KAI'S CLAN LIBRARIAN PREPARATION GUIDE

Nebraska Library Commission

GRADES 3-12

ROBOTICS

ARTIFICIAL INTELLIGENCE

INTERNET OF THINGS

AUGMENTED REALITY

VIRTUAL REALITY

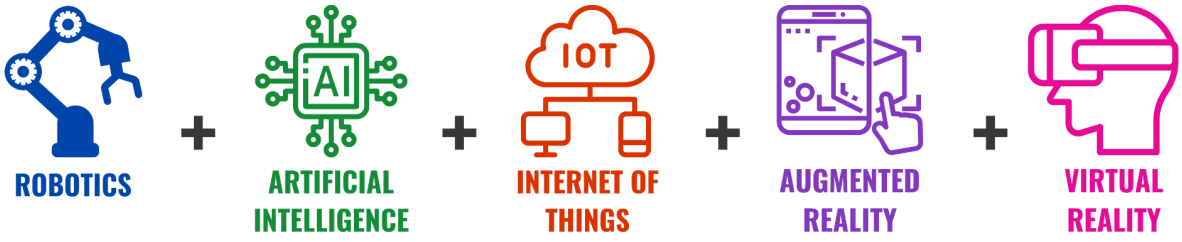
BEGINNER-FRIENDLY GUIDE

Kai's Clan exists to help people learn the Industry 4.0 technologies that are changing the way we live, work and interact. Use this guide to set up your kit and get comfortable teaching the technology of the future.

TABLE OF CONTENTS

GETTING STARTED WITH KAI'S CLAN & INDUSTRY 4.0 TECHNOLOGIES

Kai's Clan exists to help people learn the Industry 4.0 technologies that are changing the way we live, work and interact with one another. Most of this tech is new to people:



Y**ou are not expected to be an expert in all technologies**. This guide will help you:

1. **Facilitate Activities:** Understand enough about new technologies to comfortably facilitate activities, and know why this tech is important to your community.
2. **Career Exploration:** Leverage Kai's Clan activities and learning platform to help students explore technology and innovation careers that make the world better.

STEPS TO BECOME AN EFFECTIVE FACILITATOR

STEP 1: SETUP KAI'S CLAN

Setup Kai's Clan and learn how to use the software with built-in activities and lesson plans.

STEP 2: LEARN NEW TECH

Learn Industry 4.0 tech, access curated educator resources, and decide what to learn.

STEP 3: LEARNING PATHWAYS

Grow from beginner to expert with curated tutorials and real-world tech explanations.

STEP 4: TEACH TECH

Choose a collection of activities and guide community members of all ages toward new tech.

STEP 1: SETUP KAI'S CLAN

All Kai's Clan Classroom Kit activities start with the same basic robot set up and use the Kai's Cloud learning platform. After you learn Kai's Clan basics, it will be easier to use the kit to dig deeper into potentially unfamiliar tech concepts like artificial intelligence.

Setting up Kai's Clan includes laying out an Adventure Mat, robots and smartphone tripod, downloading the Kai's Eye app to track the location of the robots on the mat, and setting up teacher and student accounts on the Kai's Cloud platform to code the robots.

Follow these steps to setup Kai's Clan and learn the basics of the kit:

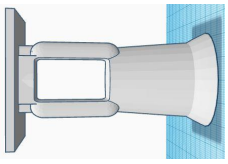
1. Review Contents of Kit
2. Gather Additional Materials
3. Set Up the Activity Station & Software
4. Explore Kai's Cloud Learning Platform
5. Find & Complete Activities

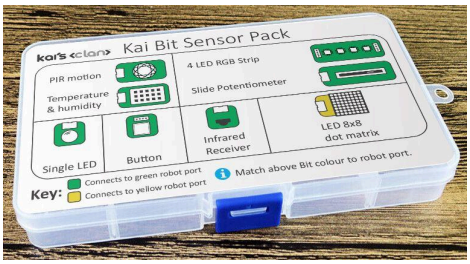
Want a preview? Watch this video to see Kai's Clan in action!

REVIEW CONTENTS OF KIT

Kai's Clan is a combination of physical robots, an adventure mat, and the accessories necessary to sync the physical materials to an app on your phone.

Start by making sure everything is in the kit.

Image	Title	Qty	Purpose
	**Kai Robot**	12	These are the physical robots that navigate the Adventure mat
	**Mars Discovery AR VR Adventure Mat** (approx. 3 ft. x 3 ft.)	1	Different activities are associated with different Adventure Mats. Use this mat to explore Mars.
	**Automated Warehouse AR VR Adventure Mat** (approx. 3 ft. x 3 ft.)	1	Use this Adventure Mat to access activities to learn about Automated Warehouses.
	**3D Printed Objects**	2	White stands with QR codes designed to fit in grippers.

	**Smartphone Tripod & mount**: Tripod expands telescopically. Mount is stored separately and must be screwed on.	2	Mount your smartphone on this tripod so the camera can see the QR codes. Smartphone is not included with kit.
	**Large Kai Bit Sensor Pack**	1	Connect sensors to enhance robot capabilities. Read temperature, measure distance, and more.
	**4-Way USB Charging Cable**	2	Charge multiple robots simultaneously using the USB hub.
	**Kai's Coding Cards**	1	Use these grab and go activities to learn the basics.
	**Quick Start Guide**	1	This booklet has the QR code you need to sync the robots up to the software.
	**Luggage-Style Storage Case**	1	Large orange rolling luggage case to securely store everything in one spot.

GATHER ADDITIONAL MATERIALS

Kai's Clan requires a smartphone that fits in the tripod to track the location of the robots and QR markers, and a laptop, computer or tablet to program the robots. Here are the specifications:

Smartphone:

- Android or iOS phone that supports video 720p or greater
- W-Fi enabled
- Bluetooth enabled
- No SIM card required

Device for Programming Robots:

- Laptop, desktop, iPad, Chromebook or any internet-connected device
- Latest version of Chrome or Safari browser
- This device will only be used to access Kai's Cloud https://app.kaisclan.ai
- Does not need to be Bluetooth enabled. Robots are connected through the Kai's Eye app on the smartphone.

Optional:

- Physical 3D printed objects to complement Activity mat
- Additional figurines or decorative objects
- Printed handouts, worksheets, or information posters for tech concepts

SETUP THE ACTIVITY STATION & SOFTWARE

Now that you're familiar with the contents of the kit, it's time to set up the activity mats, robots with location tracking system, and sync everything up to the software.

