KANO EDUCATION

Creative Computing Curriculum

PREVIEW

Unlock the full curriculum at
kano.me/education/resources
or speak to your reseller

A little story…

Once upon a Tuesday,
a Hero, a teacher, uncovered something new.
A new way of learning,
using stories, making, and play.
Brandishing the Four Cs of legend,
They opened up machines, code, and creativity,
unlocking the potential of many students,
helping them create, not just consume.
They ended the day having taught Computer Science
(even though they were not a Computer Science teacher),
being rewarded with a juicy apple,
And empowering their students to shape the world.
Then they went to Karaoke night.

Hello

Contents

Contents

🔓 **To unlock the full curriculum go to kano.me/education/resources or speak to your reseller**
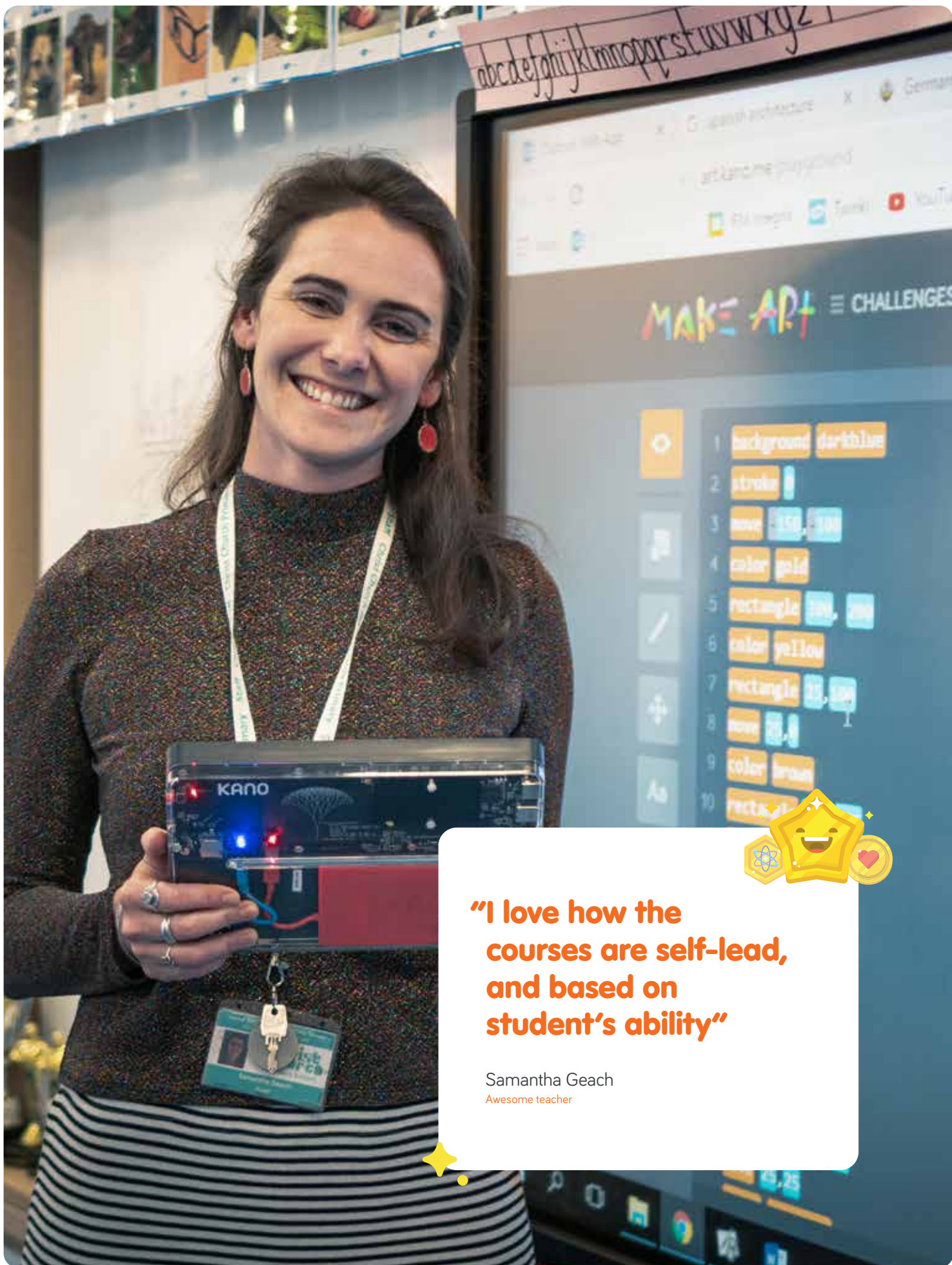
"I love how the courses are self-lead, and based on student's ability"

Samantha Geach
Awesome teacher

Who is Kano?

KANO EDUCATION

Anyone can make

The world is full of devices. But many of us simply swipe, tap, swipe. Only 1% of 1% of 1% know how they work, how to make them do something new. Kano is for the new creative generation. With computers you build, coding, and creativity we open up machines. Make them simple, and fun. So anyone can create, not just consume technology. Anyone can take control. Anyone can shape the world.

Working together

Every day teachers like you empower the next generation to build technology, and make amazing art, games, music, and more. Our curriculum is used to teach computer science, coding, and digital literacy in creative ways. Together we can demystify hardware and software so young people can take control, and change how the world works.

With help from our Champion Educator Community we've created the Kano Curriculum to help you better integrate computing and coding into your classroom, and help students develop a DIY mindset. There is a mix of teacher-led lessons and student-led learning, that considers different abilities. You don't have to be a computer science teacher, or have a background in coding to teach with Kano. These lessons are designed to get you started with creative computing, no matter your level of experience.

Who uses Kano?

Over 4,000 classrooms, clubs, camps, and community programs use Kano to engage learners in understanding and participating in the digital world. With Kano, you are part of a global community who's aim is to make computing accessible not just for learners, but also teachers.

Why is Kano valuable?

In a world full of technology, social media, and data, Kano Education is part of a movement to grow new innovators, and creative thinkers to address some of the challenges we face as a global society. Kano is the best tool to get the next generation started, bringing them into a world of STEAM, 21st century skills, and differentiated learning.

STEM, STEAM, STEAMED...!

STEM (Science, Technology, Engineering, Maths) is becoming more popular. But what is STEAM? The 'A' stands for 'Art'. And hands up who has heard of STEAMED (add Entrepreneurship and Design on the end)? Whatever version you go for it is clear that problem solving with technology is critical to any future jobs. But STEAM skills do not need to be limited to these subjects, they can be cross-curricular.

Our projects push students to develop STEAM skills that can be used in any class. Teachers and learners can choose projects they feel are relevant.

Future skills

How we teach must reflect how our students learn, the world our they will go out into, a world they will shape. Together we can use an approach that combines computing, coding, stories, and creativity to promote deeper learning in a hands-on way, preparing the next generation for this future world Kano's technology, along with our guided lesson plans, ensure that we weave the 4Cs into teaching and learning:

1. **Creativity and Innovation**

2. **Critical Thinking and Problem-Solving**

3. **Communication**

4. **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

Start by following simple steps to build the kit, different students may build at different paces, but that's ok! With our coding apps start with the early challenges to get familiar with each app and learn how to use it. Then those of an intermediate ability can move through these challenges quickly and start creating! You'll find differentiated learning in these lessons too - look out for the level shown on each lesson and you'll be good to go.

"Kano engages children by giving them ownership over the computer"

Cory Roush
Hero Teacher

Lesson Overview

Unit objectives

It's not just about making sure learners develop math and reading skills, but also skills to make them thoughtful and creative human beings.

The Kano Education curriculum is designed to help you and your learners feel empowered and confident around technology, and the design process. Working with teachers, all over the world, discussing the things that matter in the classroom, we created a curriculum that not only focuses on hard skills like programming and building a computer, but also on soft skills that will stay with learners throughout their lives.

Your students will get to the fun of building the Kano PC and learning how to code creatively, but first let's give them some time to practice problem solving, and feel confident in tackling an unknown task.

Each unit has their own unique objectives developed around core skills, and careers in the STEM field.

Unit 1: Be a Problem Solver

The objective is to help learners understand what it means to be a problem solver and persevere. Learners then develop a list of skills they can use when they find themselves in a difficult situation.

Unit 2: Be a Technician

Students get to build their own computer! They gain a general understanding of what a computer is, and the four main components (input, storage, processing, and output) that make up all computers. Learners will also develop skills around identifying problems, diagnosing issues, and isolating problems, so they can fix their computer.

Unit 3: Be a Programmer

Let's code! Students will explore Make Art and Kano Code. They'll learn to create art, games, and music with both block based and text based code, and understand basic programming principles of loops and variables.

Unit 4: Be an Engineer

Your learners now know what parts make up a computer, but what do each of those parts do? In this unit we focus on specific components in the Kano PC, learning how they work.

Unit 5: Be a Designer

More challenge based, focusing on developing design thinking skills. Here learners will be given a specific coding challenge in Make Art or Kano Code, and will design the best code to meet the challenge requirements.

Unit 6: Be a Creator

More of an open play or "sandbox mode" for learners, where they are given a general theme, but can make on their own. This unit can take as long as you need for a learner to create a final project. Let them play and explore.

US and UK curriculum standards

All our lessons align to US and UK standards. So our way of making, doing, and playing is also backed up with real learning outcomes.

