BOYS & GIRLS CLUBS
OF SPRINGFIELD

ENGINEERING WEEK

February 20th-24th

Monday	Tuesday	Wednesday	Thursday	Friday
"Ask an Engineer" Event U.S Cellular 1:30pm-3:00pm *Hosted at the Sertoma Unit	Coding & Programming 3:30pm-6:30pm	Animation Station 3:30pm-6:30pm	Build Guild & Claymation 3:30pm-6:30pm	Graduation Party 3:30pm-6:30pm
• Get a hands-on look at how U.S Cellular's high quality network operates. • Get information about engineering careers. • See how a light truck (COLT) or engineering car operates.	• Learn the basics of programming language. • Utilize code.org to learn about programming. • Utilize code.org to create your own Minecraft world.	• Create your own animation. • Learn about basic angles and the math necessary to create animation. • Work as an individual member and problem solve.	• Learn how to create using building materials such as Legos, Cup-Stacks, pasta, marshmallows, Lincoln Logs, and more. • Learn the foundations of building and math. • Compete for prizes.	• Celebrate your commitment to engineering. • Ask questions about careers in STEM. (Guest Speaker) • Awards given for the week.

Session 1: Coding & Programming

Objective: Members will learn the basics and fundamentals of coding/programming and creating their own video games.

Supplies: computers, blocks, outlet to show a video to the group, prizes

Discussion: To begin this session, explain what the day will look like. Allow members to ask questions. Encourage full participation and remind members of the graduation party for those who commit to completing the fun filled week. Explain how awards will be given on Friday!

Activity: Begin this session with this video (Computer Science is Changing Everything-5 min: https://code.org/playlab)

Members will learn how to code and create their own Minecraft game. First, however, it is important to introduce members to coding language through this fun activity.

Harold the Robot: Thinking about programming languages

Divide members into teams of two. In this activity, members simply give directions to a "robot" and find out which instructions the robot is able to follow, and how their instructions are taken literally.

1. Place a small collection of blocks or similar objects on the bench.
2. One member plays the role of Harold the Robot. Harold can only respond to particular commands. These commands are not given to the members, and can be made up on the fly.
3. Have a member talk Harold through making a tower out of the blocks using instructions such as "Move your hand to the left", "Pick up the block beside your hand" and so on. If the member gives an instruction that is too complex or otherwise not in Harold's vocabulary (e.g. "put the three blocks on top of each other") then Harold expresses confusions by shaking his head or burying his head in his hands.
4. The task is completed when the tower is built. At this point, discuss with the members about which commands it would be reasonable for the robot to respond to, which wouldn't make sense. Does a small vocabulary limit what can be done, or does it simply make more instructions necessary? This activity has similar goals to the "Marching Orders" activity, and is intended to expose students to the idea that computers follow instructions very precisely, which can be frustrating at times. It also raises the issues surrounding choosing instruction sets, and whether it's better to have a large complex instruction set, or a small efficient set.
5. Have members switch roles and repeat.

This simple but effective activity was invented by Richard Nelson, Jason Clutterbuck, Sebastian Höhna, Stefan Marks, and Wilson Siringoringo at a workshop for Postgrad Computer Science students in April 2008.

Members know understand simple programming commands and how to be the most effective when programming. Begin this next activity by showing this video (https://studio.code.org/s/minecraft/stage/1/puzzle/1). Members will then plug in the same URL. The video will show again, however, you can just have members X out of it to begin coding their own Minecraft game! They will follow several steps to learn the basics of SNAP coding and them can create their own environments.

Session 2: Animation

Objective: Members will learn how to animate and create their own characters and environments using digital technology.

Supplies: computers, outlet to show a video to the group, prizes

Discussion: Ask members what they remember from the Coding and Programming session. Explain that during the Minecraft activity, the animation was already complete and that today, members will learn how to animate.

Activity: Bring up this URL and have members go to the same one (https://studio.code.org/s/artist/stage/1/puzzle/1). Walk members through the steps to create their own animation (STEP ONE and TWO-do this all together with staff demonstrating at the front). Members will complete the following tasks on their own using the staff for help. Once STEPS ONE-NINE are complete, members may create their own masterpieces during STEP TEN!

***Remind members that the program gives helpful hints at the top if they get stuck!**

Session 3: Build Guild and/or Claymation

Objective: Members will complete various challenges to foster their creativity, engage their engineering skills, and use the fundamentals of basic math.

Supplies: Legos, spaghetti, marshmallows, building blocks, wooden clothespins, binder clips, colored jumbo craft sticks, hot wheels or toy cars, rulers, buckets.

Discussion: Ask members what they remember from the Animation session. Explain that today will be all about building and creating using hands on activities. Remind members about the graduation party coming up!

Activity: First, divide members into groups of 2-4. In these groups, members will work together to achieve various goals.

1. Give members spaghetti and marshmallows and tell them they have 5 minutes to construct the tallest tower possible.
2. Have a member come to the front and draw a LEGO challenge card. Once read, groups will have 2 minutes to build the item on the card. Repeat for time allowed.
3. The final challenge will be the most challenging. Members will be given a bucket with clothespins, binder clips, and craft sticks. They will work together for 10 minutes to create the most stable, creative bridge possible. The bridge must be at least 3 inches off the ground or building surface. Staff will test the bridge by driving a car across it.

OR

Activity: SUPPLEMENTAL ACTIVITY (Could be used on President's Day or in addition to or instead of Build Guild): Claymation

Objective: Members will create their own stop-motion movies using various outlets such as stick bots, play-doh, and more.

Supplies: play-doh, stick bots, digital cameras, art supplies for members to create a background, outlet to show a video to the group, prizes

Discussion: Explain what Claymation is and why it is important. Show videos from this URL to illustrate what members can make (http://www.ipadartroom.com/clay-mation/)

Remind members of the following:

1. Take some time to consider and control the background
   Clean colored or white paper is fine, just make a little space and use it as a 'stage'. Of course, you can also draw on this, use images, shoot on location or outside…you are limited only by your imagination. Cardboard is also a great option.
2. Make the most of the lighting
   Bright light is important, so choose a well-lit area.
3. Keep that camera still!
   To start with, the more successful animations involve moving the subjects of the film only.
4. Film one scene at a time
   Using a variety of shot types makes your movie more exciting.
5. A note about mess and materials
   Claymation does not need to be messy. If you don't have a space where you can use clay and art-materials, play dough has very little residue and is almost mess-free. It is easily wiped off with a cloth (tracking a few bits through the carpet is the biggest risk, so think about the flooring). You can produce claymation with one ball of clay, but remember that you may also want to mix media, draw scenery or create elaborate sets using toys, etc.

Activity: Divide members into small groups (3-4) and provide them with the materials listed in the supplies section. They can then begin their creation!

Session 4: Celebration

Objective: Members will celebrate their commitment to engineering and learn about their future opportunities.

Supplies: Based on your members wants

1. Snacks (i.e. ice cream, pizza, etc.)
2. Drinks (i.e. soda, punch, etc.)
3. Engineering Week Certificates (make sure these are finished ahead of time)
4. Engineering Week prizes (i.e. stick bots, play doh, coding kits, etc.)
5. Items needed for guest speaker (dependent on speaker)
6. Computers

Discussion: Ask members their favorite parts from the week. Ask them what they remember and what they learned.

Activity: Members will enjoy snacks, receive awards, and have the ability to ask questions to their guest speaker. If time permits, members can have personal time on code.org experimenting with other engineering activities!