1. **Charge all robots**. Allow for a 1 hour charge time to get up to 4 hours of use.
    a. Need help? Use this Video Tutorial to Charge the Kai bots
2. **Clear at least an 9ft x 9ft space** so students can move freely around the mat
3. **Choose an Adventure Mat** and lay it out in the middle of the space
4. **Take out enough robots for all students**
    a. Beginners or large classes might want to pair up to work together.
5. **Download Kai's Eye Robot Tracker app** on your smartphone.
    a. This smartphone will be mounted on the tripod and cannot be accessed during activities. Robot tracking will be lost if the phone is removed.
6. **Open Kai's Eye app to calibrate your chosen Adventure Mat to the app.**
    a. Calibration Tutorial Video: https://youtu.be/1biGioK6YLE?t=190
    b. Written Steps:
        i. Open Kai's Eye App. Select QR Scan. Scan the Serial barcode on the front cover of the Quick Start Guide.
        ii. Select "Tracker" mode
        iii. The app will instruct you to start at the Logo side of the mat, hold up the camera on your smartphone and position your camera so all QR codes are within camera view.
        iv. Move to the left side. Position camera so all QR codes are visible
        v. Move to the top side. Position camera so all QR codes are visible
        vi. Move to the right side. Position camera so all QR codes are visible
        vii. The app will let you know when calibration is complete on all sides
7. **Open Kai's Cloud on a separate device: https://app.kaisclan.ai**
    a. Use latest version of Chrome or Safari browser
    b. Register a Teacher account. **Need help?** Watch the Tutorial Video
    c. Look for the activation email or contact support@kaisclan.ai. Make sure you check your Spam folder if you can't find the email.
    d. Login and click "Create Classroom" (upper right corner). Name your classroom and save to generate a QR Code.
    e. Need help creating a classroom? Try this video tutorial.

8. **Connect Kai's Eye App to Your Classroom in Kai's Cloud**
    a. Open the Kai's Eye app where you just calibrated your mat.
    b. Select QR Scan and scan the classroom QR code you just created in Kai's Cloud.
    c. Need help? Watch this video tutorial.
9. **Pair the robots to the Kai's Eye App**
    a. Go to the "Home" section of the Kai's Eye app
    b. Switch on a robot and bring it close to the smartphone. Grippers will start in the open position.
    c. An icon with different color circles will appear in the app. They should match the eye colors of the physical robot. Use the dropdown menu in the app to assign the correct number according to the sticker on the robot.
    d. When paired, robot grippers will close.
    e. Repeat these steps with as many robots as needed.
    f. **Note:** If a red up arrow appears in the Kai's Eye app, the robot firmware needs an update. Follow this Firmware Update Video Tutorial
10. **Setup the smartphone tripod to Track Robots**
    a. Watch this Tutorial Video to Setup Kai's Eye Robot Tracker on the mat
    b. Twist the tripod legs to unlock, fully extend and twist again to lock
    c. Attach the phone holder
    d. Mount the phone with the camera facing the mat
    e. Position phone camera so all QR codes are visible. You may need to place the tripod up higher to get a full view of the mat.
    f. Open the Kai's Eye app, if not already open. Select Robot Tracker
    g. Remove all robots from the mat. Ensure all mat QR markers are visible
    h. Align the phone camera view so the camera sees the entire mat
    i. The camera app will beep when the camera is not aligned correctly, or if any QR markers are covered. Adjust the camera and uncover QR markers.
11. **Place the robots on the mat**
    a. You no longer need to do anything with the Kai's Eye app on the phone
    b. Go back to the Kai's Cloud programming software on your other device
    c. Login at https://app.kaisclan.ai if not already logged in
    d. Robots will start to appear under map view.

You are now set up and ready to learn how to code in Kai's Cloud!

EXPLORE KAI'S CLOUD PLATFORM

Now that you have the Kai's Clan Activity Station set up, you can start programming your robot using the Kai's Cloud platform. There are an overwhelming number of features available, but we are going to focus on the basics to get you started.

1. **Join a Classroom**
    a. You should have created a Classroom during setup. If the QR Code popup is still open, close the popup. Click "Join" on your new classroom.
2. **Explore Kai's Cloud Features**
    a. Watch the **Overview of the Kai's Clan User Interface Video** to understand important features.
3. **Watch Lessons 1-3 in Blockly Coding Tutorial Videos:** Lessons 1-3 will help with Junior activities. Keep the other coding lessons handy for future activities.

You don't need to know every little feature right away. To start, pay attention to these features from the Overview video. Use the Blockly tutorial videos to learn basic coding.

Icon	Feature Name	Description
	**Project & Lesson Plan Information**	Find Student Instructions, Teacher Lesson Plans, and tips and tricks to program Blocks. Also find the User Manual for troubleshooting.
	**Programming (Blockly or Python)**	Click the icon once to open Blockly. Click the icon again to toggle to Python. Switch back and forth if you're curious.
	**Blockly Coding Tutorial Videos**	Use these tutorial videos to learn how to program the robot, and offer them as resources to students. Start with Lessons 1-3 for Junior activities.
	**Student Logins**	Add students to your classroom and print Student Login cards so students can easily access the classroom from any device.

FIND AND COMPLETE ACTIVITIES

Now that you're more familiar with the Kai's Cloud platform and know where to find Blockly coding tutorials, try the first couple activities for your chosen Adventure Mat.

1. **Create a Classroom in Kai's Cloud.** Join the Classroom
2. **Find Projects related to Adventure Mats.** Click "Projects". "Kai's Projects"
    a. The Automated Warehouse and Mars Adventure Mats are included with this kit. You learn similar skills with either mat, but with different examples.
    b. Click on your chosen Adventure Mat category
3. **Find Lesson Plan Order:** Skills build on previous lessons, so make sure you follow the activity order from the Lesson Plan Breakdown (Google Drive folders)
    a. Choose "Junior Lessons (7-9 years old)
    b. Choose your chosen Adventure Mat
    c. Write down Lesson Plan order
    d. Return to Kai's Cloud and open the first Junior Lesson Plan
    e. **Note:** Click on the colored block section to open the lesson plan. Clicking on the picture or text will not open the lesson plan.
    f. Starter code will automatically generate.
    g. Click the "?" Icon to find the Lesson Plan w/ Teacher & Student Instructions
4. **Complete all Junior Lesson plans to learn the basics**
5. **Add Student Accounts:** Practice adding Students for facilitating activities
    a. Click the "Suitcase" icon. Type in a student name or alias. Save.
    b. Assign each student/ group to a different robot using the dropdown menu next to the student name.
    c. When all students are added, click "Print Student Login Cards"
    d. Print the generated file, cut out cards and hand them out to students.
    e. Instruct students to go to https://app.kaisclan.ai and scan the QR code.
    f. Students should automatically be placed in the classroom where you generated the login cards.
    g. Note: If you don't have access to a printer, you can save the Student Login cards as a PDF and email them to students.