Individual lessons identify the US standards they conform to, but as the UK ones are quite long, and we don't want to fill this document up by repeating them over and over, we've decided to list them just here. You can thank us later.

Units 1, 2, 4

Key stage 1

- Use technology safely and respectfully, keeping personal information private; identify where to go for help and support when they have concerns about content or contact on the internet or other online technologies.

Key stage 2

- Understand computer networks including the internet; how they can provide multiple services, such as the world wide web; and the opportunities they offer for communication and collaboration.
- use technology safely, respectfully and responsibly; recognize acceptable/unacceptable behavior; identify a range of ways to report concerns about content and contact.

Key stage 3

- Understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems.
- Understand how instructions are stored and executed within a computer system; understand how data of various types (text, sounds, and pictures) can be represented and manipulated digitally, in the form of binary digits.

- Understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognize inappropriate content, contact and conduct and know how to report concerns.

Key stage 4

- Develop their capability, creativity and knowledge in computer science, digital media and information technology
- Develop and apply their analytic, problem-solving, design, and computational thinking skills

Units 3, 5, 6

Key stage 1

- Understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions
- Create and debug simple programs
- Use logical reasoning to predict the behavior of simple programs
- Use technology purposefully to create, organize, store, manipulate and retrieve digital content

Key stage 2

- Design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts
- Use sequence, selection, and repetition in programs; work with variables and various forms of input and output
- Use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs

Key stage 3

- Create, re-use, revise and re-purpose digital artifacts for a given audience, with attention to trustworthiness, design and usability

Key stage 4

- Develop their capability, creativity and knowledge in computer science, digital media and information technology
- Develop and apply their analytic, problem-solving, design, and computational thinking skills

Lesson plan pedagogy

All Kano Education lessons are designed with a clear structure in mind that you can adapt to your learning environment.

We use scaffolding to help learners acquire new knowledge. The scaffold provides a temporary framework that is put up for support, 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

    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.

    c. 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%.

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? 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.

    c. This is the point where the educator works with the learners to learn a new concept. The teacher talks 40% and learners talk 60%.

3. Challenges

a. This is the time where learners explore, and it should be the bulk of activity time. 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. When you are making lessons, make sure that the activity in some way:

    ii. Links to your greater objective.

    iii. Helps learners focus and work toward the objective.

    iv. 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 World community.

b. What questions, processes, or steps can you use to help learners evaluate themselves? Is this in the form of remodeling what was explored by rethinking in new ways? Is it with some type of formal evaluation?

c. What can you do to push learners to rethink what they created? How can we check for understanding?

5. Closing

a. Wrap up the day in some type of closure. Is it giving a homework assignment? Is it reflecting on what they've learned in their **Hacker Notebook**?

b. This is the last remark you make for the day. What is the closing thought you want to get across? This section will also connect to homework examples.

How to use worksheets

Each lesson comes with worksheets to print and use. Worksheets are split into three parts:

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 where different code blocks live.

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 students learned. For example, in the "Intro to Kano Code" 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 done **after** the lesson. In the "Creator" section, learners are asked to be creative and think of new ideas, designs, or code. For example, students 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!

Questions and answers

So you have everything in one place, each lesson is self-contained. Worksheets can be found at the end of each lesson, along with an Answer Sheet for that lesson.
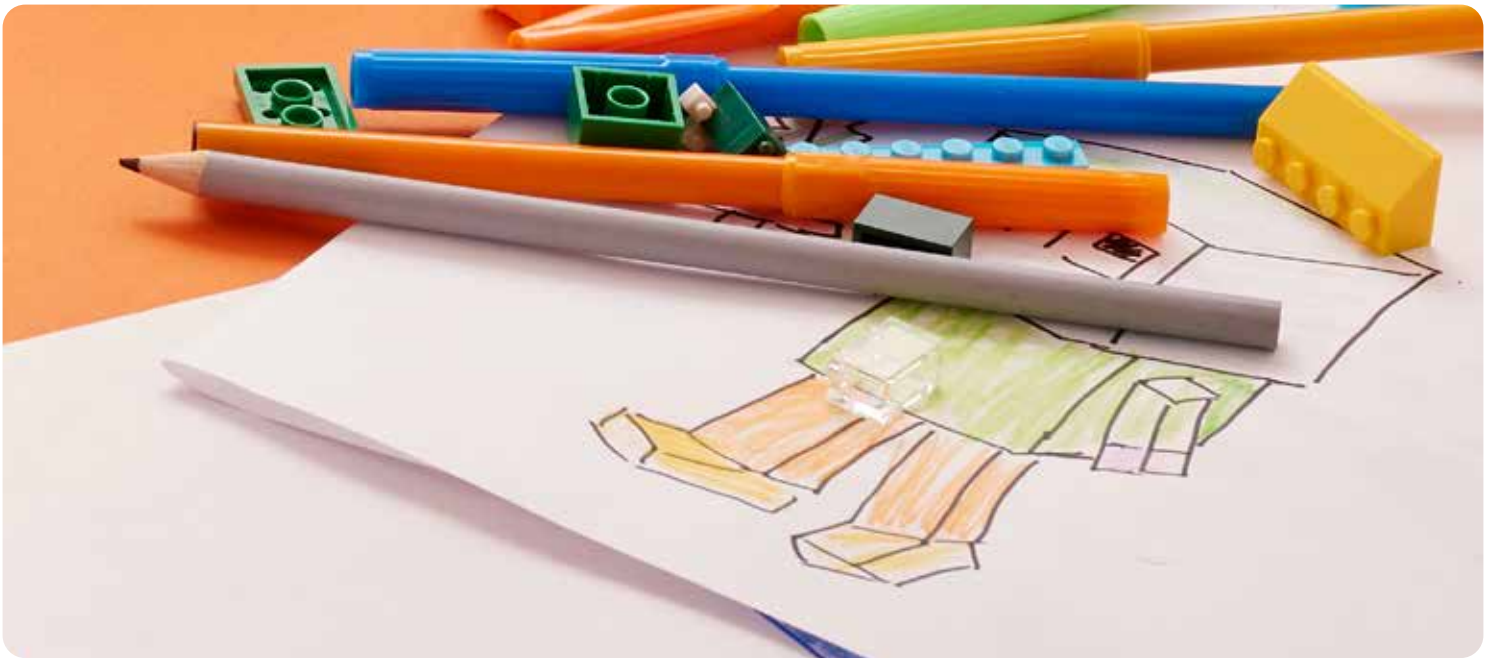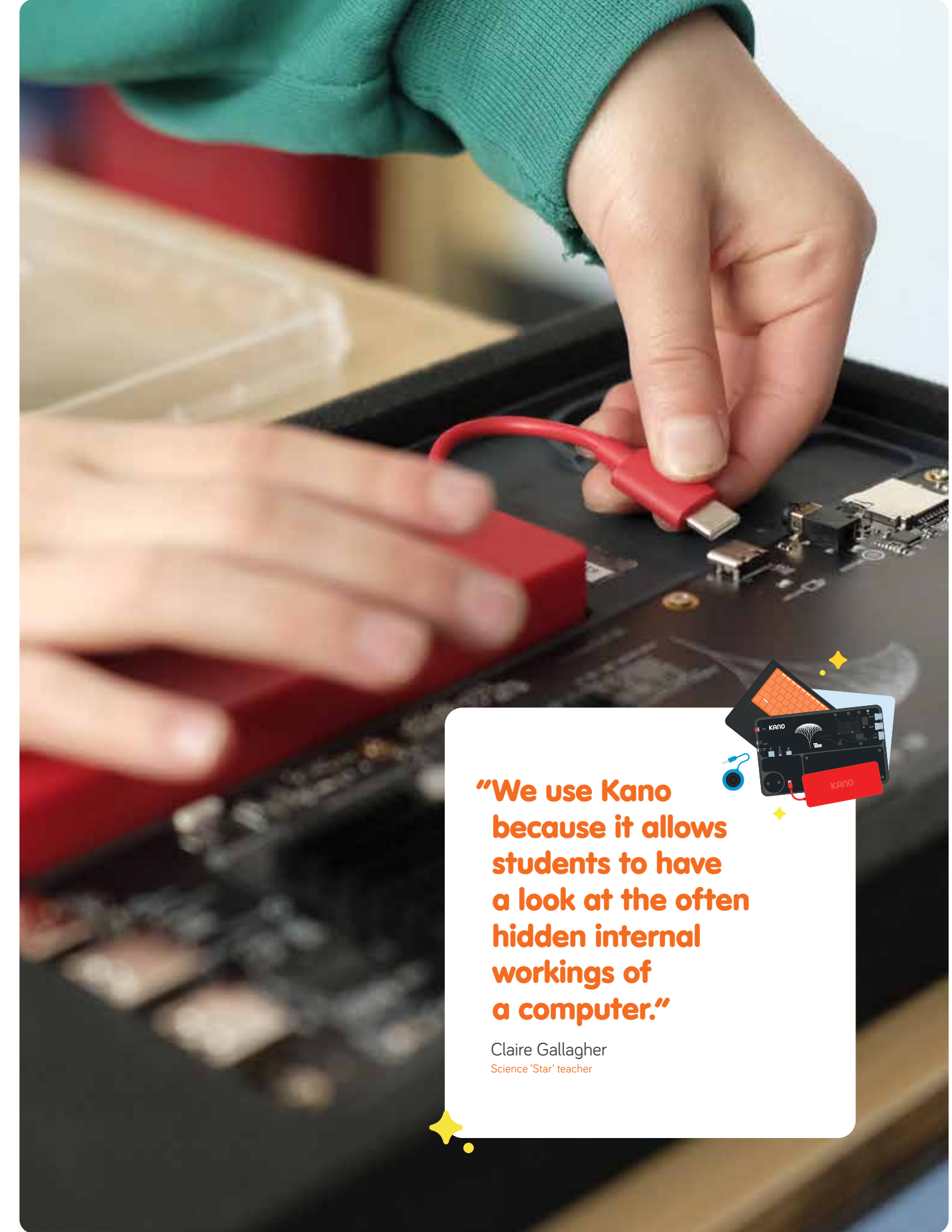
Hacker Notebook

The Kano Education curriculum is designed to help teachers deliver creative, fun, and engaging lessons in your class. But when should your students take notes?

