Anyone Can

The Kano PC Curriculum Sample

KANO
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Sample Curriculum

Contents

Introduction to the Kano Curriculum

Every day, Kano Educators all over the globe empower young people to build technology and create with code. Kano is being used to teach computer science and coding in classrooms, in makerspaces to develop a DIY mindset, in libraries to enhance digital literacy, and more! In those learning spaces, educators and facilitators are helping young people demystify the hardware and software that makes computers work and we've seen some amazing creations.

With help from our champion educator community, we've put together the Kano Curriculum to help you integrate computing and coding in your learning space. The lesson plans in this book are a mixture of teacher-led structure and student-led learning, designed to enable your learners to progress in their understanding of technology, while inspiring them to create with it. You don't have to be a computer science teacher, or have any background in computer science, to teach with Kano. These lessons are designed to help you get started with creative computing, no matter your level of experience.

Each lesson comes with an accompanying worksheet to help check what learners understand and to celebrate their successes with them, their peers, and their family.

Why Kano?

Kano is focused on bringing a creative approach to computer and coding education. We are creating a world where anyone, anywhere, can learn make and play with technology, not just consume it. From kids in Sierra Leone who have never had a computer to young learners in the UK and US - all are part of the new creative generation.

Who Uses Kano?

Over 1,000 classrooms, clubs, camps, and community programs are using Kano to engage learners in understanding and participating in the digital world. With Kano, you're truly part of a global community; 150,000 Kano Kits have been shipped to young people in over 86 countries. Our aim with Kano for classrooms is to make computing education accessible not only to learners but also to teachers.

Why Is Kano Valuable for Learners?

Kano is designed to build a generation of creators, not just consumers. Our education programs are part of this movement, to empower the innovators and designers that will address some of the grand challenges we face as a global society. Kano is the best tool for programs at the intersection of STEM education, 21st century skill development, and differentiated learning.

STEM, STEAM, STEAMED...! Education

In recent years, there has been a push to promote STEM (Science, Technology, Engineering, and Mathematics) Education. You may have also seen the acronym with the "A" included for "Arts," and even with an "'ED" at the end to include Entrepreneurship and Design! The objective in any case is clear: we know that developing learners able to solve problems with technology is critical for the jobs of the future. Kano believes that developing STEM skills is not limited to these subjects, but as a cross-curricular movement.

Kano's projects and challenges push learners to develop STEM skills in a fun and engaging environment. Kano develops challenges that are available online for free, so learners can select projects they find fun and relevant.

21st-Century Skills

How we teach must reflect how our learners learn. It must also reflect the world they will emerge into and shape–a world that is rapidly changing and is increasingly connected. Kano's style and approach to teaching must emphasize acquiring basic digital literacy necessary for succeeding in the 21st century, with both teachers and learners at the core. Kano's hardware and software weave creativity, technology, and coding across subject areas, to promote deeper learning in an engaging and hands-on way.

Kano's technology, along with our guided lesson plans, ensure that we weave the 4Cs into teaching and learning:

Creativity and Innovation
Critical Thinking and Problem-Solving
Communication
Collaboration

Our lesson plans and student-led approach help to build life and career skills, including:

Flexibility and Adaptability
Initiative and Self-Direction
Social and Cross-Cultural Skills
Productivity and Accountability
Leadership and Responsibility

Differentiated Learning

Kano offers immediate differentiated learning in its operating system. When you log into Kano, you can access all of the apps and go through walkthrough tutorials to learn about different coding languages. All of the apps have challenges that range from basic, to medium, to advance. Each app also includes “playground mode,” where anyone can explore coding and make creations all their own! Some of our most advanced coders like to explore what others have created and remix the code to make their own piece of art, game, or song; the possibilities are endless!

Lesson Plan Pedagogy

All lesson plans in this packet are designed with structure in mind. Below is a guide to help you understand the structure and adapt it to your learning environment.

We use scaffolding to help learners acquire new knowledge. As with other subjects, with computer science, the scaffold provides a temporary framework that is put up for support and access to meaning and is then taken away as needed, when the learner secures control of success with a task.

In this framework, learners are explicitly taught and instructed in the following way:

1. Linking to prior knowledge
2. Teacher Connection ("I Do"): Modeling a new concept or topic either through lecture or examples on the board. This is the explain time where teachers talk 80% and learners talk 20% (more listening).
3. Engage ("We Do"): This is the point where the educator works with the learners to learn a new concept. The teacher talks 40% of time and learners talk 60%.
4. Practice/Exploration time ("You Do"): The learners run free. They are actively exploring a new concept or building things on their own. The majority of class time should be spent with the learners actively engaged in the material. 90% of talking is from learners, 10% from teachers.
5. Evaluate ("What can you do?"): How can we check for understanding? Is this in the form of remodeling what was explored by rethinking in new ways? Is it with some type of formal evaluation?
6. Closing: Wrap up the day in some type of closure. Is it giving a homework assignment? Is it reflecting in their engineering logs?

These 6 steps can help organize lesson plans and projects for Kano.

1. Linking
2. Engage
3. Exploration: Challenges
4. Sharing
5. Evaluation
6. Closing

Within each section, there are guiding questions that can be incorporated:

1. **Linking**
    a. What is the objective of your lesson, and how can you get learners interested in it? Activate their prior knowledge!
    b. Get learners involved and thinking by presenting a problem, brainstorming, playing a game. Energize the learners.
2. **Engage**
    a. What is the specific knowledge you are trying to get across? Is it the goal for the day–for example Exploring Make Art? Is it designing a logo?
        i. Name the logo, explain what it is and how it is used.
    b. Get feedback from learners and play off of each other's ideas
3. **Exploration: Challenges**
    a. This is the time where learners explore, and it should be the bulk of activity time. When you are making lessons, make sure that the activity in some way:
        i. Links to your greater objective
        ii. Helps learners focus and work toward the objective
        iii. Helps learners think of new and creative ways to explore and create
    b. There are multiple challenges in each lesson. If a learner finishes one challenge, allow them to move on to the next challenge in the lesson.
4. **Sharing**
    a. Always give your learners the opportunity to share their thoughts with the community, be it with their partners or the larger Kano community on Kano World.
5. **Evaluation**
    a. What questions, processes, or steps can you use to help learners evaluate themselves?
    b. What can you do to push learners to rethink what they created?
6. **Closing**
    a. This is the last remark you make for the day. What is the closing thought you want to get across?
    b. This section will also connect to homework examples.

How to Use Worksheets with Kano

All lesson plans in this packet will have a worksheet that can be used during or after the Kano session. Each lesson is divided into three parts: **Explorer**, **Programmer**, and **Creator**.

Explorer:
This section can be done **during** the Kano session or **after**. It is typically an activity where learners have to find or remember key elements of the lesson. For example, the "Explorer" section in "Intro to Kano Code" would be to identify what blocks live under which category in Kano Code.

Programmer:
This section should be done **after** the Kano session and be used as a formative assessment on the learner's use of Kano for the day. Typically, the Programmer Section is 1-2 exercises that ask probing questions on what the learners learned. For example, in the "Intro to Scratch" lesson, the learner may be given a code block sequence, and they have to explain what the code would do.

Creator:
This section can be **after** the Kano session. In the "Creator" section, learners are asked to be creative and think of new ideas for a design or code. For example, learners may be asked from the "Make Art Pattern Perfection" lesson to design a new pattern and explain how they think they could code this new pattern in Make Art!

Worksheets can be found at the end of each lesson with an answer key for the lesson in the appendix.

Learning Objectives

While your learners use Kano they will be having fun exploring and learning at the same time! Although each lesson has its own set of learning objectives that connects cross curricularly, the packet has core concepts and objectives embedded throughout. These concepts include:

- Hardware
- Software
- Program Development
- Control
- Algorithms
- Variables
- Problem Solving

The curriculum learners will be able to….

- Articulate the difference between hardware and software.
- Troubleshoot computer issues.
- Identify programming languages and how they are used on Kano.
- Navigate the Kano computer and understand the components of Kano Apps.
- Work collaboratively on projects.
- Communicate ideas clearly to their peers.
- Articulate the impacts of technology on a local and global scale
- Identify community needs and think of innovative solutions to address them

Build A Kano PC

Beginner **1 hr 45 min**

Students will discuss ahead of time what are the 4 things that make a computer and then build their own Windows Kano PC!

OBJECTIVES

- Learners can define what is a computer
- Learners will be able to identify the 4 parts of a computer: input, storage, processing, and output.
- Learners will build their own Windows Kano PC

STANDARDS

- **K12 CS:** .
  Computing Systems.Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-A-5-2, 1A-A-3-7, 1A-A-6-8
  3-5: 1B-A-2-1, 1B-A-5-4, 1B-A-3-7, 1B-A-6-8
  6-8: 2-A-5-6

MATERIALS NEEDED

world.kano.me

Introduction

10 mins

Linking

Today learners will build a computer! Before they do, challenge them. Ask them to write down as many parts of a computer (mouse, speaker, etc) as they can in 2 minutes. After the time is up, have them compare with their partner. As a group, share out your answers and the lead write them down so the class can see the parts. Discuss the difference between hardware and software.

Engage

We were able to name a lot of parts for a computer, and today we will focus on these hardware pieces. Some we always knew, some we just learned. Today, we are going to see how all these parts interact and make a computer. We will have our own components, and by the end of the day we will build, and have a computer that works!

Collect Kano PCs

5 mins

Retrieve Kano PCs

Exploration Activities

Challenge 1: What Can Computers Do?

5 mins

Ask learners what they think computers can do. As they discuss write their responses down.

- What are they used for?
- What is code?
- What is a computer?

Challenge 2: Define what a computer is and how it works!

30 mins

We have seen computers in a lot of places in our lives. And we have a pretty good idea of what computers can do. Now let's define it! We will watch Code.org's video **How Computers Work: What Makes a Computer, a Computer?**

While you watch the video take notes on what are the 4 things that make a computer. Be ready to discuss!