When you're done with the Junior Lesson Plans, move on to learn more about the technology concepts behind Kai's Clan, like artificial intelligence or virtual reality.

STEP 2: LEARN NEW TECH

Kai's Clan robots are adorable, but there's more going on behind those little grippers. In this section, we will explore the many ways Industry 4.0 technologies are changing and creating jobs, solving global problems, and changing the way we live on a daily basis.


ROBOTICS

ARTIFICIAL INTELLIGENCE

INTERNET OF THINGS


AUGMENTED REALITY


VIRTUAL REALITY

As a facilitator, you don't have to be an expert in tech. Your goal is to guide students to connect new technologies with relevant community problems, cultivate curiosity, and connect individuals with the right resources and experts who can guide further learning.

To accomplish this goal, this section will help you understand Industry 4.0 technologies, offer career exploration resources, helpful handouts and supplementary materials.

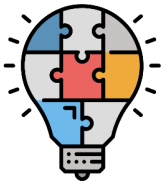
Review these sections to find resources and learn about Industry 4.0:

- What is Industry 4.0?
- Robotics
- Artificial Intelligence
- Internet of Things
- Augmented Reality
- Virtual Reality
- How Facilitators Can Use These Resources

WHY LEARN TECH?

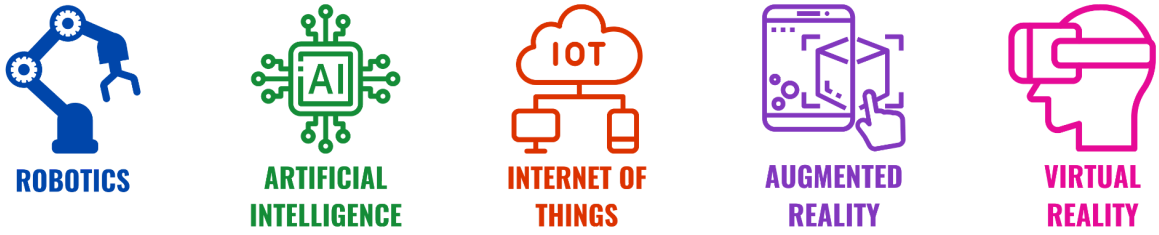

SOLVE GLOBAL PROBLEMS


IMPROVE EXISTING JOBS


CREATE FUTURE JOBS

WHAT IS INDUSTRY 4.0?

Industry 4.0, or the Fourth Industrial Revolution is a relatively new term used to describe how technology is changing the way we live, work and interact with one another. The rate of change is happening too fast for businesses, government regulations, and educational institutions to keep pace. People who understand these technologies will shape the future of work for everyone, creating and changing jobs across industries.



EXPLAINER VIDEOS

Watch these short videos to learn more about Industry 4.0, and what you need to know to prepare your community for a better future of work and everyday living.

- **What is the Fourth Industrial Revolution- CNBC** (4 min 17 sec)
- **What is Industry 4.0- Bernard Marr** (4 min 56 sec)

MIX & MATCH TECHNOLOGIES

Most Industry 4.0 technologies are creatively combined to form more powerful solutions to the world's problems. Check out these examples of how Artificial Intelligence (AI), the Internet of Things (IoT), and robotics work together in the real world:

- **Amazon's Newest Warehouse Robots** (8 min 11 sec)
- **Grocery Warehouse Automation** (5 min 8 sec)

This guide will help you understand each of these technology concepts on their own, then use Kai's Clan to learn how technologies combine to form real-world solutions.

IMPACT ON JOBS

Factories, warehouses and fulfillment centers can now be built almost fully automated from the start. This **Smart Grocery Warehouse** is a good example. Robots took over repetitive lifting and poor ergonomics tasks that were leading to workplace injuries.

Now people are installing and maintaining robotics and automation technology, developing software, and analyzing data to improve processes. These new jobs require a drastically different skillet, and schools and employers are struggling to keep up.