In each lesson we tell you when it is a good time to use a 📓 **Hacker Notebook** - a place your students should write down all their thoughts, share their sketches, and draw doodles. Students should get in the habit of making a daily log in their 📓 **Hacker Notebook**, during and after every lesson. It is a document they can refer back to in later lessons.

We recommend you use a simple blank notebook or OneNote if you have access to it.

"We use Kano because it allows students to have a look at the often hidden internal workings of a computer."

Claire Gallagher
Science 'Star' teacher

UNIT 2

Be a Technician

Level:
Beginner

Duration:
1 h 45 m

Build a Kano PC

Students will discuss what a computer is, identify four things that make a computer, and then build their own Kano PC.

Objectives

⚡ Understand what a computer can do

⚡ Follow the simple steps, build a Kano PC

⚡ Play with the apps

What you need

Kano PC boxes

Kano PC story books

Make Art

Standard alignment

K12 CS

- Computing Systems.Troubleshooting; Algorithms and Programming.Algorithms
- Algorithms and Programming.Control; Algorithms and Programming.Program Development

US Computer Science Teachers Association

- **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

Exploration Activities

Linking
🕐 10 mins

Today your class will build a computer all by themselves! Before they do, ask them to write down as many parts of a computer (mouse, speaker, screen, etc) they can think of. They have 2 minutes.

Then get your class to share their answers and write them on the board so the everyone can see the parts. Discuss the difference between hardware and software.

Engage
🕐 5 mins

Something to say:
We were able to name a lot of parts for a computer, some we knew already, some we just learned. Today, we are going to see how all these parts interact to make a computer. By the end of the day we will build, and power-up a working computer.

Challenge 1   **What can computers do?**

🕐 5 mins

Ask learners what they think computers can do. Write their responses down.

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

Challenge 2   **Build a Kano PC**

🕐 30 mins

Now it's time for your class to build their own computer. Put a Kano PC box in front of each student.

Have you ever built your own computer? Today is an exciting day because that's exactly what we're going to do.

You have a box of Kano PC parts. Inside the box is a book that shows you how to build your computer. Make sure to follow the steps inside.

If you get stuck when building your computer, ask a neighbor for help, if they don't know how to fix it, ask someone else in the class. Try to ask at least 3 other people before coming to me, as I know you can all build these computers together!

Let's do a countdown. When I say "Kano" we will open our boxes. 1....2....3....KANO!

Teacher tip!

Clap and cheer as learners power up their computers and the lights come on. They will be excited so keep the energy up!
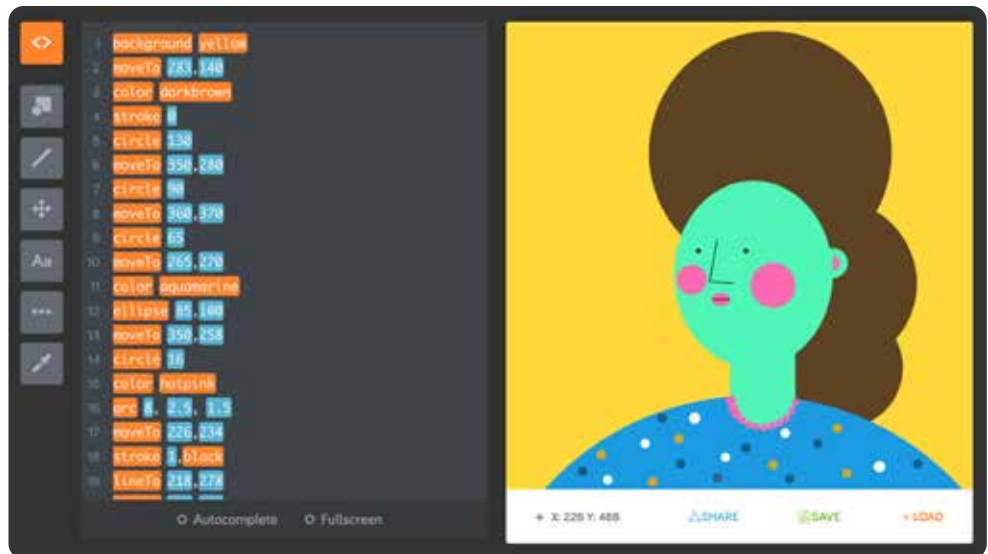
Challenge 3

Explore the Kano PC

🕐 10 mins

If you have a little time, let the students play around and try out the different apps. Direct them to Make Art so they can start creating their own art!

Conclusion

Sharing
🕐 5 mins

Once the computers are picked up, ask students to fill out their 📖! **Hacker Notebook**.
Ask the class to answer these questions:

- What was your favorite part about today's session?
- What was your least favorite 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 a question each.

Closing
🕐 5 mins

Ask your students to go home tonight and draw or write what it was like to build a computer. Did they enjoy it? Were they excited? What was the computer like? They can do this in their 📖! **Hacker Notebook**!

Also, pass out the "**Build a Kano PC Worksheet**" to be completed at home.

Clean up
🕐 10 mins

As you start using Kano in class, how you clean up will become important. Take 10-15 minutes to practice your clean up routine with your students.
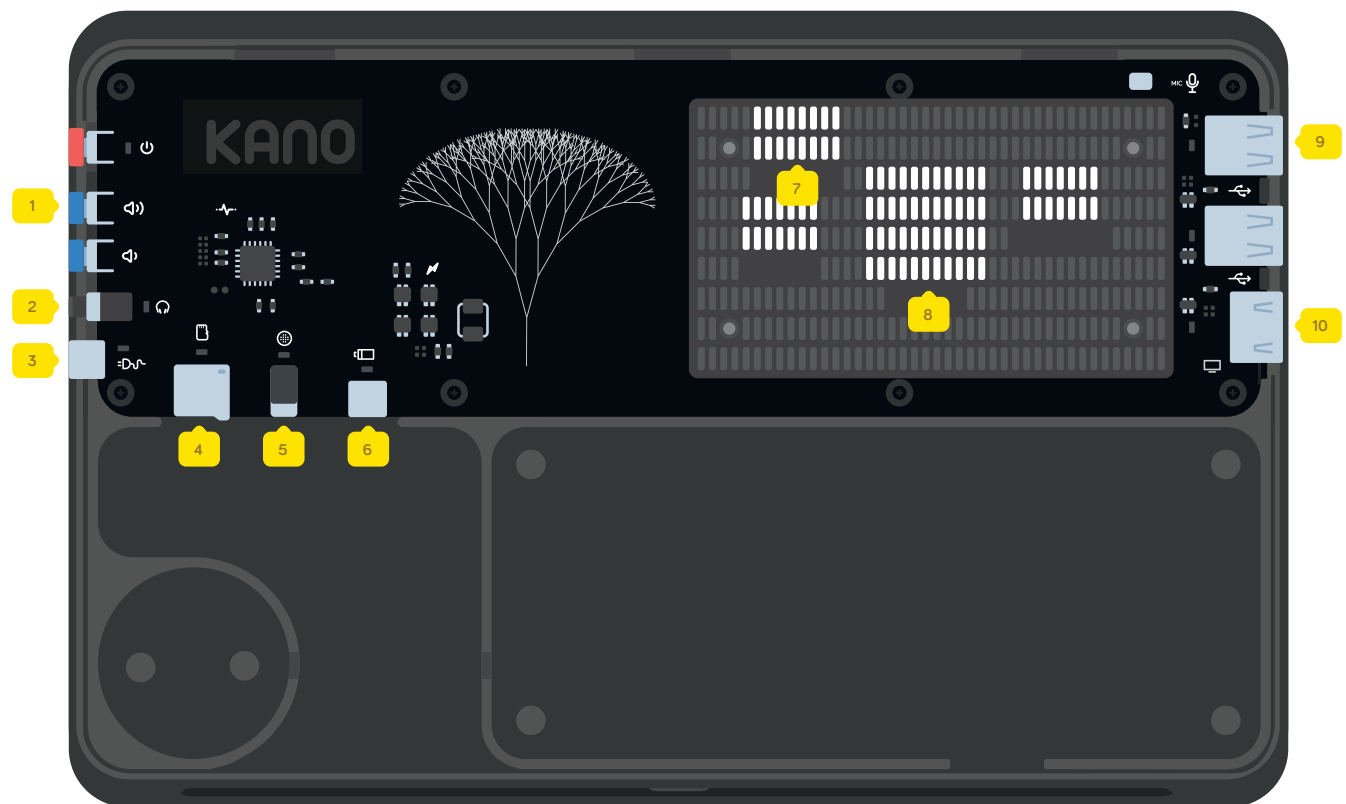
Build a Kano PC

Name: _____

Date: _____

Explorer

Can you identify all the parts of the Kano PC PCB? Look through the book for help.