Challenge 3: Explore the Kano PC

10 mins

If you have a little time, let the kids play around and move into different apps on Kano. Direct them to Make Art so they can start coding art!

Closing

Evaluation

5 mins

Once the computers are picked up, ask students to fill out their engineering journal daily log. As well, in the in class reflection section answer these questions:

- What was your favourite part about today's session?
- What was your least favourite part about today's session?
- What are 3 things you learned today?
- Why is it important to create, not just consume, technology?

Call on 4 people to answer 1 of the 4 questions above.

Extension

5 mins

Before everyone leaves, ask the learner to go home tonight and draw or write what it was like to build a Kano Computer. Did they enjoy it? Were they excited? What was the computer like?

As well, pass out the "Build Worksheet" to be completed at home. You can find the worksheet in the appendix section of this packet.

Kano Clean-up

10 mins

As you start using Kano in class, how you clean up will become important. Take a substantial amount of time (10 - 15 minutes) to practice your clean up routine with your students.

Build Worksheet

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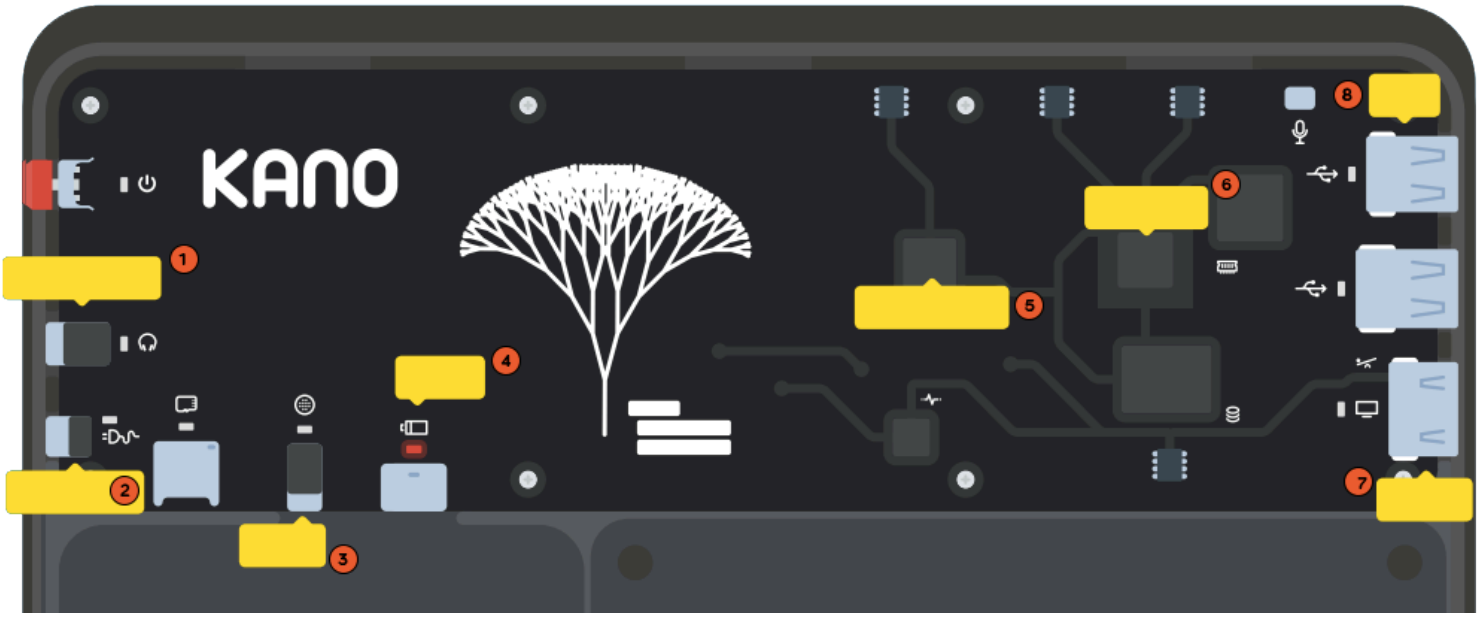
Name: _____ **Date:** _____

Explorer Questions

Directions: Refer back to your Kano PC storybook. Can you identify all the parts on your Kano PC PCB?



1.

2.

3.

4.

5.

6.

7.

8.

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Build Worksheet

Programmer Questions

In the sections below answer the questions to the best of your ability. If needed, draw examples to support your statements!

1. Today you built and coded your Kano PC! Can you name the components that were **hardware** of the Kano? Can you name the components that were **software** on the Kano?

Hardware	Software

2. While you were using the Kano there were components you used that were **inputs** (you putting information into the Kano) and there were things that were **outputs** (the Kano showed you something). What do you think of the Kano hardware was an **input** device? What do you think was an **output** device?

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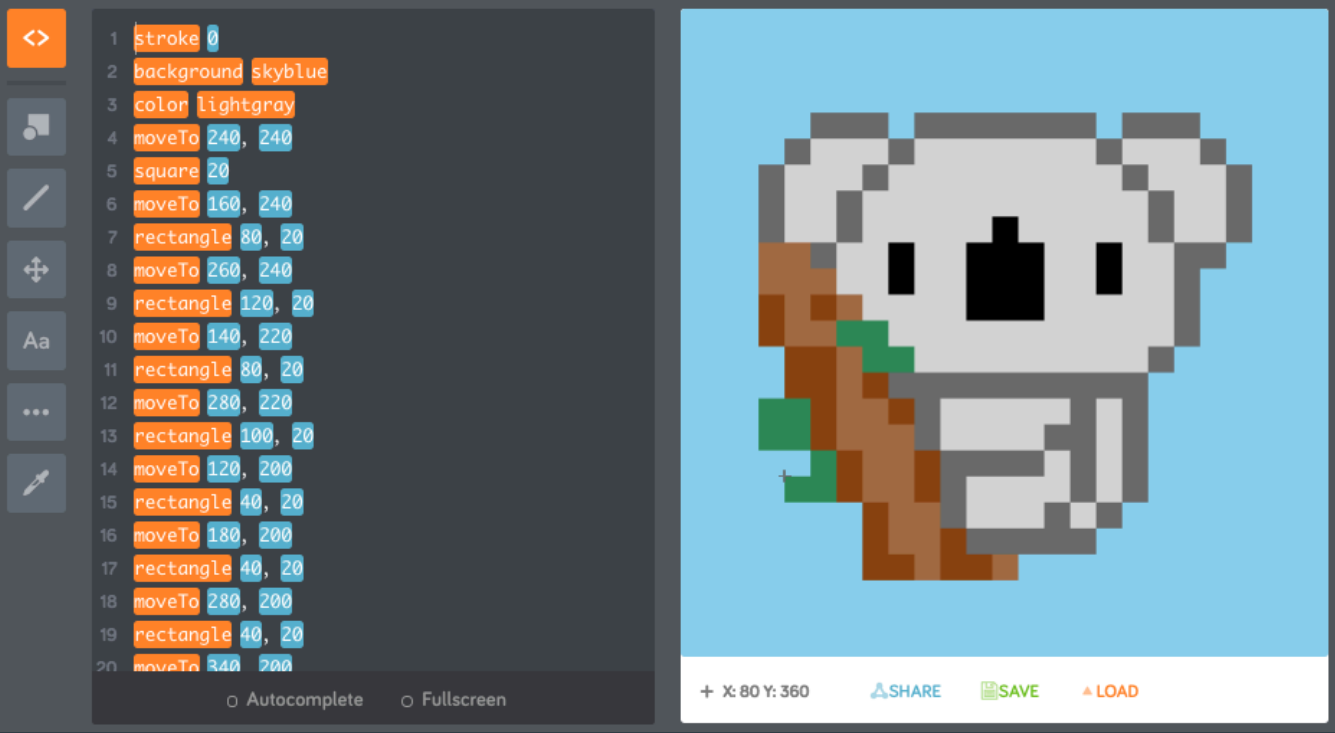
Build Worksheet

Creator Question

You just built your own computer! Now how about you design your own computer? Below draw the perfect computer! What components would it need to turn on? What would make it unique? Be creative!

Impact Question

How has technology changed in your life? What was it like when you were 5? What was it like 3 months ago? What new technologies have you heard about or seen?



Intro to Make Art

Beginner 1 hr

Have your creators gets used to Make Art and begin creating unique creations to share!

OBJECTIVES

- Learners will understand how to access Make Art
- Learners will be able to identify the features of Mark Art and use them to create their own pieces of art

STANDARDS

- **K12 CS:**
  Computing Systems.Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18

MATERIALS NEEDED

Visit http://art.kano.me/challenges to find all our Make Art challenges

Introduction

10 mins

Linking

Ask your learners to draw anything, using a pen and paper. It can be as simple or as complex as they want but they only have 5 minutes. Put a countdown up to get them energized to go!

Engage

Tell your learners to turn and talk to each other for 1 minute each. What is your favorite program you have used to edit images (Paint, Photoshop, Code)? Do they think they can transfer their drawings to the computer with one of those softwares? If you can how? After they are finished with the 2-minute turn and talk discuss how computers are becoming used more often in artwork, from Disney films, to 3D printed jewelery, to laser cut wood prints, to art made from code! Art is changing and using technology to create this change. Today, they will learn one platform to use code to create art and share it with the world!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

35-45 mins

Challenge 1: Get to know Make Art!