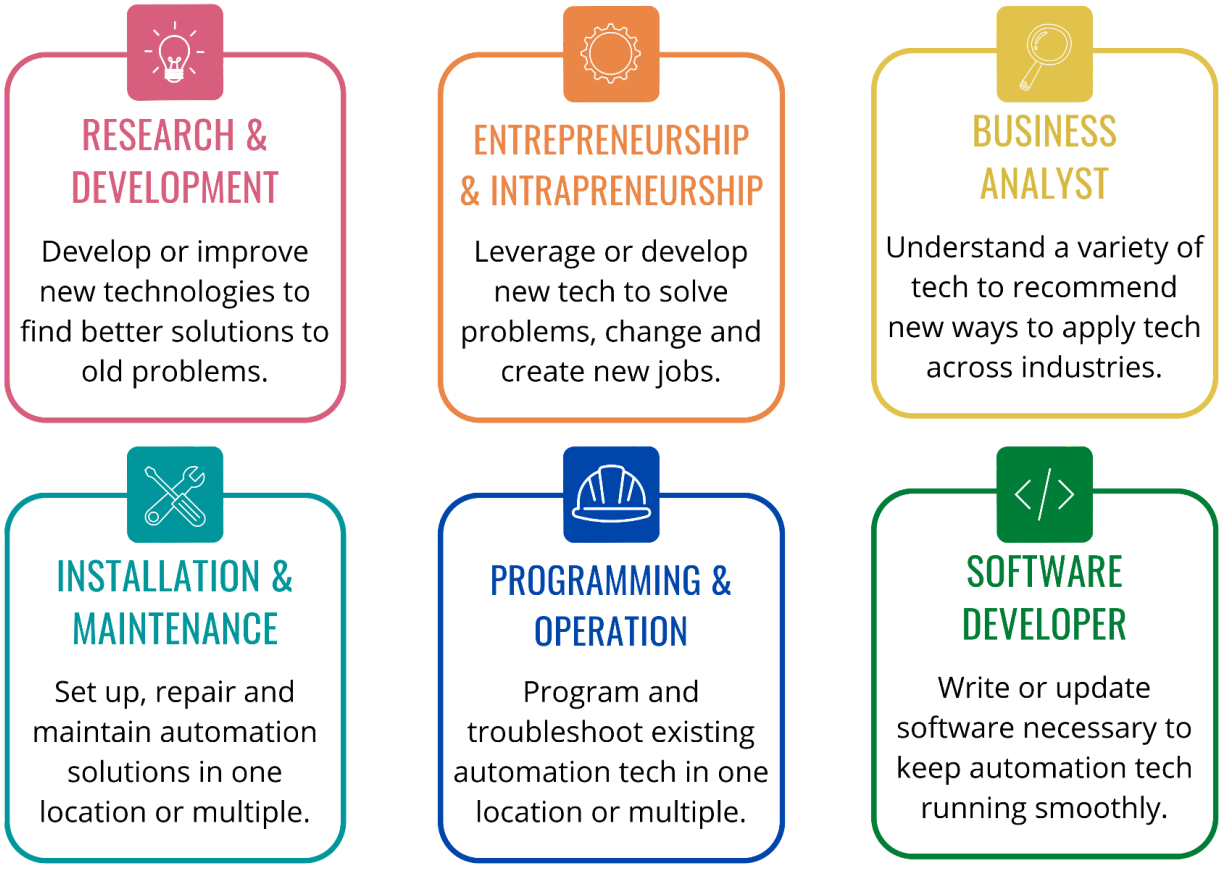
EXPLAINER VIDEOS & ARTICLES

Check out these videos and articles for a closer look at the jobs of the future:

- **The Future of Work: A VICE News Special Report** (54 min 47 sec)
- **The Big Debate About the Future of Work Explained- VOX** (9 min 2 sec)
- **Understanding the Impact of Automation on Workers- Brookings**
- **Industries Most Likely to be Taken Over by Robots- World Economic Forum**

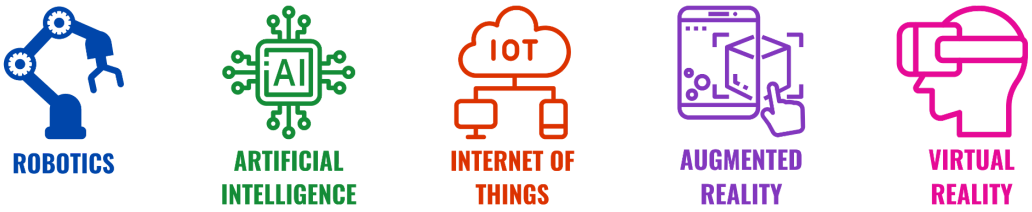
EXPLORE NEW CAREER AREAS

Use Kai's Clan to explore the foundational skills necessary to get the jobs of the future!



INDUSTRY 4.0 TECH RESOURCES

The Tech Resources in this Librarian Preparation Guide will help you understand and choose Industry 4.0 technologies that are relevant to your community, and build a collection of handouts and supplementary materials for use in activities.



Each Industry 4.0 technology offers two resource categories in this Guide:

1. **Understanding Technology & Real World Applications:**
    - What is this technology? Industry Applications?
    - Ethics, regulations, and impact on society.
    - How is this technology made and implemented in organizations?
    - Learning communities and industry experts

2. **Career infographics w/ linked articles (Handouts)**
    - Tech Overview Infographic
    - Industry Applications
    - Careers/ Team Roles
    - How Technology is Made

USING THESE RESOURCES IN ACTIVITIES

Get the most out of these supplementary resources using the following examples:

- **Career Exploration:** Handouts for STEM Career Exploration
- **Customize Activity Examples:** Research local or regional industries and jot down real-world industry examples for your chosen technologies.
- **In-Depth Discussion:** Ask students to read about technology ethics from curated resources and start a discussion about the impact of tech on jobs or everyday life.
- **Guest Speakers:** Bring in local experts to talk about how this technology is made, then ask students to consider where they would fit on a tech team.
- **Refer to Experts:** Reach out to online learning communities to set the stage for warm referrals for students who want to learn more from industry experts.
- **Entrepreneurship:** Ask students to research community problems like managing traffic flow, and how Industry 4.0 tech is creating solutions. Design your own solution. Prototype on paper, or using Kai's Clan!

QUESTIONS TO CONSIDER

Consider these questions while learning about Industry 4.0 technologies, and brainstorming which technologies are most relevant to your community.

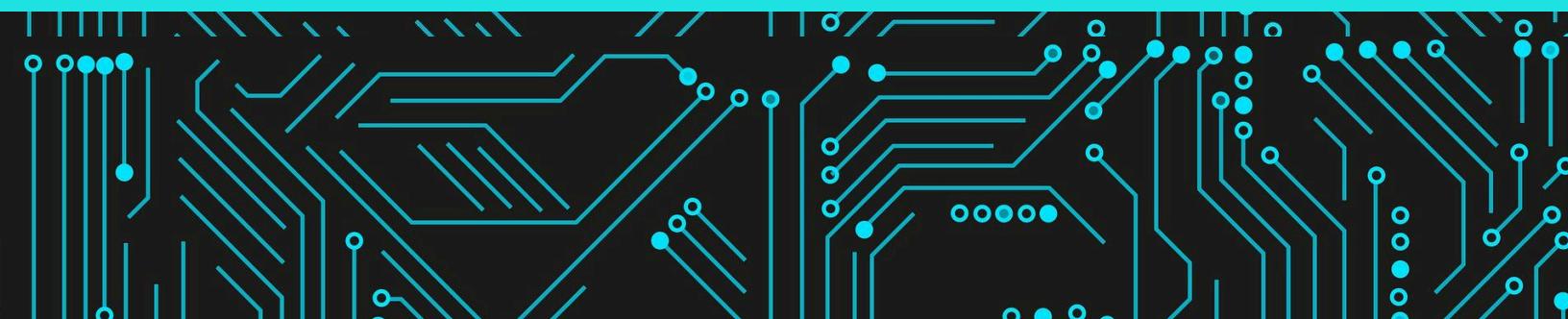
1. Can you explain this technology in your own words? Try it!
2. How are different technologies being used in your community? Which industries?
3. Are there any organizations that could be using this tech but are not currently?
4. What are your favorite tech applications that would be interesting to students?
5. Are there any local or remote work career opportunities to promote as examples?
6. Why should people in your community care about this technology?
7. Are there any local or virtual guest speakers available to supplement activities?
8. What do you think people need to know most about this technology?