1 _____   6 _____

2 _____   7 _____

3 _____   8 _____

4 _____   9 _____

5 _____   10 _____

Build a Kano PC

Name: _____

Date: _____

....

Creator

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

Impact

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?

Your answer: _____

_____

_____

Build a Kano PC

Explorer Answer

1. Volume

2. Headphone Jack

3. Power Socket

4. SD Card Slot

5. Sound

6. Power

7. Flash Storage

8. Processor

9. USB Port

10. HDMI Port

Creator Answer

Let learners be creative on what their own computer would be like. The main focus is to say what components it needs to turn on, and how it is unique.

Impact Answer

Answers may vary. The important thing is for students to discuss how much technology has changed.

Be a Programmer

KANO EDUCATION

Level:
Beginner

Duration:
2 h 40 m

Intro to Kano Code

Students start exploring Kano Code and begin making their own art, animations, music, and more.

Objectives

⚡ Students will understand how to access Kano Code

⚡ Identify and use the features of Kano Code to make their own creations

What you need

▣ Kano PC

▣ Kano Code app

▣ Pen and paper

Standard alignment

K12 CS

Computing Systems –Troubleshooting. Algorithms and Programming –Control. Algorithms and Programming – Algorithms. Algorithms and Programming – Program Development.

US Computer Science Teachers Association

- **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

Kano Code creations

Some inspiration from the Kano World community

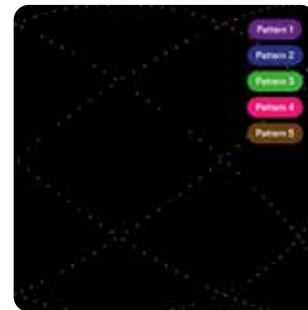With a little curiosity, creativity, and coding people make some amazing things.

My fav colors
by AudPep23

City Generator
hicks

Pizza Clock
by builtFromBlocks

Pattern Changer
by Hediho

Silly String Maker
by holographicleah

Cloudy Sunset
by AlexMaxine

Exploration activities

Linking
🕐 5 mins

Take 5 minutes to draw a picture of your favorite app and write 5 sentences explaining why it is your favorite app.

Engage
🕐 5 mins

Ask a few learners to share their favorite apps and why. Let learners who have similar app love raise their hands or show their support for their app.

Apps are pretty awesome. From Pokemon Go! to WhatsApp, apps can do a lot of things. Today we're going to play with an app called Kano Code. With it we will learn how to use code to create our own fun experiences, art, animations, and more.

Collect Computers
🕐 5 mins

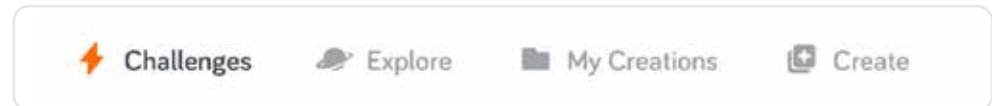Retrieve computers, turn on, log in.

Challenge 1

Welcome to Kano Code

🕐 30 mins

Let's get coding! Ask your class to open up **Kano Code**.

When open you will see a few options:

- **Challenges** is where you learn to code with guided step-by-step instructions. There are a number of different challenges that increase in difficulty.

- **Explore** Get inspired by the Kano World community. Open any creation, and click "Remix" to see and play with the code.

- **My Creations** Anything you are making will be saved here. You can also share your creations to the Kano World community.

- **Create** This is a playground mode where you can create from a blank slate.

First, let's check out the coding tool. Click on **Create**. You should see this screen:
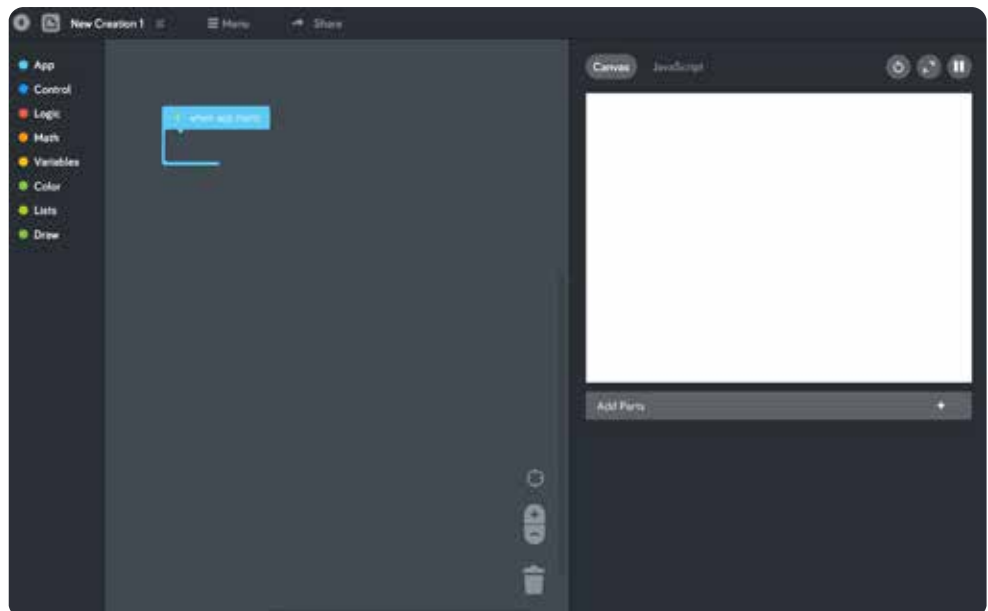
In Kano Code, the left side is where you add code blocks and the right side is your canvas – where your creation will appear.

Challenge 1
(Continued)

Kano Code uses code blocks that snap together like puzzle pieces. They are organized into trays on the left side of the coding space:

App   Code blocks that tell your app how to respond. For instance: **When app starts** run the code.

Control   This is where the loops and timed processes are kept. They tell your computer how to act.

Logic   Logic blocks such as: **if**, **else if**, else statements, comparison and Boolean (**true** / **false**) blocks.

Boolean blocks are **true** / **false** statements that help us determine what we should do in different scenarios. Think how you would act in real life: **If** a store is open you go inside, **else** you leave. So…

If the store is **true** (open), go inside. **If** it is **false** (closed) then leave.

Math   All the math based blocks, including: numbers, operations, random selection, and comparison.

Variables   Create and use variables. A variable is a place holder for something. For instance x and y are place holders numbers in algebra. However, variables in code can hold **data**, **numbers**, **text**, and more.

Color   With these blocks you can add a color, change the hue of a color, or select a random color.

Lists   This is where lists live. A list is known as an array in programming, and it is a way store a lot of information at once (like a box holding a lot of objects).

Draw   Here are the blocks that let you move around the canvas using x and y coordinates to draw a picture. You can draw different shapes, draw thick and thin lines, and more.

Challenge 1

(Continued)

Under the canvas you will also see an **Add Part** button.

Add Parts ✛

The "Add Part" function will let you add sounds, stickers, data, buttons, text, and other parts that will make your creation more interactive. All parts come with their own unique code blocks which will appear in new trays on the left.

Why not try spending a little time adding parts, and dragging code blocks onto the code space, see how it feels. Did you make anything happen by accident?

When the time is up make sure to exit the code editor using the arrow in the top left of the screen.

Get a more detailed explanation of each code block in this document

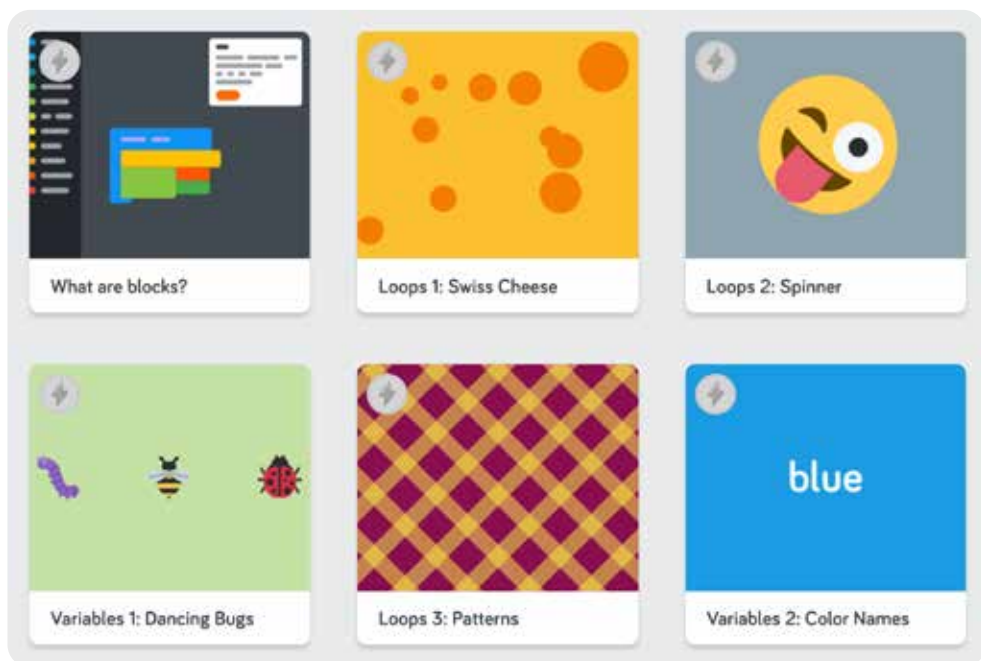**Challenge 2**

Coding basics

🕐 30 mins

Time for your students to learn to code. Each challenge has step-by-step instructions for everyone to follow.