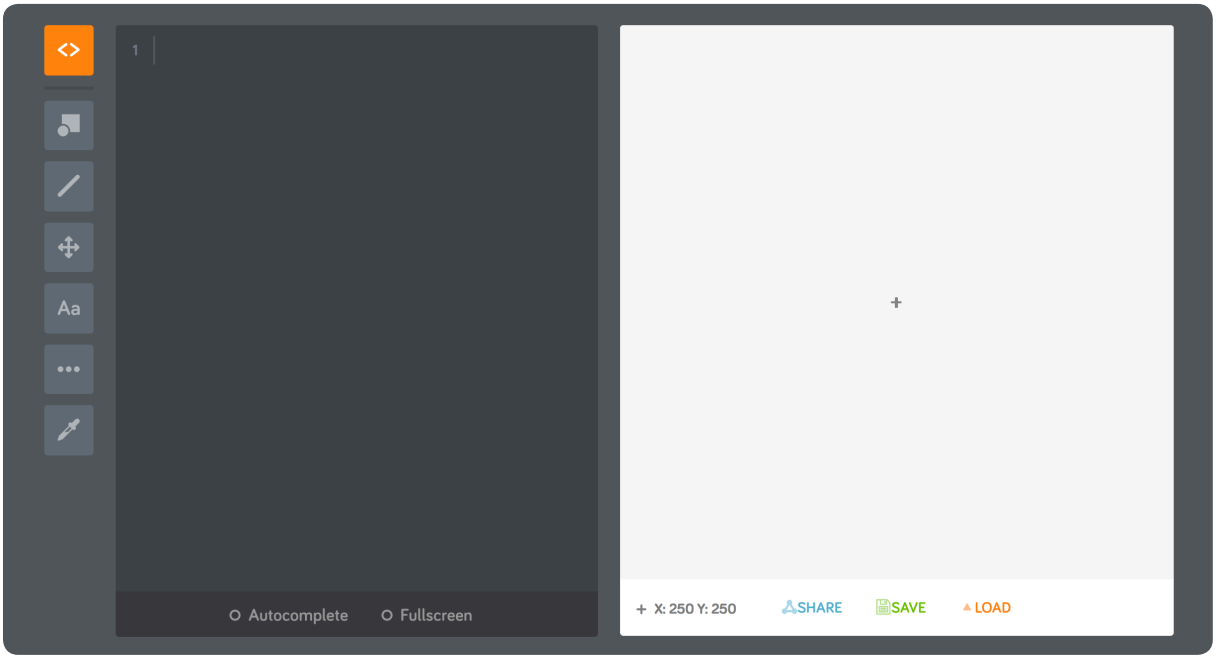
Briefly go over the features of Make Art and how you access the app.

 Click this icon to launch Make Art!

Once the app is open, they will have the option to work on ”challenges” or hang out in the “playground.” Challenges are exactly that, challenges, that the Kano team creates to help creators get used to the environment and start learning code. They are walkthroughs that provide specific instructions to move forward and you can customize your creations afterward!

The playground is a little different. There are no walkthroughs, it is a playground for your imagination! Take the skills you learned in the walkthroughs or tinker around to see what you can create!

When you open up Make Art in “challenges” or “playground” you will see a screen like the one below. The left side is where you will code, and the right side is where you will see your creations start to grow and be built!



Try hitting enter a few times in the dark left side. You will notice numbers appear. This is a number system to help you create individual lines of code.

Now on the right side move your cursor around. You should notice that in the bottom left corner of the white screen you will see the “x” and the “y” move positions. In Make Art you are creating masterpieces on a grid that corresponds to a coordinate plane. You can use your cursor to help you identify where on the grid you need to draw!

On the left side you will notice seven gray boxes. These are buttons to different windows that give you information on Make Art!

Code: This will be where you will usually have your left screen working on. Here you type in the code that will help build your creations on the right side.

Shapes: Do you want to create objects? You can create shapes: circle, ellipse, square, rectangle, and polygon in this section with the example code shown.

Lines: With this button you can draw lines! These include drawing a line of a certain size, and drawing a line to a certain point.

Position: We want to create in different spaces on our digital canvas. To do this we need to learn how to move around on the board. You can see example to move the cursor a certain distance away and move the cursor to a particular position.

Text: Maybe you want to say something in words. Use the text box to learn examples to: write a message, set size and/or font, sets bold text on (true) or off (false), sets italic text on (true) or off (false).

General: This button explains a few things that don't fit in the other categories. Such as: repeat code or get a random number in a range.

Colors: What is a piece of art without color? In the color button you will see examples to: set the background color, change the color in use, change the width and color of the stroke (border, set a color's brightness, set a color's saturation, rotate a color's hue angle by a given amount, set how see through a color is.

Challenge 2

Get used to Make Art! Have your learners click on Make Art and explore the beginner challenges. Remind them to remix each challenge and don't forget to tell them to share their art pieces on Kano World!

Challenge 3

Are your learners ready for a challenge? Have them open up the playground and attempt the following scenarios:

Scenario 1: Can you draw an example of a drink you would have in the current weather? For example, if it is cold you may drink hot chocolate! If it is hot you may drink iced tea.

Scenario 2: Let's make something more extensive. Can you draw your name in different colors? Stylize it and make it your own!

Challenge 4

Challenge a classmate! Pair up your learners. Have each student write a challenge on a piece of paper. Tell them to make it reasonable and something that can be created in Make Art only. Make sure their partner doesn't see! Once they have their challenge thought out they will exchange with their partner. Can each person finish the challenge before they run out of time?

Challenge 5

Wow, your creators have gotten far super fast! Now, can they take their drawing from the start of class and do the impossible? Can they turn their paper drawing into CODE?

Save your work and share to Kano World!

Closing

Sharing and Evaluation

15 mins

Your learners should have finished Challenge 3. Ask the challenger to critique the challenge -y's artwork. Did it make the grade? Ask the challenger to grade them! If they did, give them a 3, if it was okay a 2, if not that much a 1. Ask the challenger to give two lines of feedback, one helpful comment to make it better and one positive comment!

Educator Note: It is recommended you model this to the learners to make sure they fully understand the task.

Tell the learners you hope they enjoyed this introduction lesson and that they will be doing more exciting work with Make Art. While learners leave, tell them to turn in their post-it notes with their grade for their challenge partner's work. Also, have learners complete their daily engineering log!

Extension

Before leaving, pass out the "Intro to Make Art Worksheet" to be completed at home. You can find the worksheet in the appendix section of this packet.

Kano Clean-up

5 mins

Power down and put away Kanos

Intro to MakeArt

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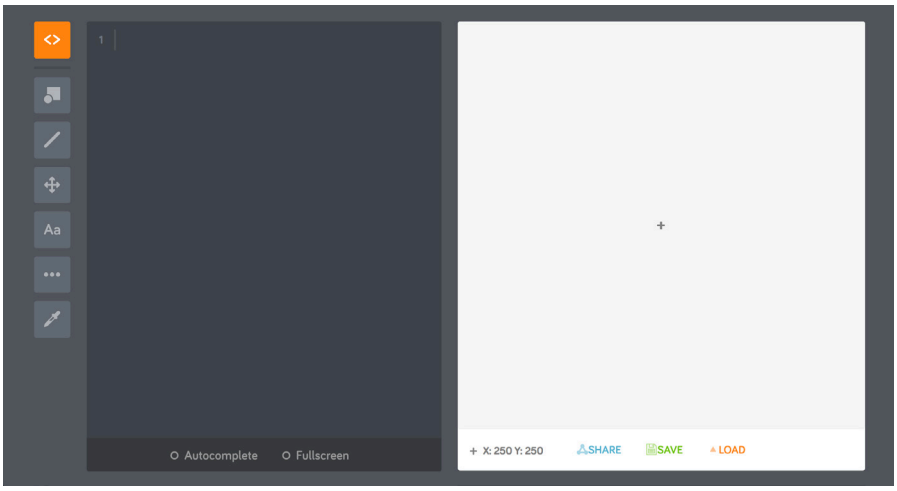
Name: _____ Date: _____

Explorer Questions

Directions: Under each image ,write a brief description about each MakeArt feature. Think about what you can code with each feature.



_____

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_____

_____

Intro to MakeArt

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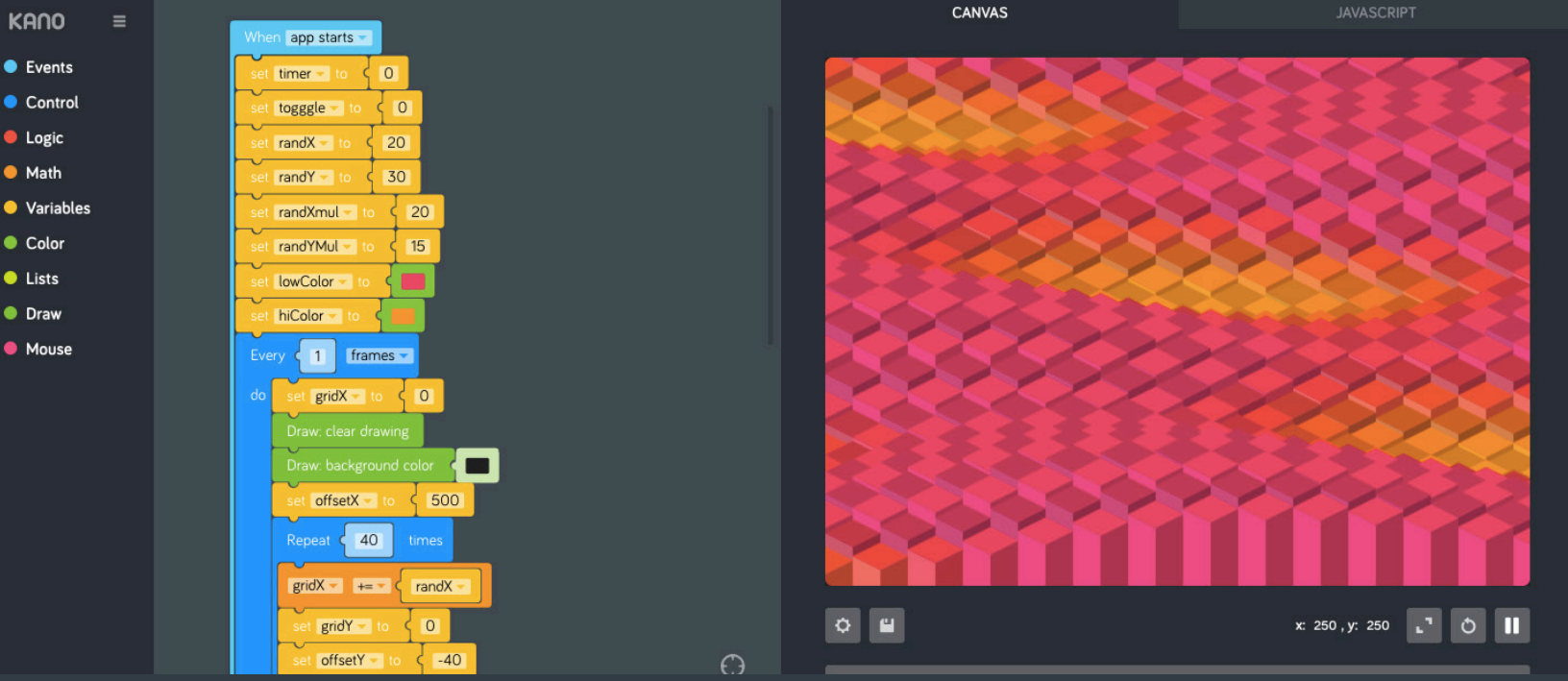
Programmer Questions

What does Syntax error mean? How do you fix it?

