on the SET PWR command in the canvas and type the value into the dialogue box or simply use the slider (see picture left).
- Compile and run the program.
- You'll notice that MOTOR A is moving much more slowly now; you can adjust output power in this way, when working with DC operators (motors in this case). Motor B, meanwhile, is still running at the default 100% power.



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Programming for Robotics

 5
POINTS
FOR EDP

Yellow Level Overview

Robotics incorporates mechanical engineering, electrical engineering and computer science - all of which deal with the design, construction, operation and application of robots. The world of robotics is vast and provides endless possibilities!

Robotics Level 1 introduces the hardware used for RiQ including The Brain microcontroller and DC motors. Program The Brain of RiQ using the Cortex programming environment in the following projects. Learn the basics of motor control through an introduction to the language and logic used by computers.

Skills & Learning Objectives

Card 1:

5 POINTS

RiQ: Introduction to fischertechnik™ and PCS Robotics: The Brain and Cortex

Build with fischertechnik™ manipulatives and start basic programming with The Brain in Cortex software.

Card 2:

5 POINTS

Cortex, New Project, New User, Save and Bluetooth Connectivity

Create a new project and new user as you write and save your first program.

Card 3:

5 POINTS

Motor Commands: ON and ON FOR

Learn motor control and adjust the motors on RiQ.

Card 4:

5 POINTS

Motor Controls: SET PWR and MOTOR polarity

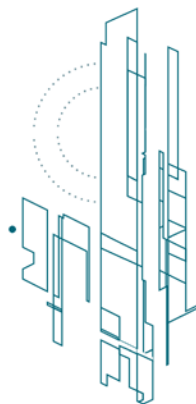
More advanced motor commands are added to your programming skill set.

End Design Project / EDP *

Now that you understand basic motor control, demonstrate your mastery by programming RiQ to draw a recognizable shape using the Engineering Design Process; plan your program, test and modify until it works. The only criteria for your drawing is that a peer or instructor can look at the shape and quickly identify it!

** After completing the skills and activities on cards 1-4, return to this final project to test the knowledge you've gained throughout the yellow level.*

5 POINTS



19 Resources

PCS Edventures! LABCard Samples

<http://edventures.com/pages/curriculum-samples-request-form>

Computer Science Teacher's Association CSTA Standards

<http://www.csta.acm.org/Curriculum/sub/K12Standards.html>

International Society for Technology Education ISTE Standards

<http://www.iste.org/standards/ISTE-standards/standards-for-computer-science-educators>

National Science Foundation The Future of Computer Science Education

http://www.nsf.gov/news/news_summ.jsp?cntn_id=133577

Code.org

<http://www.code.org>

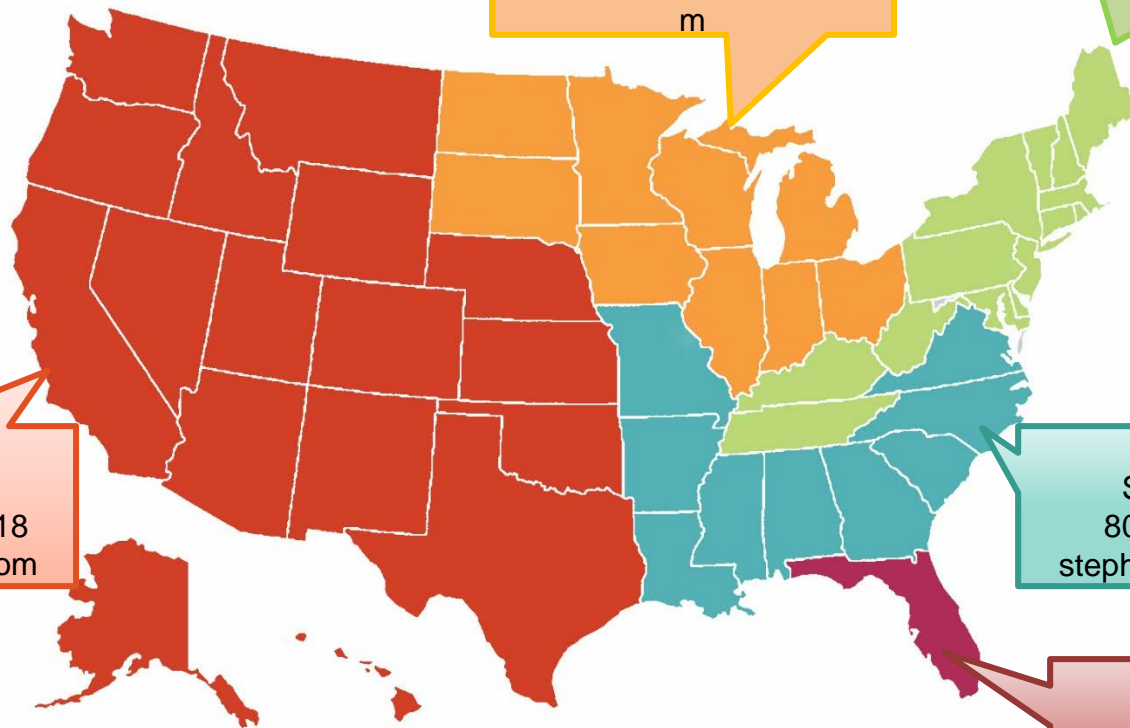
20 Let's Talk - Q & A

Questions?



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STEM Experts Near You!



Midwest Region
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michael@edventures.com

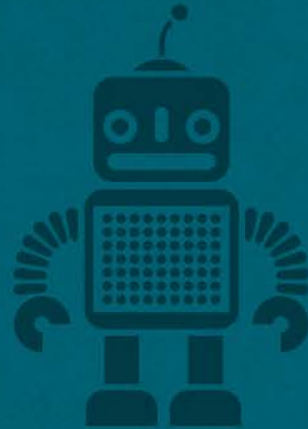
Eastern Region
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Thank you!



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