So we just learned about code blocks, parts, and the canvas. Now, let's actually make some AWESOME creations!

In the main menu click on Challenges. and you will see a list of coding challenges. Click on the first one: "Coding Basics".
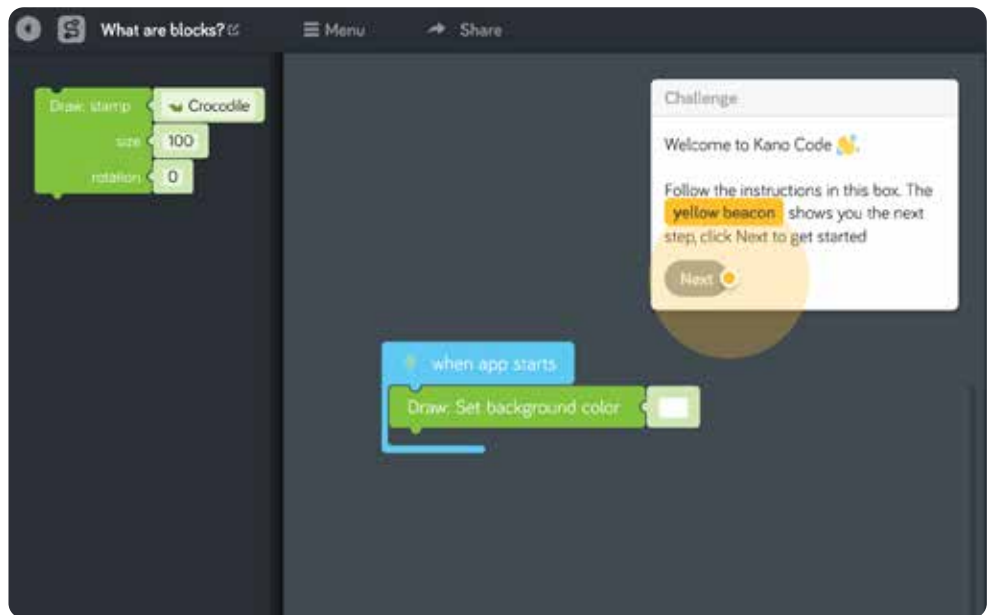

Coding Basics

Then click on the first challenge.

What are blocks?   Loops 1: Swiss Cheese   Loops 2: Spinner

Variables 1: Dancing Bugs   Loops 3: Patterns   Variables 2: Color Names

Challenge 2
(Continued)

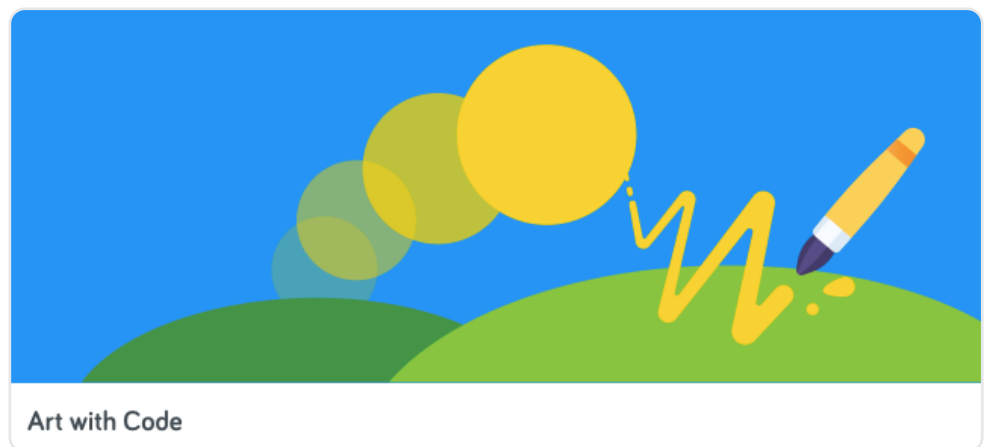Instructions will appear in the top of the screen. Simply follow along.

Challenge 3

Create art with code

🕐 30 mins

Now that we've learned how to make with code, and have an understanding of basic coding principals, let's create some art. Go through the "Art with Code" challenges.
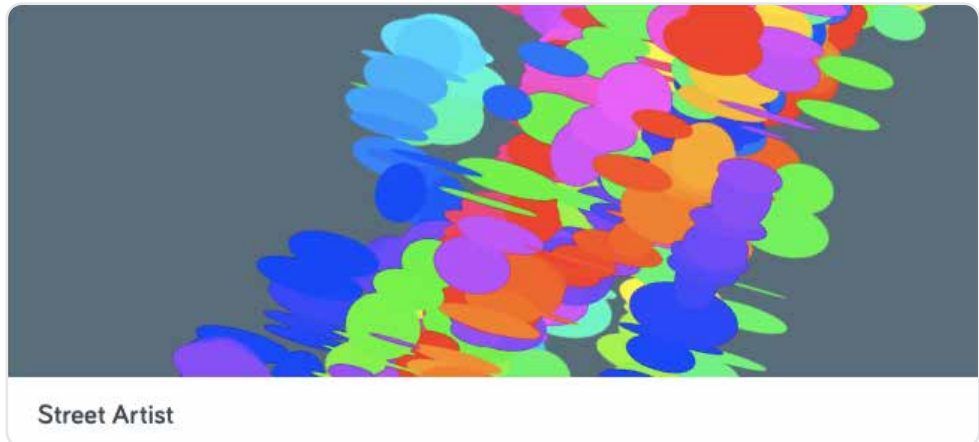

Art with Code

Challenge 4

Become a digital street artist
🕐 30 mins

Now that you have learned how to use creativity and data to code, let's learn to create different brushes and effects. Go through the "Street Artist" challenges.
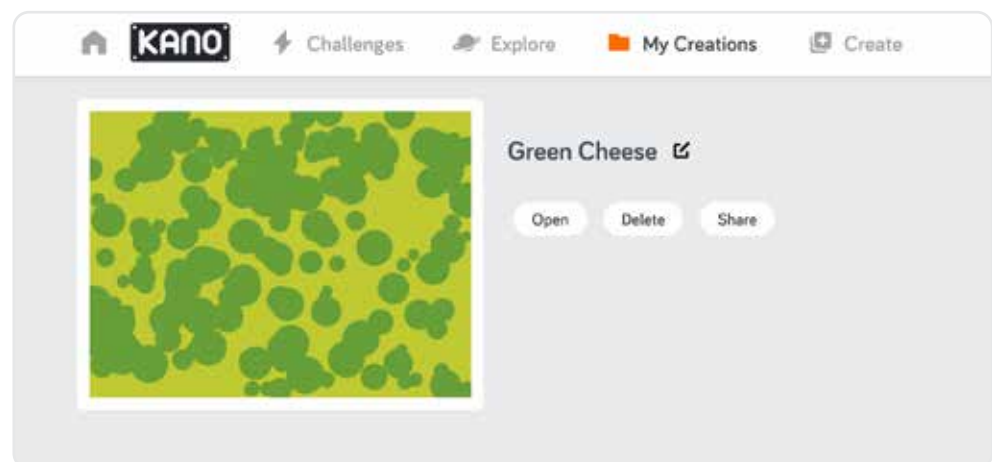

Street Artist

Conclusion

Sharing
🕐 15 mins

Use the remaining time in class to share what people have made, and reminding students to share to the Kano World community.
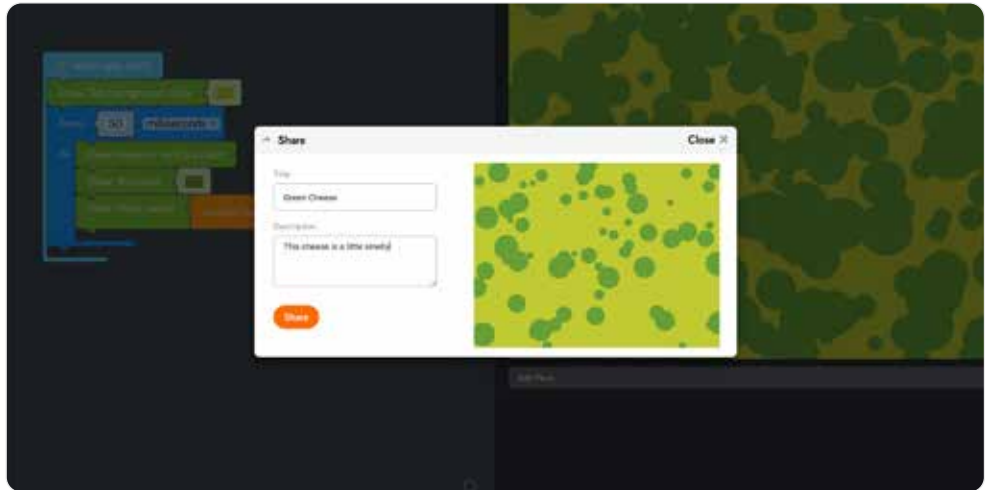
They can see their creations by clicking on **My Creations**. Clicking "Share" will share it directly to the Kano World community.