CHOOSING WHICH TECH TO LEARN

You might not have the time or energy to learn every single technology in depth. You can choose to learn the technology that interests you personally, or use one of the following tips to choose technology most relevant to your community:

- **Business-Led:** Call some of the largest local businesses to learn which tech is creating the most jobs, and how. Focus on the tech requested by businesses.
- **Follow the Money:** Call the Department of Economic Development to find out which technologies are receiving funding to drive innovation. For example, Nebraska recently received a multi-million dollar grant for robotics and AI.
- **Partners:** Reach out to your local Chamber of Commerce to partner with local businesses. Choose tech based on what your partners wish to help facilitate.
- **Student-Driven:** Ask students to research and learn about technology and have them vote on which technology types they prefer, and why.

When choosing technology, keep in mind that it's hard to isolate and learn one, single tech type. Technology overlaps so often you might find yourself focusing primarily on robotics, but naturally incorporating AI and IoT concepts, just like real-world technology.



ROBOTICS

“A robot is an autonomous machine capable of sensing its environment, carrying out computations to make decisions, and performing actions in the real world.” –Institute of Electrical and Electronics Engineers (IEEE). But what does that really mean? Check out these resources to learn more about robots in the real world.

Robotics Resources: Curated information pages to learn the following:

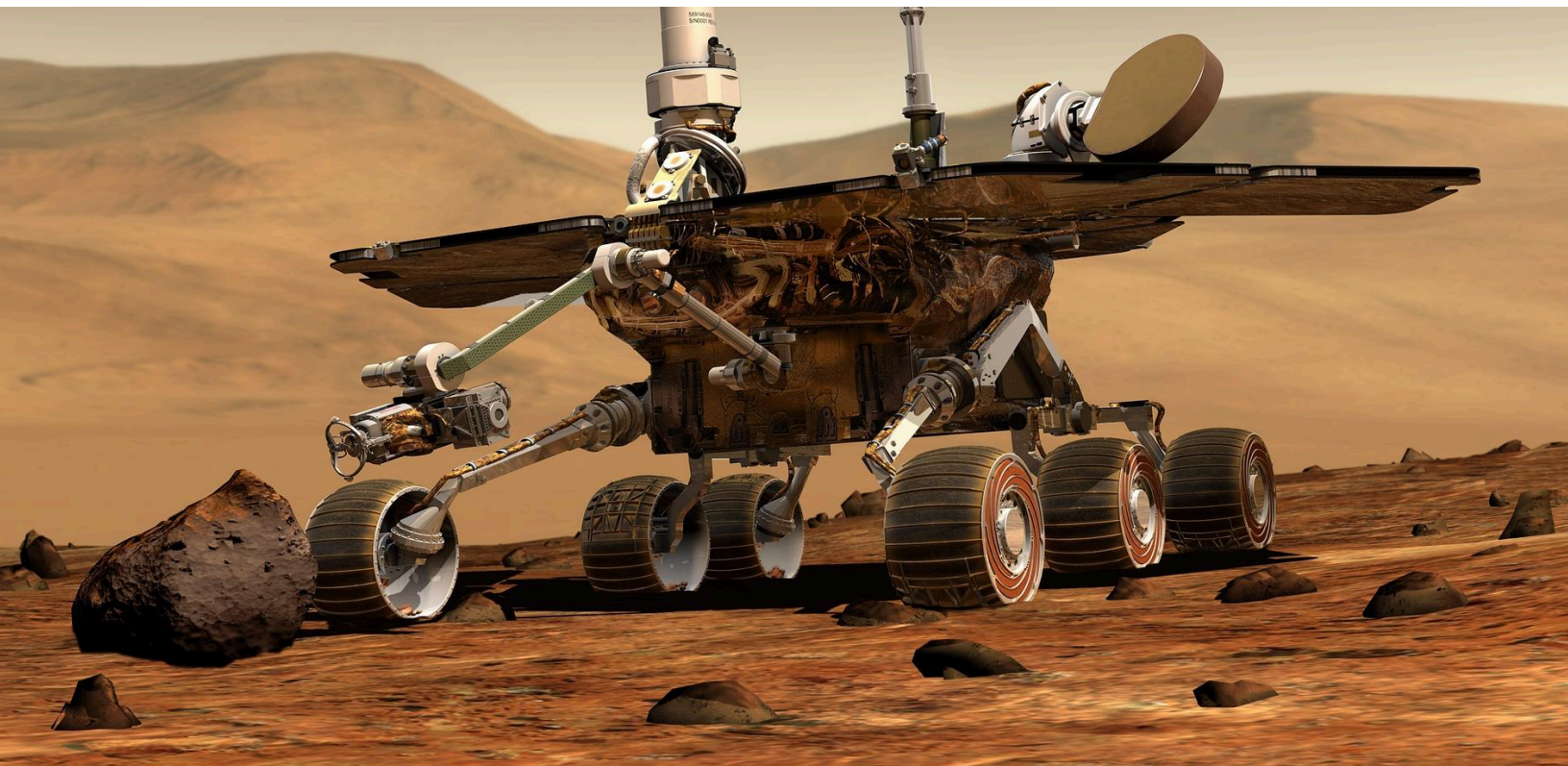
- What is a Robot?
- Real World Applications
- Ethics & Regulations
- How Robots Are Made & Implemented in Organizations
- Learning Communities

Robotics Career Infographics: Use these Infographics as handouts during activities or information sheets on your website.

- What is a Robot?
- Robotics Careers
- Robotics Design Process
- Types of Robots

Additional Career Resources:

- Types of Engineers & Their Roles (Thomas.net)
- Meet Your Lean Robotics Team (Robotiq)



INTERNET OF THINGS RESOURCES

“The Internet of Things (IoT) is a network of connected things and people- all of which collect and share data about the way they are used and the environment around them” **(IBM).** When your Fitbit collects data about your heart rate and sends it to an app on your phone, that is a small piece of IoT. Learn more about IoT using these resources.