In the challenge "Sunny Day" you have the completed code below. In the below code, explain which words can be changed to modify the outcome and which things have to stay the same.

Creator Question

You created on Make Art today, but challenge yourself now! Draw a simple drawing using only three shapes (rectangles, circles, and/or triangles). Try to code this drawing tonight or in class later!



Kano Code Challenge

Beginner **1 hr 30 min**

Learners will take what they have learned from Kano Code and create a new app that must contain specific parts. The most creative app wins!

OBJECTIVES

- Learners will understand how to access Kano Code
- Learners will be able to identify the features of Kano Code and use them to create their own creations

STANDARDS

- **K12 CS:**
  Computing Systems. Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16
  9-10: 3A-AP-18

MATERIALS NEEDED

world.kano.me

Introduction

10 mins

Linking

We have played a lot with Kano Code and we are basically experts now, right? Now how about a final challenge? In their engineering logs, plan out an app using Kano Code only. What would it do and how would you use it?

Engage

We all wrote down something we wanted to build in Kano Code. Now LET'S DO IT. Find a partner and decide together which project you want to make. Before you start though, I will be giving you some more challenges to make it harder. Be prepared!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In.

Exploration Activities

Challenge of the Day:

30 mins

Sit with your partner and decide which project you want to try and work on. You will have the whole class period so try to think of one you can do in that time frame.

Before you start going I will give you a few specifications that your final project MUST include. These are:

- At least one variable
- At least one control block
- At least one thing that is randomized

This means I will be looking specifically for these three types of blocks!

If you need help with anything see if you and your partner can figure it out. If you can't then see if someone at another group can help you. If you all can't then raise your hand and I'll come by!

When learners are done, they will share their creations with the class.

Save your work and share to Kano World!

Closing

15 mins

Sharing

Use the remaining time in class to share what the learners remixed or created on their own. Remind learners to share their creations on Kano World!

Evaluation

Ask learners to find one partner and turn and talk to answer the following questions. What did everyone like about the creations? What was difficult? What is a new skill you learned that will help next time you use Kano Code.

In their engineering logs, have the learners write one idea they have for next time to use Kano Code

Extension

Have learners fill out the “Kano Code Challenge.” worksheet that can be found in the appendix.

Kano Clean-up

5 mins

Power down and put away Kanos

Kano Code Challenge

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Name: _____ **Date:** _____

Explorer Questions

Directions: For this Kano Code Challenge you had to be creative and create your own program! Below, draw a picture and write at least five sentences explaining what your program did in Kano Code.

Programmer Questions

Directions: In the Kano Code Challenge you had to use the following blocks:

- At least one variable
- At least one control block
- At least one thing that is randomized

In the space below, can you explain in your own words how you used each block and what that block did when used.

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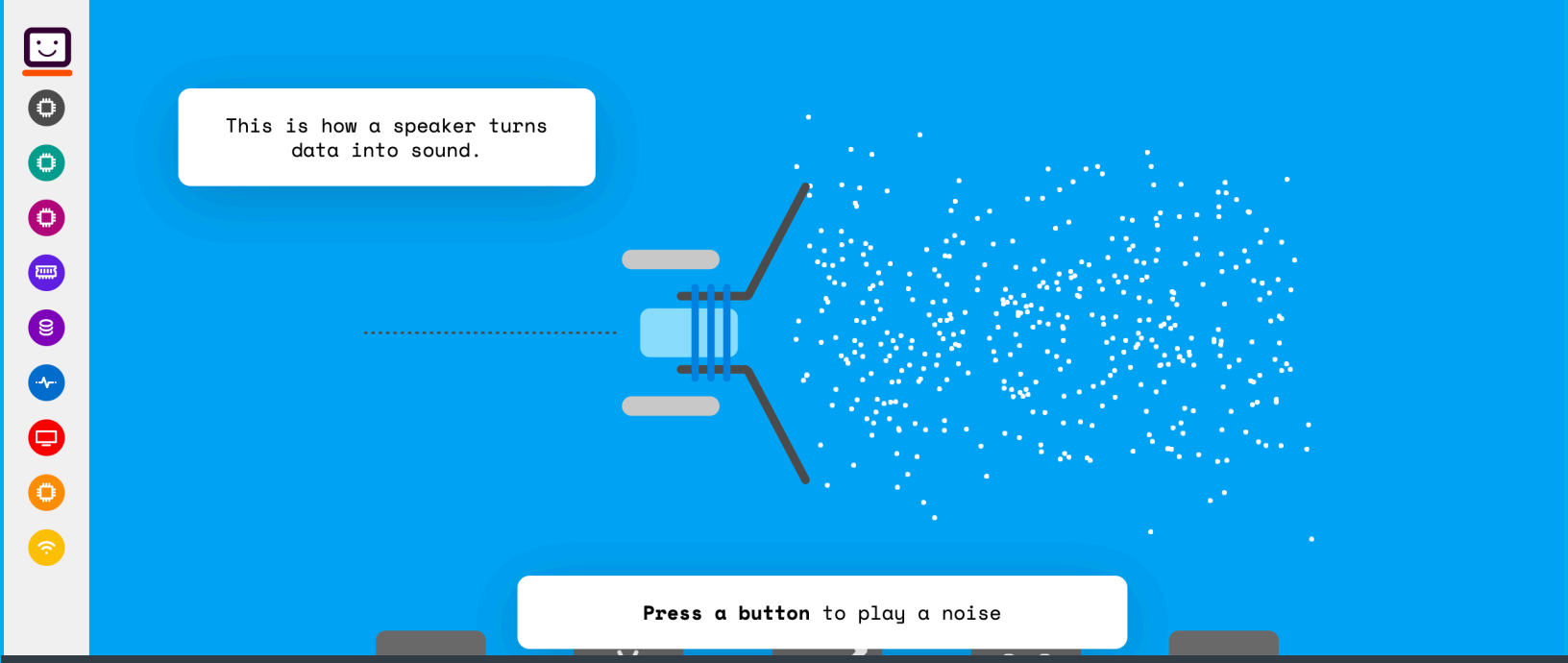
Kano Code Challenge

Creator Question

Directions: Part of coding is thinking about ways to improve your projects. Below, draw a design on how you could improve your Kano Code Challenge for next time! Label the drawing explaining how you would improve it.



How Sound Works

Beginner 1 hr 10 min

Use your computer's microphone to visualize sound and understand how your computer makes sounds!

OBJECTIVES

- Learners can explain how sound is made by vibrations in the air
- Learners can explain how an ear can understand sound
- Learners can define how electromagnets work and how they are used in speakers

STANDARDS

- **K12 CS:** Computing Systems.Devices, Computing Systems.Hardware and Software
- **CSTA:** 3-5: 1B-C-7-9, 1B-C-7-10, 1B-C-6-11
- **Common Core:** CCSS.MATH.PRACTICE.MP1

Introduction

10 mins

Linking

When students walk in show them the video from NPR on **"What Does Sound Look Like?"**

Engage

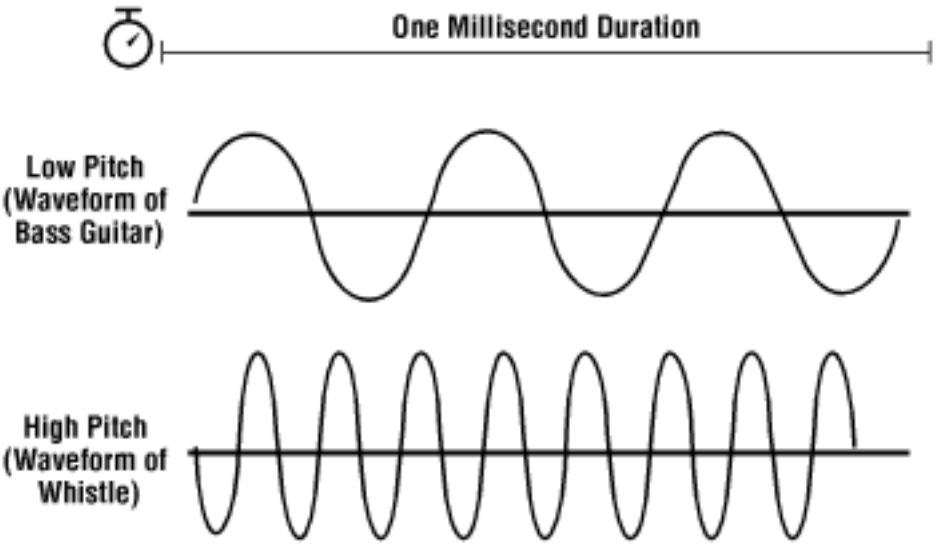
What did you learn from the video? *Take answers from students. Main point should be that in the air when a sound is produced waves are created.*
Pretty cool right? Today we are going to explore everything with sound. From what it is, how we hear it, and how our computers make sound for us to hear.

Exploration Activities

Challenge 1: How Does Sound Work?