Conclusion
(Continued)

If they want to tweak it a little, they can open it up, make their changes before clicking share at the top of the code space.

Ask learners to find one partner to work together 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 ![notebook icon] **Hacker Notebook**, learners should write down one idea they have for the next time they use Kano Code.

Closing
🕐 5 mins

Have learners fill out the "Intro to Kano Code" worksheet.

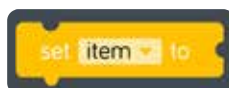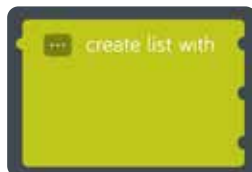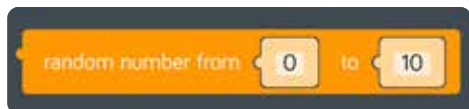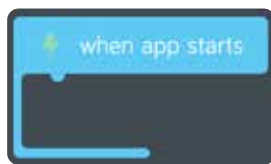## Cleanup
🕐 5 mins

Power down and put away the computers.

Intro to Kano Code

Name: _____

Date: _____

....

Explorer

In Kano Code you use different code blocks to make your own creations. In the code space, there are multiple trays that contain those code blocks. Match the code block with the tray (draw a line connecting them):

when app starts	**Variable**
random number from 0 to 10	**App**
if / do	**Math**
random colour	**Logic**
create list with	**Color**
Repeat 10 times	**Lists**
Draw: Set background color	**Draw**
set item to	**Control**

KANO EDUCATION

Intro to Kano Code

Name: _____

Date: _____

....

Programmer

Below are three examples of Kano Code blocks. In your own words, describe what each block would do in a creation. Could you also explain which tray they belong to?
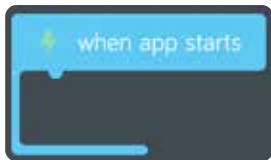
Your answer: _____

_____

Your answer: _____

_____

Your answer: _____

_____

Intro to Kano Code

Name: _____
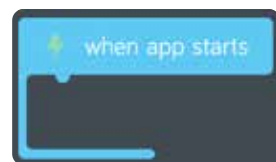
Date: _____

Creator

In Kano Code you can create interactive and animated code. What do you think you will create next time on Kano Code? Draw an image of what you want like to create below and label it with the code blocks you will use!

Intro to Kano Code

I knew that

Explorer Answer
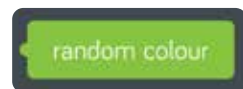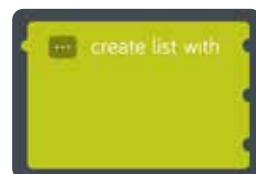
Block		Category
when app starts		**App**
random number from 0 to 10		**Math**
if / do		**Logic**
random colour		**Color**
create list with		**Lists**
Repeat 10 times		**Control**
Draw: Set background color		**Draw**
set item to		**Variable**

Intro to Kano Code

Programmer Answer

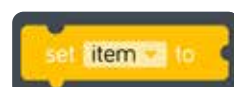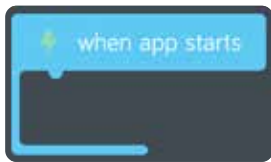This block lives in the **App** tray. It is used to start the code, so when the app starts the code will run everything inside it.

This block lives in **Logic**. It is used to create a conditional statement, so when this block is used it will first check to see if something happens. If it happens (is true) then it will do the next block inside the conditional block.

This block lives in the **Control** tray. It is used to create a loop, so when this block is used it will loop the code blocks inside it 10 times.

Creator Answer

Let learners be creative in their designs. There should be a clear drawing with labeling that shows their thinking and ways to create the code.
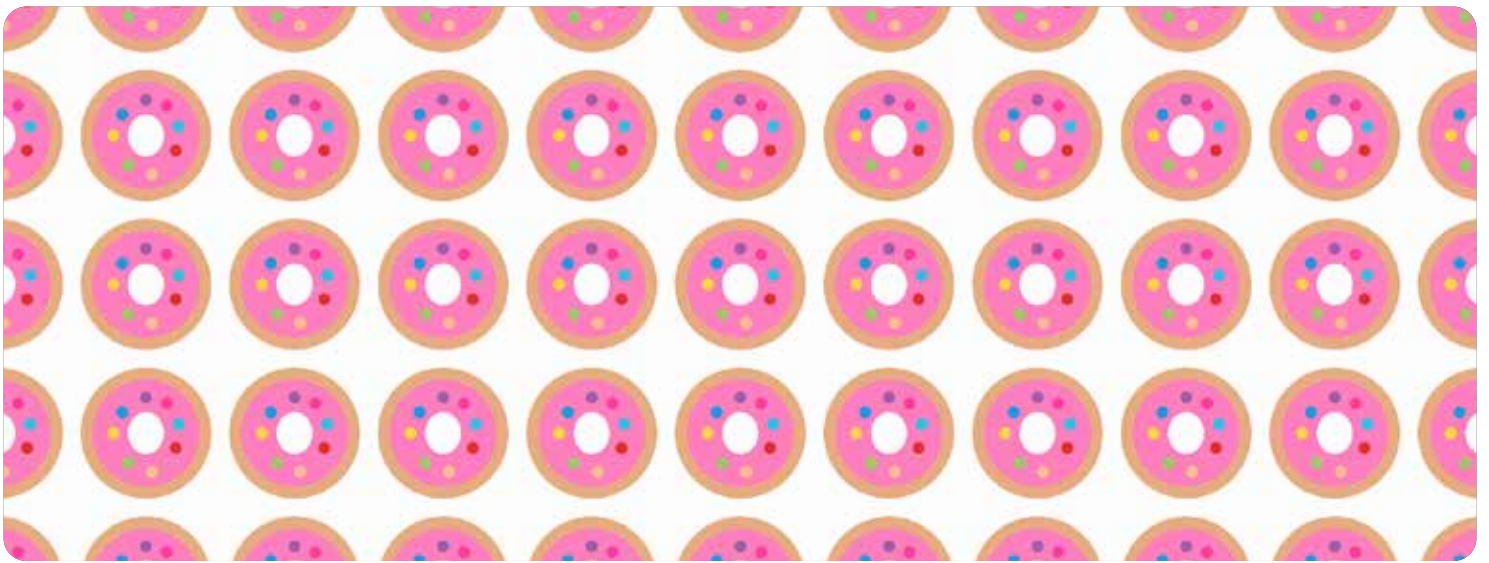
△ **Level:**
Beginner

🕐 **Duration:**
2 hours

Intro to Make Art

Your students will begin to use Make Art to create their own masterpieces.

Objectives

⚡ Students will learn how to open Make Art

⚡ Identify the key features of Make Art and use them to create their own art

What you need

⌨ Kano PC

🎨 Make Art app

📝 Pen and paper

Standard alignment

US Computer Science Teachers Association

L1:6 CT Computational Thinking

- Understand and use the basic steps in algorithmic problem-solving

- Develop a simple understanding of an algorithm

- Understand the connection computer science and other fields

L1:6 CPP Computing Practice and Programming

- Construct a program as a set of step-by-step instructions to be acted out

- Implement problem solutions using a block based visual programming language

Make Art creations

Some inspiration from the Kano World community

With a little curiosity, creativity, and coding people make some amazing things.
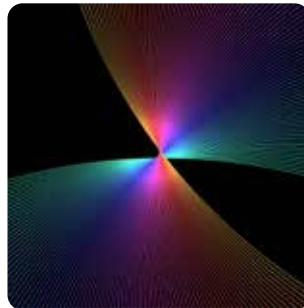
INK COMBO!!! X100!
by coding_Daniel

The lion sleeps tonight
Cheese_Man

Haru as a Cat
by Honeyflower

Peppermint Butler
by platypusmaster

Snake For Krismarkov!
by ashi

^_^
by asal

Exploration activities

Linking
🕐 15 mins

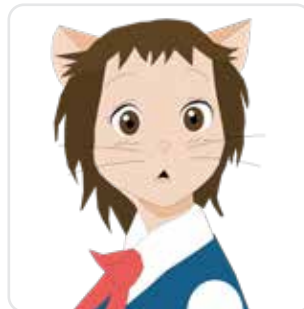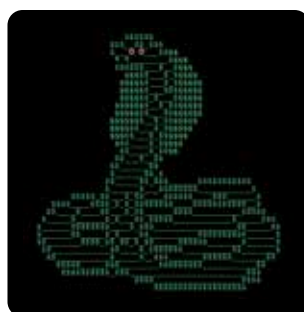Ask your students to draw anything, using a pen and paper. It can be as simple or as complex as they want but they only have 5 minutes. Put up a countdown clock to get them energized to go!

Engage
🕐 5 mins

Tell your students to turn and talk to each other for 1 minute each. Focus the conversation around these questions:

- What is their favorite program to edit or create images (Paint, Photoshop, Code)?

- Do they think they can transfer their drawings to the computer with one of those programs? If so, how?