Internet of Things Resources: Curated information pages to learn the following:

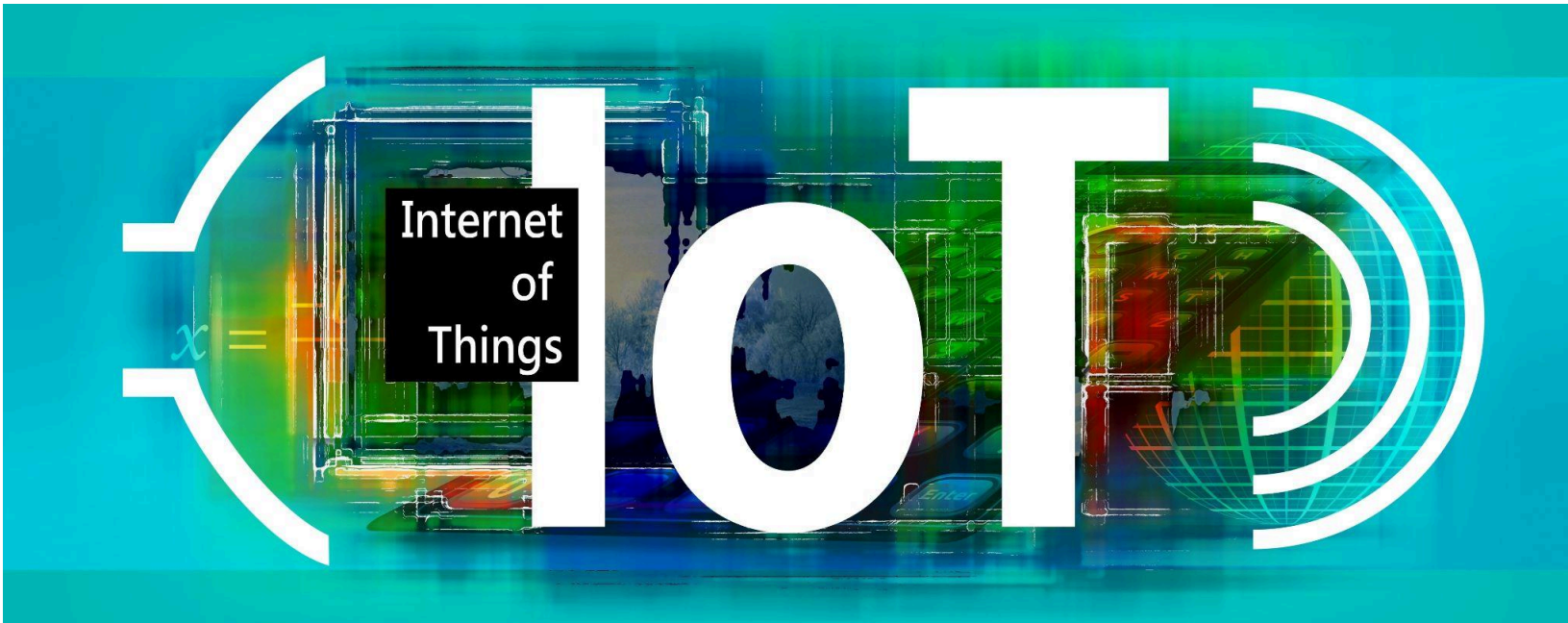
- What is the Internet of Things?
- Real World Applications
- Ethics & Regulations
- How IoT is Made & Implemented in Organizations
- Learning Communities

IoT Career Infographics: Use these Infographics as handouts during activities, or information sheets on your wall or website.

- What is the IoT Explainer
- IoT Careers
- How IoT is Made
- IoT Organizational Ecosystem
- Industry Applications

Additional Career Resources:

- Career Opportunities in the Internet of Things (Future of Tech)
- IoT Career Opportunities: Ultimate Guide 2023 (My Great Learning)



ARTIFICIAL INTELLIGENCE

“Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems **(TechTarget)**. The easiest way to learn about AI is to look at examples of AI in real life. Use these curated resources to understand how it all works.

Artificial Intelligence Resources: Curated information pages to learn the following:

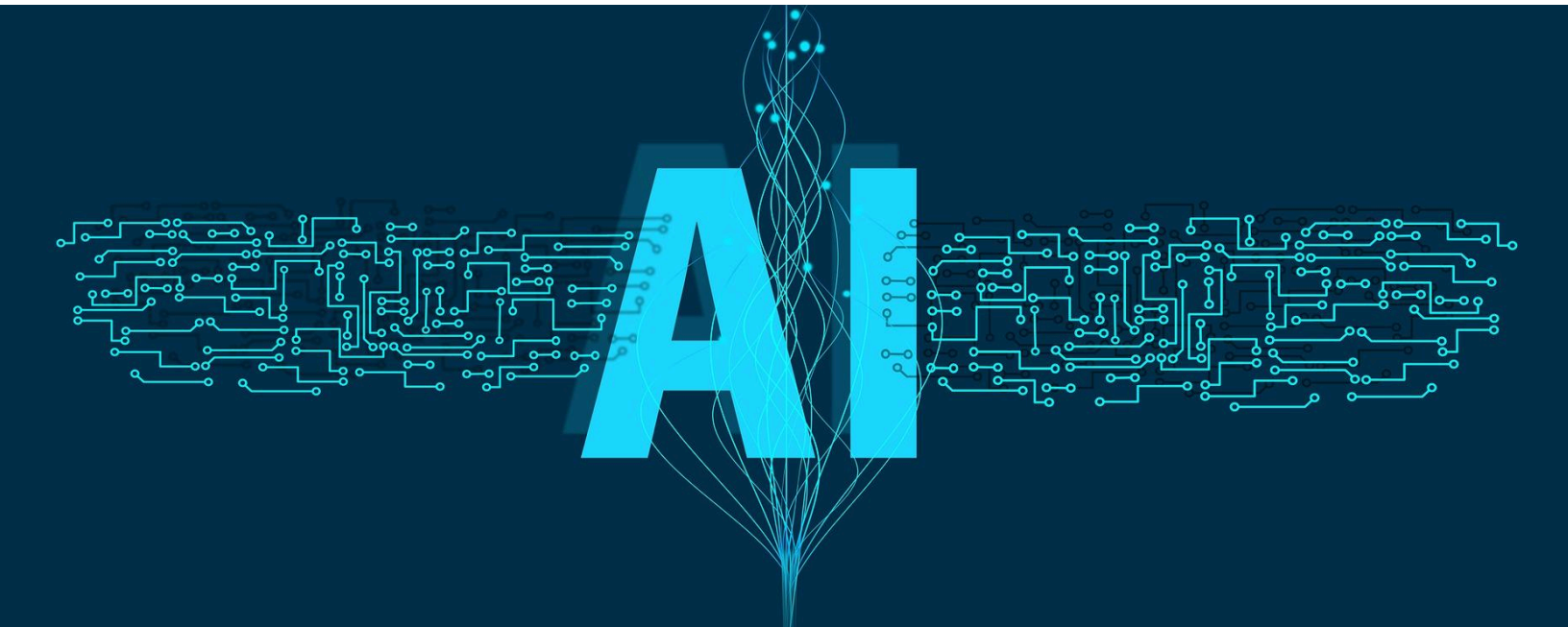
- What is Artificial Intelligence?
- Real World Applications
- Ethics & Regulations
- How AI is Made & Implemented in Organizations
- Learning Communities

AI Career Infographics: Use these Infographics as handouts during activities or information sheets on your website.