5 mins

Sound is something that we interact with everyday. What kind of things do you hear each day? *Take examples from students*
As we saw in the earlier video, when we hear it sound it is because of **vibrations in the air.** These vibrations create waves, like when you throw a rock in a body of water. When we hear sound we are also hearing **pitch, or frequency of the sound.** When you think of pitch think of how a voice sounds, is it a high voice or someone with a low voice?



When we also think of sound we think about if it is really loud or soft. The volume level for sound is created by how much the vibrations move air particles. A very loud sound will create a greater displacement of air molecules!

Have more time? **Check out this cool resource** to visualize a sound waves amplitude and frequency.

Challenge 2: How Do You Hear Sound?

30 mins

So sound travels in the air, moves air particles with vibrations, which we hear. But how does an ear understand what these vibrations? Human ears are super cool and are designed to understand the vibrations. Inside your ear is a very thin piece of skin called the eardrum. When your eardrum vibrates, your brain interprets the vibrations as sound -- that's how you hear.

Have more time? Students can play **with an interactive ear** to learn more about how ears work!
Even MORE? Try this experiment.
- Take a bowel and cover it with cling wrap.
- Hold it down by pulling a rubber band across the open top.
- Place a little of salt on the top. Now, take a pan and hit it with a spoon.
- The salt moves because the loud noise (vibrations) in the air. Our eardrum is the same!

Challenge 3: What is an Electromagnet

10 mins

Before we talk about speakers its important we understand a few more concepts. How many people have heard of magnets,? Raise your hand. Now, how many people have heard of an electromagnet? An electromagnet is a coil of wire wrapped around a piece of iron. If no current passes through the coil of wire, the electromagnet is not magnetized. When current passes through the coil of wire, the electromagnet becomes magnetized. This is very helpful because sometime you don't want to have something always magnetized, just sometimes!

If you have time, have students make **their own electromagnet!**

Challenge 4: How Does a Computer Speaker Make Sound?

10 mins

Now let's take everything we learned about sound, ears, and electromagnets and understand how a computer makes sound! Open up the "How Computers Work" app and click on the sound activity. See if you can figure out how a speaker makes sound. A few things to make note of while you complete the activity:

- How does a speaker make a digital file into sound vibrations?
- How does a speaker use an electromagnet to make sound?
- You have a lot of sounds to listen to, which has a higher pitch?
- How can you make something have a higher amplitude?

Kano Clean-up

10 mins

Put away the Kano PCs

Closing

Evaluation

5 mins

Once the computers are picked up, ask students to fill out their engineering journal daily log. As well, in the in class reflection section answer these questions:

- How is sound made?
- How does a speaker work?

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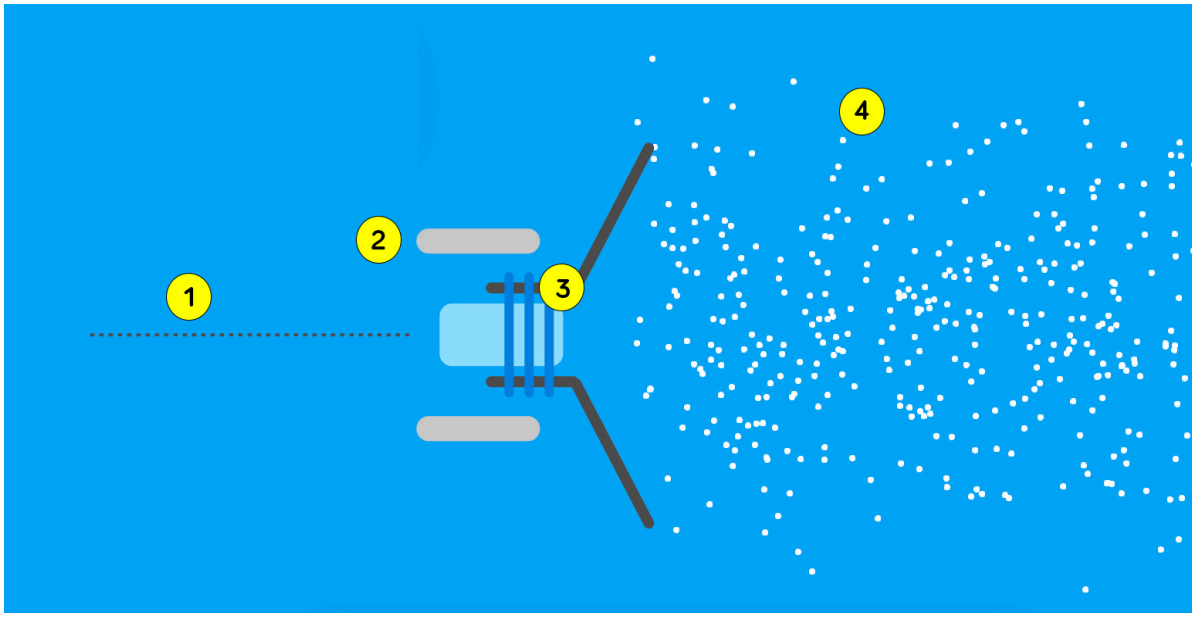
Sound

Explorer Questions:
Directions: You learned a lot about sounds and how speakers work. Below can you identify all the parts of speaker and sounds? If you can, go a little further and explain the science behind each piece!



1

2

3

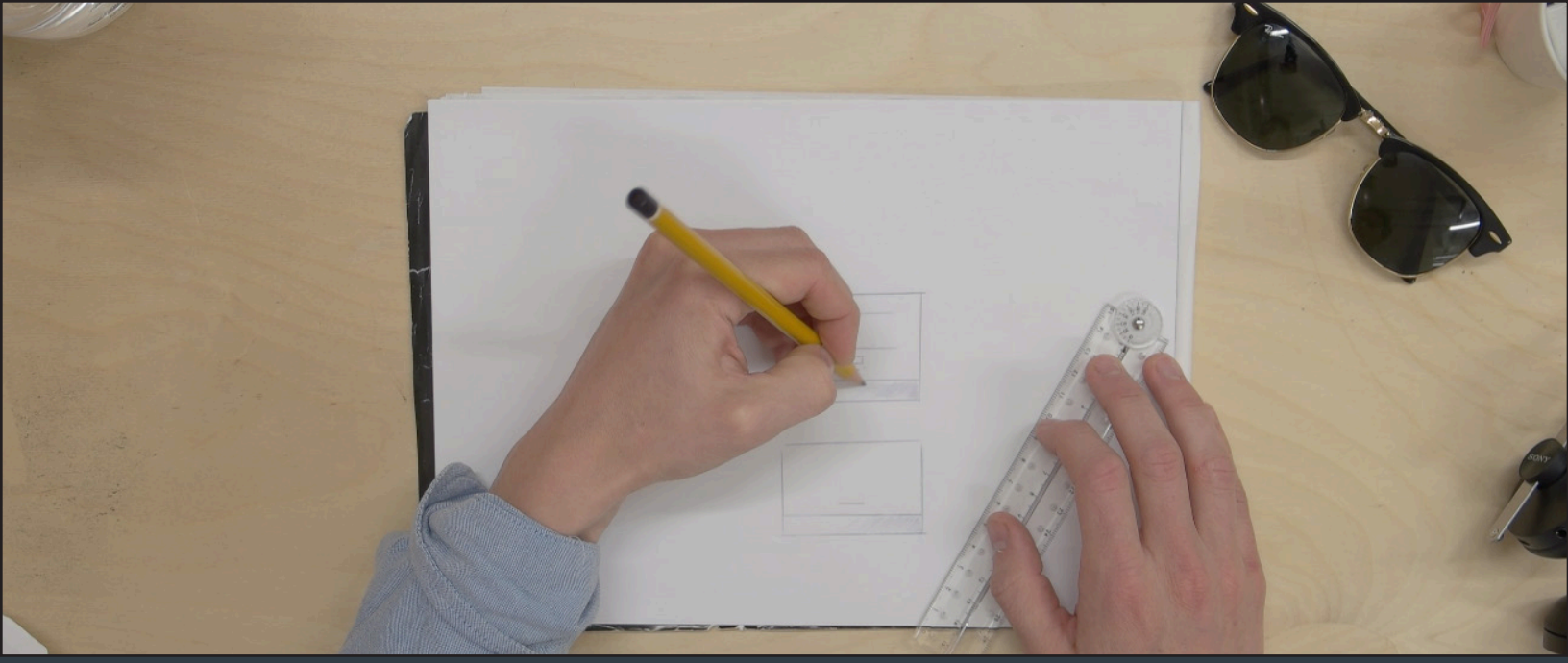
4

Programmer Questions

For the speaker to work it uses an **electromagnet** to help create the movement of the speaker. How does an electromagnet work? Why do you think you wouldn't just use a regular magnet?

Creator Question

Speakers and sound are super cool and around us every day! If you had to design a speaker for the future to listen to sound, what would it look like and how would it work? Show your design below!



Design Thinking

Intermediate **2hrs** (Can split into multiple sessions)

In this lesson you will use the popular Design Thinking framework to design your own product and give important feedback to Kano!

OBJECTIVES

- Learners can identify the steps in Design Thinking.
- Learners understand what it means to give constructive feedback and how that applies to design thinking.

STANDARDS

NGSS:

3-5-ETS1-1 D 3-5-ETS1-2 MS-ETS1-1 D MS-ETS1-2

CSTA:

K-2: 1A-AP-15
3-5: 1B-AP-13, 1B-IC-20
6-8: 2-AP-16, 2-AP-17
9-12: 3A-AP-13

Introduction

15 mins

What is your favorite toy or game? Gather a list from the learners and write it on a board. Everything you named was thought out before it was made. For example, when we decide which way to walk to a store, or when we think about writing an essay, we think about it before making a decision.

Today, we are going to talk about Design Thinking. Walkthrough each of the steps and ask learners for examples of things they've tested or been part of testing.

Empathize

Work to fully understand the experience of the user for whom you are designing. Do this through observation, interaction and immersing yourself in their experiences.