After they are finished with the 2 minute turn and talk, discuss how computers are becoming used more often in art, from **Disney films**, to **3D printed jewelry**, to **laser cut wood prints**, to **art made from code**! Art is always changing and using the latest technology to create new exciting things. Today your students will learn code to create art and share it with the world!

Distribute computers
🕐 5 mins

Retrieve computers, distribute to students, turn on, log in.

| **Challenge 1** | ## Get to know Make Art |
| | 🕐 30 mins |

These challenges will build upon each other, becoming more difficult as you progress.

To start, click on the **Make Art** app.

Once the app is open they will see a couple of options:

- **Challenges** is where they will learn to code art with guided step-by-step instructions. There are a number of different challenges that increase in difficulty as they work through them. They can also remix the art to make it their own at the end of every challenge.

- **Playground** This is where your students can create their own art from a blank slate. There are no walk-throughs or rules, they can let their imagination run wild.

First, let's check out the coding tool. Click on **Playground**. You should see this screen:
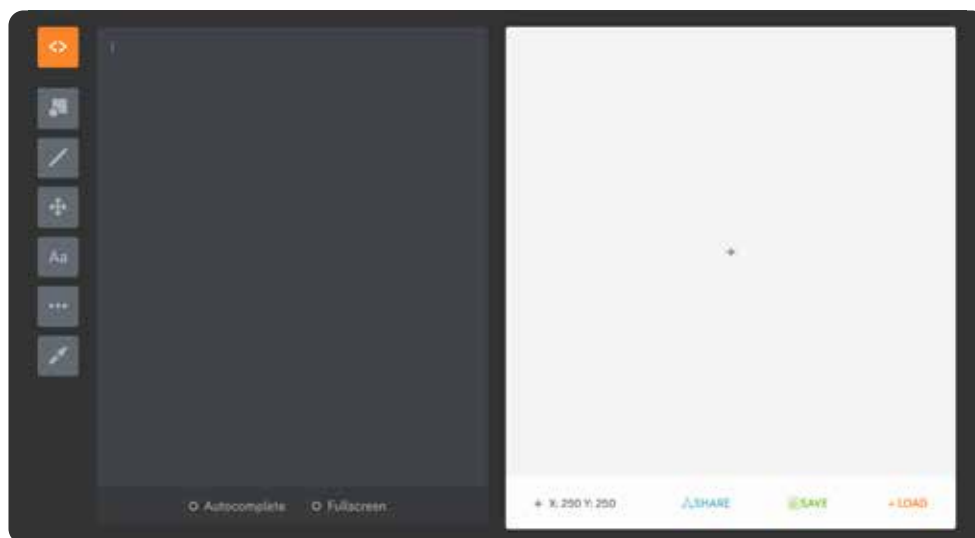
The left side is where you type the code, and the right side is the canvas – where you will see your creations come to life.

Can you see a flashing cursor on the left side? Try hitting **Enter** a few times on your keyboard. You will notice numbers appear. This is a number system to help you create individual lines of code.

Challenge 1
(Continued)

Now, ask your students to move their mouse cursor around on the canvas. They should notice there are numbers changing in the white bar at the bottom. These are "**x**" and "**y**" positions. In Make Art you are creating pictures on a grid, and you use x and y coordinates to move the **+ drawing cursor** to specific positions. You can use your mouse to help you quickly see where on the grid you need to draw!

```
+ X: 120 Y: 165          ⚠SHARE          🖫SAVE          ▲LOAD
```

```
1   moveTo 120 , 165 |
```

Now, lets talk about the 7 gray boxes on the left. These are buttons that give you useful coding information, and let you add code quickly if you are stuck.

Code
This is your main code space, where you are typing code and making art. Click this button to return to your creation.

Shapes
Hit this button to see a series of shapes: circle, ellipse, rectangle, polygon, and more. Just click the + button next to the shape you want to make.

Lines
With this button you can draw lines of a certain size, and to a certain point.

Position
To draw the best pictures we must learn to move the **+ cursor** around the canvas. Here, see how to use x and y to move the **+ cursor** a certain distance away, and to a specific position.

Text
Want to say something in words? Use this button to learn how to write a message, change the font size, and make it bold or italic.

General
Shows how to create a loop and get a random number in a range.

Colors
What is art without color? In the color button you will see how to create with color. Set the background color, change the color in use, change the width and color of the stroke, change transparency, and more.

Challenge 1
(Continued)

Get your students to play for 5 minutes, see if they can make anything. Try clicking some of the buttons like **Shapes** and **Colors** to see some of the code they can add. Click a **+** button to add that code.

Challenge 2   Explore basic challenges

🕐 10 mins

Time to learn to code some suns, flags, faces, and balloons. Don't forget to ask your students to share their masterpieces on Kano World!

Basic

Challenge 3   Playground challenge

🕐 10 mins

Are your students ready for a challenge? Have them open up the **Playground** and attempt the following scenarios:

Scenario 1:

Can you draw a drink you would have in the current weather? For example, if it is cold draw a hot chocolate! If it is hot draw a glass of lemonade.

Scenario 2:

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

Challenge 4   ## Classmate drawing challenge
🕐 10 mins

Challenge a classmate! Pair up your students. Have each one write a drawing challenge on a piece of paper. Tell them to make it reasonable and something that can be created in Make Art. Make sure their partner doesn't see!

Once they have their drawing challenge worked out, they should give it to their partner.

Can both partners finish their drawing challenge before the time runs out?

··

Challenge 5   ## From drawing to code
🕐 10 mins

Wow, your class has gotten far super-fast!

Now, remember the drawing they did at the very start of the lesson? Can your students do the impossible and turn their drawings into CODE?

They can save their work with the SAVE button. Or share it to the Kano World community for the kudos and LIKES they deserve.

| + X: 120 Y: 165 | ⚠ SHARE | 🖫 SAVE | ▴ LOAD |

Conclusion

Sharing
🕐 15 mins

Your students should have finished Challenge 4 – **Classmate Drawing Challenge**.

Ask them to critique their partner's artwork. Did it make the grade? Did it successfully complete the challenge? Ask them to grade the drawing out of 3.

3 = Great
2 = Okay
1 = Not great

Ask the challenger to write the grade, and give 2 lines of feedback on a piece of paper; one helpful comment to make it better, and one positive comment.

Educators Note: It is recommended you model this to the students so they fully understand the task.

Closing
🕐 5 mins

Tell the students you hope they enjoyed this introduction to Make Art, and they will be doing more exciting work in the future.

As students leave, tell them to turn in their partner's grade and feedback for their. Also, ask students to add what they've learned today in their 📖! **Hacker Notebook**!

Clean up
🕐 5 mins

Power down and put away the computers.

Intro to Make Art

Name: _____

Date: _____

Explorer

Write a brief description about each MakeArt feature. Think about what you can code with each feature.

Intro to Make Art

Name: _____

Date: _____

Programmer

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

_____

_____

_____

In the "Sunny Day" challenge you created code below. Which words or numbers could be changed to modify the outcome, and which words or numbers have to stay the same?

1. _____

2. _____

3. _____

```
1  background blue
2  color yellow
3  circle 150
```

Intro to Make Art

Name: _____

Date: _____

Creator

Today you learned the basics of Make Art. But try challenging yourself!

Create a drawing using only three shapes – **rectangles**, **circles**, and **triangles**. You can use the three shapes as many times as you like, but you must use all three. Try to code this drawing tonight or in later in class.

Intro to Make Art

Explorer Answer

The gray space on the left is where you type out your code, the white space is the canvas that displays the code in image form

This button shows you the code to create shapes

This button shows you the code to draw lines

This button shows you the code to move the cursor and objects on the canvas

This button shows you the code to add text

This button shows you the code to create loops or how to get a random number

This button shows you the code to add or change color

Intro to Make Art

Programmer Answer

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

Syntax error means that in your code there is an error that is due to spelling, capitalization, or incorrect parameters. When you see this, Make Art will tell you where the syntax is. Go to the line where the error is and see if you can figure it out. You can use the buttons on the left to show what the correct code syntax should be. Also, if you click hint on the top right it will tell you what the correct code will be in a challenge.

In the "Sunny Day" challenge you created code below. Which words or numbers could be changed to modify the outcome, and which words or numbers have to stay the same?

In this code, you can change "blue," "yellow," and "150". You could also change "circle" to another shape. But "background" and "color" stay the same.

```
1  background blue
2  color yellow
3  circle 150
```

Creator Answer

Make sure that each shape (rectangle, circle, and triangle) is represented in the drawing. Some learners may be able to write out the correct code to create each shape as well!

KANO

KANO EDUCATION

Be an Engineer

1 1 1 1 1 0 1 1 0 0 0 1 1 1 0 1 1

Level:
Beginner

Duration:
45 m

Intro to How Computers Work

Students will get a brief introduction to the How Computers Work app to help them play with binary, sound, and more.

Objectives

⚡ Find and open the How Computers Work app

⚡ Understand that each part of a computer has a specific function

What you need

Kano PC

How Computers Work app

Standard alignment

US Computer Science Teachers Association

- **K - 2:** 1A-CS-02
- **3 - 5:** 1B-CS-01, 1B-CS-02
- **6 - 8:** 2-CS-01
- **9 - 10:** 3A-CS-01, 3A-CS-02

Exploration activities

Linking
🕐 5 mins

Ask your class a question...