- What is AI Explainer
- Types of Machine Learning and Industry Applications
- AI Careers
- Machine Learning Team Roles
- Machine Learning Design Lifecycle

Additional Career Resources:

- How to Build Machine Learning Teams that Deliver (Neptune.ai)
- 10 Awesome AI Careers to Pursue in 2023 (Springboard)



VIRTUAL REALITY

Put on a virtual reality headset to be immersed in a virtual world that you can explore and interact with using controllers or other input devices (Virtual Reality Society).

Virtual Reality Resources: Curated information pages to learn the following:

- What is Virtual Reality?
- Real World Applications
- Ethics & Regulations
- How VR is Made & Implemented in Organizations
- Learning Communities

VR Career Infographics: Use these Infographics as handouts during activities or information sheets on your website.

- What is VR vs AR Explainer
- AR/ VR Careers
- How VR/ AR is Made
- Industry Applications

Additional Career Resources:

- XR Jobs in Demand (Circuit Stream)
- Tips for Career Growth in XR Industry (LinkedIn)

AUGMENTED REALITY

Augmented Reality Resources: Curated information pages to learn the following:

- What is AR?
- Real World Applications
- Ethics & Regulations
- How AR is Made & Implemented in Organizations
- Learning Communities

AR Career Infographics: Use these Infographics as handouts during activities or information sheets on your website.

- What is VR vs AR Explainer
- AR/ VR Careers
- How VR/ AR is Made
- Industry Applications

Additional Career Resources:

- XR Jobs in Demand (Circuit Stream)
- Tips for Career Growth in XR Industry (LinkedIn)

STEP 3: LEARNING PATHWAYS

Industry 4.0 technologies often work together to form more powerful solutions. So you will be asked to choose between two Learning Pathways. Each pathway combines common technologies that appear together in the real world.

JUMP TO: ROBOTICS, IOT & AI PATHWAY

JUMP TO: ROBOTICS, AR & VR PATHWAY

Pathways are designed to help you work your way up from absolute beginner to intermediate or advanced, using curated Kai's Clan activities and tutorials.

As a facilitator, you can choose to learn all of these skills yourself, or stop at the beginner/ intermediate level, then allow students to advance their skills independently.

Use the **Tech Explanations** next to each activity to help introduce real-world technology applications to students while facilitating activities.

ROBOTICS, IOT & AI LEARNING PATHWAY

Use this Learning Pathway to understand these technologies individually, then explore how they work together to solve big problems across industries. Start with Beginner Level and work your way up as far as you want to go.

Use the **Tech Explanations** as a cheat sheet to explain tech to students!

BEGINNER: AUTOMATED WAREHOUSE

Access Lesson Plans & Activity Instructions in Kai's Cloud.

TECH CONCEPTS	KAI'S CLAN ACTIVITY	TECH EXPLANATION
Robotics	Lesson 1: Cleaning Robot	Learn how robots physically move and navigate in different environments, and interact with objects using special attachments. In the real world, robots can use suction cups, pinchers, scoops, or other attachments specially designed for different objects or materials. Robots may also be designed with special tracks, styles of "legs", or other methods of movement to navigate across different surfaces, underwater, or even within the human body!
Robotics	Lesson 2: Storage Bot	Robots often have to repeat the same tasks over and over again, like the example of sorting boxes in a warehouse. This lesson introduces how to use code to automate repeat actions so you don't have to manually tell the robot what to do for every box.
Robots + IoT	Lesson 3: Temperature Management	Robots use sensors to understand and interact with the world. For example, a distance sensor helps the robot understand how far it is from an object. The robot can be programmed to stop when it gets too close. Sensors are also the basic building block for all IoT applications. A sensor doesn't have to be attached to a robot to be considered IoT, it just has to collect data and be connected to another device via the Internet. Like a Fitbit connecting to an app on your smartphone. Learn sensors to understand IoT.

INTERMEDIATE: AUTOMATED WAREHOUSE

Access Lesson Plans & Activity Instructions in Kai's Cloud.

TECH CONCEPTS	KAI'S CLAN ACTIVITY	TECH EXPLANATION
Robotics + IoT	Lesson 1: Receiving-Packer or Delivery option	You can tell a human to turn left at the McDonalds on the corner, but here you will learn how robots use coordinates to determine location. The robot is communicating with the Kai's Eye app via the internet, so IoT is necessary for the robot to navigate and find objects.
Robotics + IoT	Lesson 2: Overseer	Now you know IoT is the magic behind robot navigation, but now robots need to be coded to automate navigation without having to manually program the robot for every little movement or object grab.
Robotics + IoT + AI	Lesson 3: Busy Day	IoT is also necessary to help robots talk to each other so they don't run into each other. In the real world, artificial intelligence works with IoT so the computer powering the robot can learn from previous movements, recognize patterns in repeat movement, and make predictions about which path to navigate for the least likely chance of running into another robot or obstacle. This is important when there are lots of robots moving at one time!
Robotics + IoT	Micro: bit add-on (Lesson Plan)	Micro:bit is a pocket sized computer that can be connected to Kai's Clan and used as a remote control. Micro:bit also has additional sensors built-in, and can send and receive data to the robot. This is another example of IoT connecting devices to collect and transmit data.

Additional Tech Explanation Resources:

- Kai's Eye: Computer Vision & how it works (Kai's Clan- YouTube)
- Kai's Clan- AI Path-finding and how it works (Kai's Clan- YouTube)
- Kai's Clan- Using Sensor Bits (Kai's Clan- YouTube)

ADVANCED: AUTOMATED WAREHOUSE

Access Lesson Plans & Activity Instructions in Kai's Cloud.