Define

Process and synthesize the findings from your empathy work in order to form a user point of view that you will address with your design.

Ideate

Explore a wide variety of possible solutions through generating a large quantity of diverse possible solutions, allowing you to step beyond the obvious and explore a range of ideas.

Prototype

Transform your ideas into a physical form so that you can experience and interact with them and, in the process, learn and develop more empathy.

Test

Try out high-resolution products and use observations and feedback to refine prototypes, learn more about the user and refine your original point of view.

Explain what Kickstarter is and why it's a good way to validate an idea - the public gives you a response on whether they are interested in your idea and puts down money to support it. It also helps early companies to get a product out and test with people instead of creating in a room and launching without user feedback. You can even show some Kickstarter projects on the projector. Explain that Kano was a Kickstarter that raised over 1.5m USD on the platform. Kano continues to grow with feedback from learners and teachers around the world. Today, you will give Kano feedback. You can use this presentation!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Other resources:

Paper, pencil, crayons (optional)

Exploration Activities

Challenge 1:

30 mins

Break into groups of four and each group chooses one Kano app:

- Make Art
- Make Minecraft
- Terminal Quest
- Make Snake

Answer the questions (in writing to share with Kano):

- What is your favorite part of the app?
- What is challenging about the app?
- What would you improve about the app?

Class to discuss some of the feedback.

Challenge 2:

20 mins

You have just used Design Thinking to give Kano feedback on one of the apps already on it. Now what if you can give a recommendation for a new app? Taking the feedback you heard from the class, use Design Thinking to create your own app.

- What problem are you looking to solve with the app?
- What is the app and its purpose? Who would want to use it? In your groups, use pen and paper to write out your thoughts.

Challenge 3:

30 mins

Break learners into groups and have them think of a few brands and their logos.
What do you like about those brands? What about their logos?
What don't you like about the brands or logos?
What does a logo express about a brand?

Discuss as a class.

Then, open up Kano kits and launch Make Art.
Logo frenzy!

Choose two Logos from world.kano.me [**Example 1, Example2**]and recreate them in Make Art - add your own creative flair to these logs.

Challenge 4:

30 mins

Create your logo for the app you designed in Challenge 2!
First, sketch out the logo on paper & pencil (if available).

Then code in Make Art!
Save your work and share to Kano World!

Closing

15 mins

Sharing

Groups share their apps and logos. The class can vote on their favorite! Remind learners to fill out their engineering logs!

Extension

Have learners fill out the "Design Thinking" worksheet that can be found in the appendix.

Kano Clean-up

5 mins

Power down and put away Kanos

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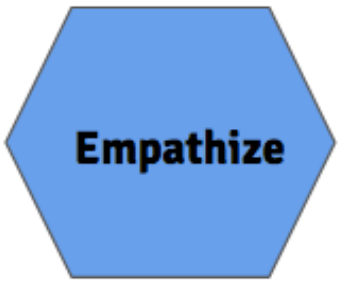
Design Thinking

Name: _____ Date: _____

Explorer Questions

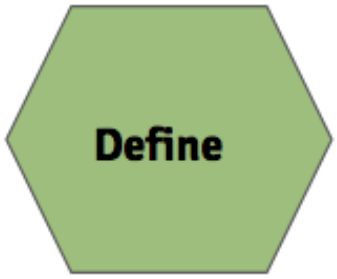
Directions: Fill out each section by reflecting on your Design Challenge Project!



Watch and Listen: What population will you work with?

_____

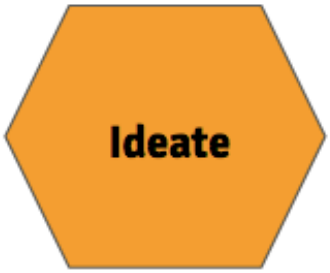
_____



What is your idea/vision based upon the population and the problem you will work with?

_____

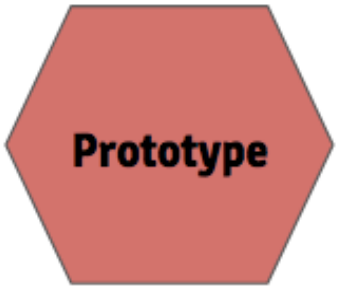
_____



What ideas did you brainstorm?

_____

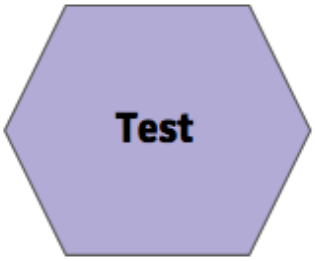
_____



Provide a brief explanation of your prototype.

_____

_____



How will you test your prototype?

_____

_____

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Design Thinking

Programmer Question

Directions: When you created your prototype you had to code a portion of the project on Kano. What did you code? Why did you use that coding environment? What were the limitations of that coding environment for your project?

Creator Question

Directions: Part of coding is thinking about ways to improve your projects. Below, draw a design on how you could improve your Design Thinking Project for next time! Label the drawing explaining how you would improve it.

Abstraction

Beginner **1 hr 30 mins**

Learners will discuss what abstraction is in computer science and use examples from the real world to demonstrate their understanding.

OBJECTIVES

- Learners will be able to explain in their own words what a abstraction is in computer science
- Learners will be able to relate abstraction to a real world application of maps to help their learning.

STANDARDS

- **K12 CS:** .
  Computing Systems.Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-08, 1A-AP-10, 1A-AP-11, 1A-AP-12, 1A-AP-14
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-15
  6-8: 2-AP-13

MATERIALS NEEDED

Maps of the London Underground, Map of London Underground to Real World, Citymapper London (for smartphones)

Introduction

Linking

10 mins

I have a subway, or underground, map of London for you! Let's go on a bit of a scavenger hunt to see if you can identify a few things! Once you have your map can you :

- Identify how many different colored lines (routes/subway lines) are on the map?
- Can you find Whitechapel?
- Can you find Stepney Green?
- Can you find Angel?
- Can you find Elephant and Castle?
- What lines (routes/subway lines) meet at Bank? (the colors)

Let learners have 5 - 10 minutes to go through the map and work with a partner to find everything. Afterward, collect the answers from the learners.

Engage

3 mins

Maps are very cool. They help us find things with ease rather than have to search on foot for something! But what is super cool about a map is that you can find the things you want immediately and ignore all the other details. The computer science topic of abstraction is the same way! Abstraction allows us to focus on the big picture, ignoring the things we don't need in order to focus on the things we do!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

Challenge 0 : What Is Abstraction?

10 mins

The BBC defines abstraction as "Abstraction is the gathering of the general characteristics we need and the filtering out of the details and characteristics that we do not need."

As said when we looked at the subway map, we see a simpler version of the city that is just how each subway line interacts with each other. Now, let's look at what the London Underground looks like on a real map. Check out this website for a simulation of movement or just this map.

Does the map look the same as the subway map? (Answer NO!)

This happens because when we design maps like ones for public transportation we don't care about all the details! We don't need to know where all the buildings are, where a mountain/hill is, where the line curves a little bit. We just want to know kind of where the lines are (north, south, east, west) and how they connect with each other.

Abstraction is the same way. For example if I was asking you to draw series of dogs. I wouldn't want all the details about the dog (fur length, length of tail, color of eyes, height). I would just want to know the basic characteristics of a dog (number of legs, eyes, mouth, ears, tail, has fur). With the very basic characteristics, the similarities, I can create a model of a dog!

Challenge 1 : Abstraction of Maps

20 mins

Let's play with the maps a little more. I am going to give you a route (the start and end point) and I need you to figure out the algorithm to get to that point (or the route). If you have a smartphone you can download Citymapper London. If not, work with a partner to see if you can figure out the route I would need to take!

Routes to figure out:
Whitechapel to Angel
Shadwell to Kensington
Notting Hill to Shoreditch High Street

Record your algorithm in your engineering logs!

Challenge 2 :Create Your Own Worlds!

20 mins

What if we had to create our own maps? Say for a video game? With a partner design an overworld map for a video game. Remember, this needs to be a general map. I do not need to see all the details, rather than main/general features!

Before the learners start on their own show them a few examples of overworld maps. It is important for them to see that in each map you do not see the specific details of the world (the people living there, the bad guys, or what it looks like) but rather a general route they follow to complete the game!

Yoshi Overworld, Mario Overworld, Zelda Overworld

Closing

Evaluation

10 mins

If I asked you to create a model of a cat what would it look like? Remember to use abstraction to pick out the general characteristics of a cat and not the specific details! Write down your response and when you are done share your answer with a partner.

Closing

3 mins

Abstraction allows us to pick out the general characteristics and not get bogged down by all the details! This way of computational thinking allows us to create more abstractly!

Tonight think of ways that you use abstraction at home. Record your responses in your engineering log!

Kano Clean up

5 mins

Power down and put away Kanos

Abstraction

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Name: _____ **Date:** _____

Explorer Questions

Today, we created an overworld map for a game we would design ourselves. What were some of the things you included in the map? What were some of the things you did not include in the map?

Programmer Question

Abstraction helps us focus on the big picture and not get too caught up in the details. For example, when we created a model of a dog, we focused on the general characteristics of a dog. If you had to create a model of a tiger using abstraction what would it be?

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Abstraction

Creator Question

You just created a basic model of a tiger. Can you now draw different variations of that tiger using the model you created? Draw them below!

Impact Question

Abstraction allows us to focus on the big picture rather than the details. Do you think this way of thinking is good or bad? Why?

Debug It!