What do you think the inside of your favorite computer looks like? It could be the Kano PC, a smart phone, or any other type of computer. In your **Hacker Notebook draw what parts make up your computer.**

Give learners a few minutes to write or draw something in their **Hacker Notebooks**. After 2 or 3 minutes see what everyone put down.

Engage
🕐 5 mins

Something to say:
Computers are everywhere, but they aren't made of magic. All the devices we use are made of parts that all perform a specific task to help make our lives easier. Today, you will learn more about what parts make up a computer and then do a little exploring to learn more about what makes them tick.

Collect Computers
🕐 5 mins

Retrieve computers, turn on, log in.

Challenge 1
(Continued)

How does a computer work?
🕐 10 mins

Time to delve into the different parts of a computer.

Building the Kano PC is a great way to see all the parts of a computer, but what do all the parts do? We can think of all the parts like a person. Each part of our body does something very specific that helps us to live and get things done.

For this activity draw a human body on the board. But make sure to add glasses, a backpack, and cellphone.

Below is a description of each computer component with a human counterpart. Draw each part on the board and connect it to your picture of the human body.

Have learners draw a human body in their 📓! Hacker Notebook and label each part.

- **Processor = Brain:** The processor is like the brain. It does all the thinking and makes everything work. The processor controls all the other parts in the computer. Just like your brain controls your body.

- **Motherboard = Skin:** The motherboard is like the skin and skeleton of the computer. It holds every part together and makes sure each part can work with one another.

- **Memory = Hands:** Memory is like the hands of the human body. If a person has more hands, they can do more things at once and multitask more efficiently. If someone has a job that requires two hands but they only have one hand, it will slow them down. But if a job requires one hand and the person has four hands, then it is pointless to have a lot of hands. Every program on your computer takes up RAM. More RAM = more programs can run at the same time more efficiently. RAM is measured in GB, and it is usually from 1GB to 8GB.

- **Power Supply = Heart:** The power supply is like the heart. Just like the heart has to pump blood throughout the body, the power supply has to make sure there is enough power for all the parts in the computer or it will not work. Power supplies are measured in watts and are usually anywhere between 300W all the way up to 800W+.

- **Flash Storage = Backpack:** Flash storage is like a huge backpack that is being worn at all times. It is where everything is stored. Pictures, movies, documents, are all stored in this backpack. The bigger the backpack, the more it could hold. Sometimes the backpack gets very messy because there is so much stuff in it so you would want to "defragment" it. What this does is it organizes everything in the backpack so it is easier to find stuff later. Hard drives are measured in GB and TB. 1000GB = 1TB.

Challenge 1
(Continued)

- **Graphics Card = Eyes:** A graphics card is like the eyes of a person with very bad eyesight. It lets you see everything that is happening but it needs eyeglasses (monitor) to show you. Without the graphics card, you can't see what you're doing. The video card requires a lot of power and when playing video games and it can get very hot.

- **Monitor = Eye glasses:** The monitor is like eyeglasses. It lets you see everything that is happening. Without it, you can't see anything. The monitor is connected to the video card.

- **Network = Cellphone:** The network is the persons phone.. It is how the person communicates to other people. How fast the person can talk to others depends on how fast the internet is.

Challenge 2

Navigating 'How Computers Work' app
🕐 10 mins

Now that we understand that computers are made from many parts, lets do a little exploring on our own.

Ask the class to open the "**How Computers Work**" app. They can find it on the desktop or in the Start Menu.
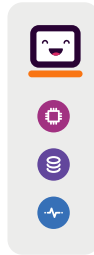
In the app you'll see an animated screen of different computer components.

Challenge 2
(Continued)

And on the left is a menu. If you click on the circle buttons, they will take you to all of the challenges. If you click on the smiling computer it will bring you back to the main page.

While you explore each challenge in the app, record what you learn in your 📓**!**
Hacker Notebooks. Make sure you visit each challenge and take notes!

Conclusion

Sharing
🕐 7 mins

In your 📓**! Hacker Notebook explain what was your favorite part you learned about and why. If there is another part you would want to learn about write it down in your notebook and explain what kind of app or game you would want to create with it.**

Closing
🕐 5 mins

You are becoming a computer master. When you get home today look at the other computers around your house. Do these computers have different parts or the same ones? Record your findings in your 📓**! Hacker Notebooks.**

Cleanup
🕐 5 mins

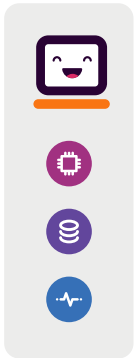Power down and put away the computers.

Intro to How Computers Work

Name: _____

Date: _____

Explorer

Can you match each icon with the correct computer component?

Flash Storage

Sound

Binary

Programmer

In your own words, can you explain how one of the components on your Kano PC works? You can use images to describe it!

_____

_____

_____

_____

Intro to How Computers Work

Name: _____

Date: _____

....

Creator

If you had to make a new part for the Kano PC, what would it be? Why would your Kano PC need it? Draw a Kano PC with the new part and explain how it might work.

Intro to How Computers Work

11111010010101001

Explorer Answer

Binary
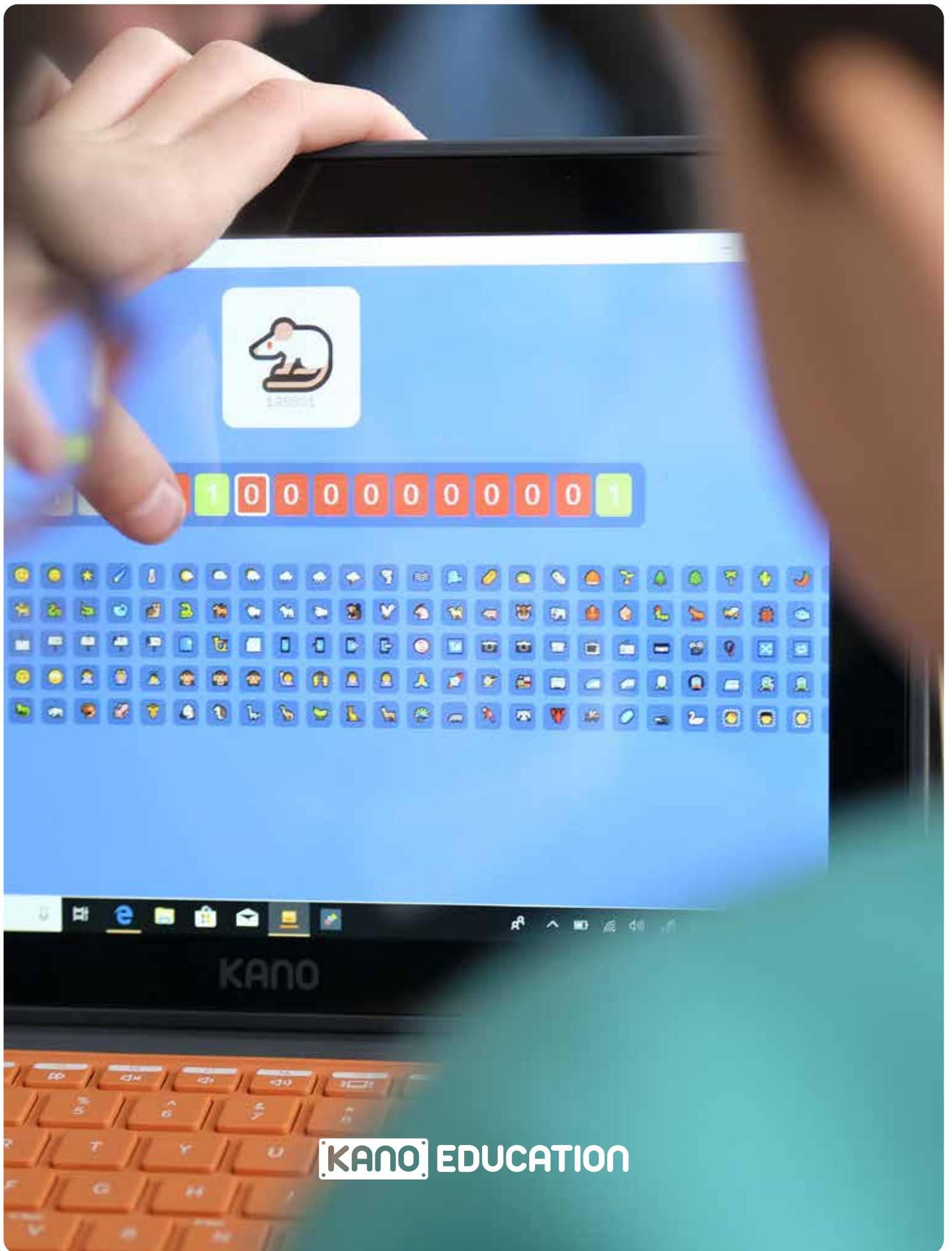
Flash Storage

Sound

Programmer Answer

In your own words, can you explain how one of the components on your Kano PC works? You can use images to describe it!

Learners may use example of human body or think of their own connection. As long as they describe the correct function of each part they are fine.

Creator Answer

If you had to make a new part for the Kano PC, what would it be? Why would your Kano PC need it? Draw a Kano PC with the new part and explain how it might work.

Answers will vary. Learners should create one basic image with 2 - 3 sentences explaining their thoughts

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kano.me/education/resources
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