



Purdue Minorities In Engineering Camp (Grades 7-9)

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Overview

Each year since 2015 Westside Boiler Invasion has partnered with Purdue's Minorities in Engineering program to host a summer camp. The camp follows the curriculum below with each session lasting approximately three hours.

The goal of the entire program is to introduce a younger and underrepresented generation to STEM and FIRST, allowing them hands-on interaction with the material in order to fulfil curiosity.

The curriculum is not restricted to the Purdue Minorities in Engineering Camp and can be adapted to other camps, lessons, and workshops.

Day 1- Intro to Lego Robots and Lego Mindstorms

Goals: Learn how to build a robot, and program simple movements

1. Introduce campers to robots and FIRST robotics
2. Divide campers into groups of 3-4, give each group a robot kit and handout, groups come up with team name, have each write team name on kit
3. Have campers follow directions on the handout to make a functioning robot
4. Once robot is built, each group will obtain a laptop and its charger, make sure to mark down which group has what computer they use each time.
5. Campers open up Lego Mindstorm and begin programming the robots to do a assortment of tasks
 - a. These tasks include (they should not get through all of these)
 - i. Stopping within box
 - ii. Entering box, turning around, and then going back
 - iii. Following a curve
 - iv. Following paths
 - v. Driving through an obstacle course
 - vi. Following a path forwards and then backwards without turning around
 - vii. Following an "S" shape
6. Have campers return computers, computer chargers, and robot kit/robot to counselors

After camp: prepare tournament brackets for next day

Day 2- Sumo Robots

Goals: Give campers practice solving challenges in a fun competition setting

1. Give small presentation about Sumo Bots
2. Have groups collect the robot and computer they were using the previous day
3. Give campers 30 minutes to convert their robots into Sumo bots
4. Have a 30 minute practice period where they can test what designs work best
5. Start having groups face each other in the Sumo Ring as according to predetermined brackets
 - a. Campers not facing off can practice on practice ring or fix/improve robot
6. Have campers return computers, computer chargers, and robot kit/robot to counselors

Day 3- Intro to Scratch and basic programming

Goals: Give campers a basic understanding of programming and build problem solving skills

1. Divide campers into groups of two within the two groups, giving each group a laptop and charger
 - a. Pair programming
 - i. Suggest one camper controls the mouse and keyboard
 - ii. Other makes suggestions, points out errors, and asks questions
 - iii. Campers should switch roles after completing each task
 - iv. Partners should be kind and respectful to each other
2. Ask campers who are experienced with Scratch to partner and work to challenge themselves with the program
 - a. Suggested tasks may include:
 - i. Animated story with multiple scenes
 - ii. Interactive game with variables in use
3. Give short Scratch presentation and tutorial to campers new to Scratch
4. Give campers new to Scratch a different set of tasks
 - a. Suggested tasks may include:
 - i. create an underwater scene with sprites
 1. Blue background, fish moving back and forth, bubbles rising, etc.
 - ii. be able to manipulate a sprite with keyboard
 - iii. create an interactive dance party
 1. no music
 - iv. create cat chasing mouse program
5. Have campers return computers and computer chargers to counselors

Day 4- Scratch Video Game

Goals: Improve understanding of programming

1. Keeping same two person groups as the day before, have each pair get a laptop and laptop charger. (continue pair programming)
2. Give small presentation and give campers rubric
 - a. Has to use controls from keyboard
 - b. Has to be able to complete/win
 - c. Clear objective
 - d. Dynamic, different each time you play
3. Have pairs who want to show everyone their game hook their laptop up to the projector

4. Have campers return computers and computer chargers to the counselors

Day 5- Working with sensors and advanced Lego robot

Goals: Give campers a better understanding of robots that can respond to their environment, utilizes concepts used throughout week

1. Campers will return to their groups from day one and day two.
2. Campers will receive the finished robot from the first day with three new sensors (touch, ultrasonic, and light-active)
3. Campers will learn to program robots to respond to its environment
4. The groups will have to complete tasks
 - a. These tasks include:
 - i. Stopping when touching a wall
 - ii. Stopping when 3-6 inches from a wall
 - iii. Stopping when over a bright orange duct tape line
5. The groups will then compete to see who can finish the challenge the fastest. The winning team receives prizes. The challenge is an obstacle course but the program must be entirely automated.
6. Have campers return computers, computer chargers, and robots to the counselors