Beginner 1 hr

Learners will use Scratch to understand debugging!
(It is recommended for learners who know PEMDAS or BODMAS)

OBJECTIVES

- Learners to investigate the problem and find a solution to a debugging challenges
- Learners to explore a range of concepts (including sequence) through the practices of testing and debugging
- Learners to develop a list of strategies for debugging projects

STANDARDS

- **K12 CS:** .
  Computing Systems.Troubleshooting; Algorithms and Programming.Algorithms
  Algorithms and Programming.Control; Algorithms and Programming.Program Development
- **CSTA:**
  K-2: 1A-AP-10, 1A-AP-11, 1A-AP-12 , 1A-AP-14, 1A-AP-15
  3-5: 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-12, 1B-AP-15, 1B-AP-16, 1B-AP-17
  6-8: 2-AP-12, 2-AP-13, 2-AP-16, 2-CS-03
  9-10: 3A-AP-18

Introduction

Linking

5 mins

Write on the board two math problems and the given solution:
5 - 1 x 3 + 1 = 13
2 x (6 + 1) - 1 = 12

Are these solutions correct? Why or why not? When you have solved the problems turn and talk to a partner and see what they think.

Engage

2 mins

In math, you follow very specific steps to get an answer. If we did something wrong in the process, then the answer will not be what we wanted. Code is very similar. You may want the program to do a very specific function; however, if you did not code the sequence correctly the program will not run the way you want to. When you are looking back at your code to figure out what went wrong, programmers call this debugging.

Today, we will put ourselves in the shoes of a programmer. We will look at code for programs and try to figure out what went wrong and how we can fix it.

Before we start though, do you know why it is called debugging? (Give the students a few minutes to chat). Not too long ago computers were huge! They took up entire rooms. Sometimes bugs would get stuck in them. The story goes that in the 1940s, Grace Hopper, the mother of computer programming who was one of the first and developed the first compiler, noticed a moth stuck in the computer which was making it not work. She said they were “debugging” the computer.

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

Challenge 0: Review Scratch

10 mins

Before we start debugging challenges in Scratch, we need to make sure that everyone understands the basic blocks in Scratch. Start with a simple activity of “When green flag is clicked move 10 steps.” You can vary this with the movements, sound, or the signal for starting the command.

Challenge 1 : What is Debugging? 20 mins

Now that we have a refresher on Scratch. Let's code something as a class! I want to code my sprite to turn in a circle when the space bar is clicked. The image below is what your code should look like for the learners:

The blocks should be the following:

- When "space" key pressed
- Turn 90 degrees
- Turn 90 degrees
- Turn 90 degrees
- Turn 90 degrees

Now try clicking the space bar. What happens? (nothing)

Ask the learners why they think this happens. (Four 90 degrees equals 360 degrees so it will not appear like it is turning)

What can we do to make the code work now? (Have less than four 90 degree move blocks)

Let's do one more together. When we click the green flag we want the sprite to have a conversation bubble that comes up and says "meow, meow, meow" and then makes the same sound three times.

The blocks should be the following:

- When green flag clicked
- Say "Meow, meow, meow! For 2 secs
- Repeat 3
- Play sound meow

Now try clicking the green flag. What happens? (The conversation bubble comes up but the sprite says meow once)

Ask the learners why they think this happens. (The blocks are not in the correct order)

What can we do to make the code work now? (Move the blocks so you have the sound and text in the loop, and the sound block should be first)

Challenge 2 : Create a Flawed Program!

30 mins

If you have extra time or your programmers are quickly figuring out the problems for flawed code move them to Challenge 2!

Now that the students understand what it means to debug have each pair create a program. It can be as simple or as complex as they want, but they have to have a clear idea of what the code should do. Give each pair 15 minutes to code their program.

After the 15 minutes, the pairs will switch with another group. Their mission is to figure out what is wrong with their code and fix it!

Closing

Sharing

15 mins

Have students share the flawed program that they were at. What was the program supposed to do? What was wrong with it? Were you able to fix it?

Closing

5 mins

Tonight, in your logs reflect and answer the following questions:

- What was one thing you learned when you debugged the Guess A Number Game in Scratch?
- What was your favorite part about debugging?
- What are other ways you find debugging in day-to-day life? (sports example: - didn't score a goal in soccer, what went wrong?)

Kano Clean up

5 mins

Power down and put away Kanos

Debugging

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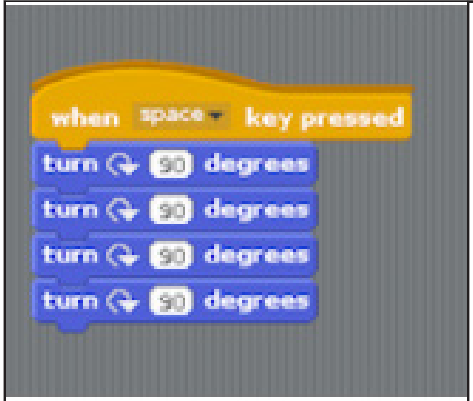
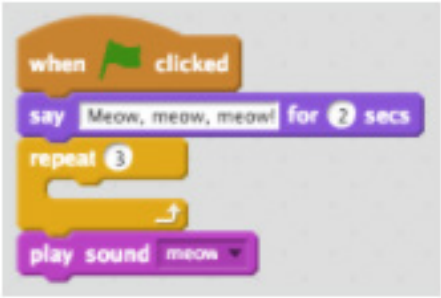
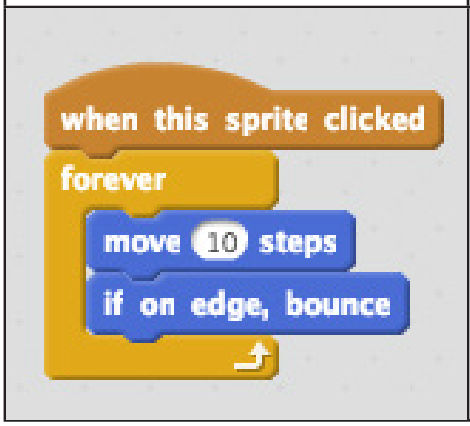
Name: _____ Date: _____

Explorer Question

Directions: While you were in Scratch, you saw a few examples of code that was supposed to do something, but it didn't work. In the images below, can you identify why the code does not work?

Code Blocks	What the code is supposed to do	Why it doesn't work
	The blocks should be the following: • When "space" key pressed • Turn 90 degrees • Turn 90 degrees • Turn 90 degrees • Turn 90 degrees	
	The blocks should be the following: • When green flag clicked • Say "Meow, meow, meow! For 2 secs • Repeat 3 • Play sound meow	
	The blocks should be the following: • When the sprite is clicked • Move across the screen • If it hits the wall it will reverse directions and repeat	

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Debugging

Programmer Question

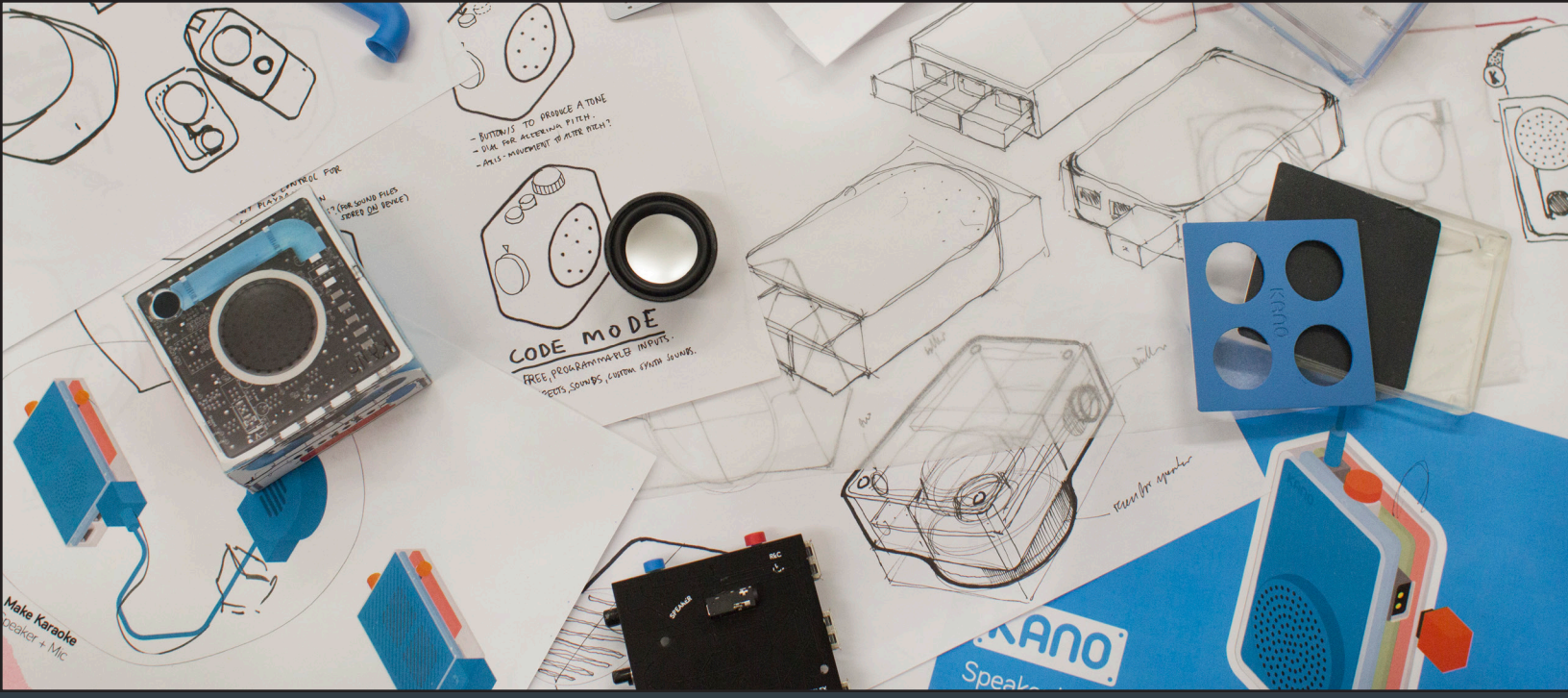
In your own words, what does it mean to “debug” something? Can you provide an example of something you may need to “debug”?

Creator Question

Can you design a simple program in Scratch? For this project, program a character to dance around the screen in any way you want! Below, write out the code blocks you would need to make the character dance! You can draw out your idea as well!

Impact Question

In life we encounter problems and we have to think of ways to fix the problem. Debugging programs is the same process. Sometimes your program doesn’t work the way you want and you have to figure out what went wrong! Think about things you have had to “debug” in your life. What was supposed to happen but didn’t? How did you go about fixing it?



Impact of Technology

Beginner 1 hour 30 mins

Students will reflect on the impact questions they answered throughout the course and discuss the implications of a more technologically driven world.

OBJECTIVES

- Learners will be able to discuss some of the major trends in technology
- Learners will be able to articulate ways to protect their information in an increasingly digital world

STANDARDS

K12 CS: .

Impacts of Computing.Culture; Impacts of Computing.Social Interactions

CSTA:

K-2: 1A-IC-16, 1A-IC-17, 1A-IC-18

3-5: 1B-IC-18, 1B-IC-19, 1B-NI-05

6-8: 2-IC-20, 2-IC-23, 2-NI-05

9-10: 3A-IC-24

Introduction

Linking

5 mins

The time is 2040 and the future is now. You are the scientist designing all the new inventions and developments of the world! What are your top three new inventions you have created for this new future? Draw and/or write out the descriptions of each invention. If you are done share your inventions with a friend!

For about 2 minutes, have learners share some of the things they "invented."

Engage

2 mins

The future seems super fantastic! We all thought of cool ideas that COULD become reality with enough brains and work going into it.

Almost all technology we interact with now wasn't here 20 years ago, and even wasn't here just 1 year ago! Technology is constantly updating and improving. With these updates our lives change, sometimes dramatically for better or worse.

Today, we are going to look a little more critically at what these changes mean for not only ourselves but the world!

Collect Kanos

5 mins

Retrieve Computers, Turn On, Log In

Exploration Activities

Challenge 1: Where Does Technology Have an Impact?

20 mins

While we have been learning more about coding we have also been answering a few discussion questions each session called the "Impact Question." Can you take out your worksheets now and read over the questions. While you read over the questions, think about what the questions were asking you. Give learners 5 - 6 minutes to read over them.

Now that we've had a bit of a refresher, what were some of these questions asking us? (Potential answers: how do we interact with technology, how do we form relationships, how has technology changed us?)

If we had to separate these questions into categories how would we separate them? (Possible themes: relationships, culture, society/government, innovation, privacy/security)

We can see that the questions look into a lot of different ways that technology has an impact on our lives. What I will do now is separate you into groups so that you are inside one of the categories. Separate the learners into the different categories

Now that we are in our category groups, I want you to discuss together and answer the following questions:

- How does technology affect my category in a good way?
- How does technology affect my category in a bad way?
- How does technology affect my category in how I deal with my friends and family?

For example. If your category is security/privacy some answers may be:

- A positive thing: Technology has made it that I can have more secure accounts that have passwords.
- A negative thing: People are now trying to hack and take our personal information from online.
- Relationships: With regards to privacy, I may have an online account I do not share with my family so I can be honest online or vent to an online community. This can be good and bad

You are required to:

- Answer each question in at least three sentences
- Draw a picture for each answer

Challenge 2: How Can We Grow with Technology? 15 mins

Stay in your current groups and now answer the following questions.
We talked about these different categories, but how can we grow with technology in these areas?
How do you think technology will change our category in the future? In what ways?

Example (security/privacy)
We can grow with technology in regards to security by making sure that as technology develops we are aware of how to code and how it affects our lives. Such as making sure we are active participants in understanding how companies or websites collect our information and use it.
As technology changes we will want to have more secure networks to make sure our information isn't abused

Again, answer each question in at least three sentences and draw a picture to represent your answer.

Challenge 3: Give Advice for the Future!

30 mins

You and your group are the experts of your category now! Can you share that information with the rest of the group? In the next 20 minutes, create a poster that presents the following information:

- What is your category?
- How has your category been affected by technology in a positive way?
- How has your category been affected by technology in a negative way?
- What are ways we can make sure there are not as many negative impacts for our category?
- What advice would you give the group about how to handle technology in your category?

When you present, make sure everyone takes a turn sharing information. You can present your information on a poster or, if you have access to a computer, in a PowerPoint.

Closing

Sharing

15 mins

Let each group have about 5 minutes to share their category. Let learners give advice to each other and have time to ask questions about each category.

Closing

5 mins

Tonight, talk to an adult in your life about the category you researched and see if they would give the same advice you would or if it would be different. Record their answers in your engineering log and be prepared to share it with the group!

Kano Clean up

5 mins

Power down and put away Kanos

Kano PC Sample Curriculum Standard Alignment

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			Build A Computer	Intro to Make Art	Pixel Hack	Pattern Perfection	Intro to Scratch	Scratch Dance Party	Intro to Kano Code	Kano Code Part 2	Kano Code Challenge	Algorithms	Abstraction	Pattern Recognition	Debug It	Impact of Technology	Design Thinking
US K12CS	**Algorithms and Programming**	Algorithms	○	○	○	●	○	○	●	●	○	○	○	○	○	○	●
	Algorithms and Programming	Control	○	○	○	○	○	○	●	○	●	○	○	○	○	○	●
	Algorithms and Programming	Program Dev	○	○	○	○	●	○	●	○	○	●	●	●	●	○	○
	Computing Systems	Devices	○	○	○	○	○	○	●	○	○	●	●	●	●	○	○
	Computing Systems	Hardware	●	●	○	○	○	○	●	○	○	●	●	●	●	○	○
	Computing Systems	Troubleshooting	○	○	●	○	○	●	●	○	○	●	●	●	●	●	○
CSTA	**K-2: 1A-AP-09**		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	K-2: 1A-AP-10		○	●	●	●	●	●	●	●	●	○	●	●	●	○	○
	K-2: 1A-AP-11		○	●	●	●	●	●	●	●	●	○	●	●	●	○	○
	K-2: 1A-AP-12		○	●	●	●	●	●	●	●	●	○	●	●	●	○	○
	K-2: 1A-AP-14		○	○	○	○	●	○	○	○	○	○	●	●	●	○	○
	K-2: 1A-AP-15		○	●	●	●	●	●	●	●	●	○	○	○	○	○	●
	K-2: 1A-CS-01		●	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	K-2: 1A-CS-02		●	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	K-2: 1A-CS-03		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	K-2: 1A-DA-07		○	○	○	●	○	○	○	○	○	○	○	○	○	○	○
	3-5: 1B-AP-10		○	●	●	●	●	●	●	●	●	●	●	●	●	○	○
	3-5: 1B-AP-11		○	●	●	●	●	●	●	●	●	●	●	●	●	○	○
	3-5: 1B-AP-12		○	●	●	●	●	●	●	●	●	●	○	○	●	○	○
	3-5: 1B-AP-13		○	○	○	○	○	○	○	○	○	○	○	○	○	○	●
	3-5: 1B-AP-15		○	●	●	●	●	●	●	●	●	○	●	●	○	○	○
	3-5: 1B-AP-16		○	●	●	●	●	●	●	●	●	●	○	○	○	●	○
	3-5: 1B-AP-17		○	●	●	●	●	●	●	●	●	●	○	○	○	○	○
	3-5: 1B-CS-01		●	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	3-5: 1B-CS-02		●	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	3-5: 1B-CS-03		○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
	3-5: 1B-IC-20		○	○	○	○	○	○	○	○	○	○	○	○	○	○	●
	6-8: 2-AP-12		○	●	●	●	●	●	●	●	●	●	○	○	●	○	○
	6-8: 2-AP-13		○	●	●	●	●	●	●	●	●	●	●	●	●	○	○
	6-8: 2-AP-16		○	●	●	●	●	●	●	●	●	●	○	○	●	○	●
	6-8: 2-AP-17		○	○	○	○	○	○	○	○	○	○	○	○	○	○	●
	9-10: 3A-AP-18		○	●	●	●	●	●	●	●	●	●	●	●	●	○	●

Kano PC Sample Curriculum Standard Alignment

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			Build A Computer	Intro to Make Art	Pixel Hack	Pattern Perfection	Intro to Scratch	Scratch Dance Party	Intro to Kano Code	Kano Code Part 2	Kano Code Challenge	Algorithms	Abstraction	Pattern Recognition	Debug It	Impact of Technology	Design Thinking
COMMON CORE	CCSS.MATH.PRACTICE.MP1		●	●	●	●	●	●	●	●	●	●	○	●	●	●	●
	CCSS.MATH.PRACTICE.MP2		○	●	●	●	●	●	●	●	●	○	○	●	○	●	○
	CCSS.MATH.PRACTICE.MP3		○	●	●	●	●	●	●	●	●	○	○	●	○	●	○
	CCSS.MATH.PRACTICE.MP4		○	●	●	●	○	○	○	●	○	○	○	○	○	○	○
	CCSS.MATH.PRACTICE.MP5		●	●	●	●	●	●	●	●	●	●	○	●	●	●	●
	CCSS.MATH.PRACTICE.MP7		○	●	○	●	○	○	○	○	○	○	○	●	○	○	○
	CCSS.MATH.PRACTICE.MP8		○	○	○	●	○	○	○	○	○	○	○	○	○	●	○
	CCSS.MATH.CONTENT.1.G.A.2		○	○	●	○	○	○	○	○	○	○	○	○	○	●	○
	CCSS.MATH.CONTENT.2.G.A.1		○	○	●	○	○	○	○	○	○	○	○	○	○	○	○
	CCSS.MATH.CONTENT.3.OA.D.9		○	○	○	●	○	○	○	○	○	○	●	○	○	○	○
	CCSS.MATH.CONTENT.4.OA.C.5		○	○	○	●	○	○	○	○	○	○	●	○	○	○	○
	CCSS.MATH.CONTENT.5.G.B.3		○	○	●	○	○	○	○	○	○	○	●	○	○	○	○
	CCSS.MATH.CONTENT.6.G.A.3		○	○	●	○	○	○	○	○	○	○	○	○	○	○	○
	CCSS.MATH.CONTENT.HSG.MG.A.3		○	○	●	○	○	○	○	○	○	○	○	○	○	○	○


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