TECH CONCEPTS	KAI'S CLAN ACTIVITY	TECH EXPLANATION
Robotics + IoT + AI	Advanced Automation	Automation means that a computer is controlling a robot, or system of robots without human intervention. Learn which tasks are best controlled by the computer, and which tasks might have to be programmed for each specific robot on a case-by-case basis. In the real world, machine learning, a type of artificial intelligence, can learn from large amounts of collected data to recognize patterns and improve processes without a human having to manually adjust the code.
Robotics + IoT + AI	Automated Warehouse, Order Management Collector Robot, Purchase Canceled, and Warehouse Lesson Plan	Automation solutions must translate the needs of the business into code. So when customers request priority shipping, the robots have to be able to understand package priority order and take action to pick priority packages first, skip a package when a customer cancels an order, and other tasks.
Robotics + IoT	Making a Smart Garden with Data Monitoring (Webinar)	Sensors are powerful tools to collect data, but data monitoring and visualization is what makes data helpful to humans. In the real world, data must be stored in a database, then that data is visualized to tell a story about the data that was collected. For example, plants grow best in different temperatures. When temperature data is monitored and stored in a database it can be visualized as a chart, graph, or other method. Then humans can use data collected over time to determine when temperatures are too low or too high in a season to plant and grow specific plants. So data is important!

Additional Tech Explanation Resources:

- The Internet of Robotic Things: How IoT and Robotics are Evolving Together
- What is the Artificial Intelligence of Things (AIoT)?

ROBOTICS, AR & VR LEARNING PATHWAY

Augmented and virtual reality can exist without robotics, but it is helpful to learn how robotics can be combined with these technologies to form more powerful solutions. Start at the Beginner Level and work your way up as far as you want to go.

Use the **Tech Explanations** as a cheat sheet to explain unfamiliar tech to students!

BEGINNER: AUTOMATED WAREHOUSE

Start by using pre-made 3D objects to get used to adding 3D objects to Kai's Clan, adding animations to loaded objects, and building a digital world.

TECH CONCEPTS	KAI'S CLAN ACTIVITY	TECH EXPLANATION
Robotics	Lesson 1-3 (Junior Level)	Robots move using wheels, gears, mechanical limbs, and various other mobility options. Some robots use grippers, suction cups, pinchers, scoops, or other attachments to interact with objects, like picking up a package on a warehouse floor. Start by learning how robots do basic movements in the physical environment, use grippers to interact with objects, and use sensors to understand the world around them.
Robotics + AR + VR	Loading 3D Models As Robot Avatars (Using pre-made designs) - View in VR or AR - YouTube Tutorial	Designing and building robots can be expensive and time-consuming, so many robot designers use Augmented and Virtual Reality to test designs before any building ever happens. In real life, designers place QR code markers on the location where the robot would exist in the real world, then design 3D objects that appear digitally on an augmented reality device. Alternatively, designers can create a digital twin of the physical environment and design an all virtual world to test robotics designs and robot placement entirely in virtual reality.
Robotics + AR	Add additional QR	In the real world, robot designers often

+ VR	markers to place new 3D objects around the Adventure Mat - QR Code Marker Tutorial & Printable Sheet	need to experiment with different objects around the room. For example, if a designer needs to know how a robot would navigate around a shelf, the designer can build a digital shelf and test the design in the virtual world. However, for this to work, the designer needs to place a QR code marker in the physical environment so the digital world knows where to place the shelf. This way the digital world can mirror the physical world.
Robotics + AR + VR	Animations & Effects - View in VR or AR - YouTube Tutorial	Robot designers also have to know how robots will interact with the physical space while navigating the environment. In real life, designers can build a simple prototype of a robot without all the bells and whistles, then digitally add any moving arms or parts. Robot designers can move the prototype robot in the real world, while a digital robot with all the added design features moves in the virtual world on the screen. This way, robot designers can get a better idea of if their design will work in the intended space, without spending time and money building the robot first.
Robotics + AR + VR	Terrain & Painting - View in VR or AR - YouTube Tutorial	Sometimes robot designers have to make changes to the physical environment, or design an entirely new room layout for a robotics system to work. In the real world, robot designers can use AR and VR to experiment with room layouts, including furniture or machinery placement. It's also helpful to determine where it is safe for humans to stand and navigate when working alongside robots. Designers can also play with color schemes and textures before spending time and money building the physical space.
Robotics + AR + VR	Speech & Sound	Robots often need to notify surrounding humans that they are traveling in the vicinity, are ready to be loaded/ unloaded, or require attention in some way. Adding these sounds digitally to test out designs in the virtual world saves time and money!

INTERMEDIATE/ ADVANCED: AUTOMATED WAREHOUSE

Now that you know how to load 3D objects, add animations, and add terrain or color, the next step is to learn how to create your own 3D objects. Kai's Clan works with TinkerCAD and Minecraft. TinkerCAD is a free 3D design software, and Minecraft is a popular game many kids are familiar with already.

TECH CONCEPTS	KAI'S CLAN ACTIVITY	TECH EXPLANATION
3D Design	Learn 3D Design in TinkerCAD - Tutorial Series Beginners: Try uploading an existing 3D model into TinkerCAD to make changes - YouTube Tutorial	3D design can be done using various different types of software, including Autodesk and other popular 3D design tools. TinkerCAD is a free tool that has been simplified and designed for beginners.
3D Design	Learn 3D Design in Minecraft in Survival Mode - Tutorial Series - Learn how to start a new world, then focus on building tutorials	Minecraft is another tool that many people already have access to at home or at school.
Robotics + AR + VR	Build your own virtual world - Revisit the tutorials from the Beginner level to use your own custom designs to build your own virtual or augmented world.	Robot designers often have to choose whether to design a robot that fits into an existing space, or design a whole new environment for their new robotics system. Experiment with designing your own virtual world!
AR + VR	Kai's Chess: Create a chess set with digital avatars - Kai's Chess Setup Guide	Augmented reality is a great tool for robotics simulations. Robotics designers can see how robots would interact in the real world by using an Augmented Reality viewer to view a digital simulation of the intended design. RobotStudio Augmented Reality View is a great tool used by professionals.

STEP 4: TEACH TECH

You are now more than ready to teach new and emerging technologies in your community! It's time to choose a collection of activities to get started.

There are additional activities created by Kai's Clan enthusiasts that are available through Kai's Cloud Project tab.

1. Login to Kai's Cloud
2. Create a new classroom
3. Click "Projects". Community.

Tech Tie-In w/ Kai's Clan Community Projects

Try these Community projects to dig deeper into these technologies:

Artificial Intelligence + IoT + Robotics

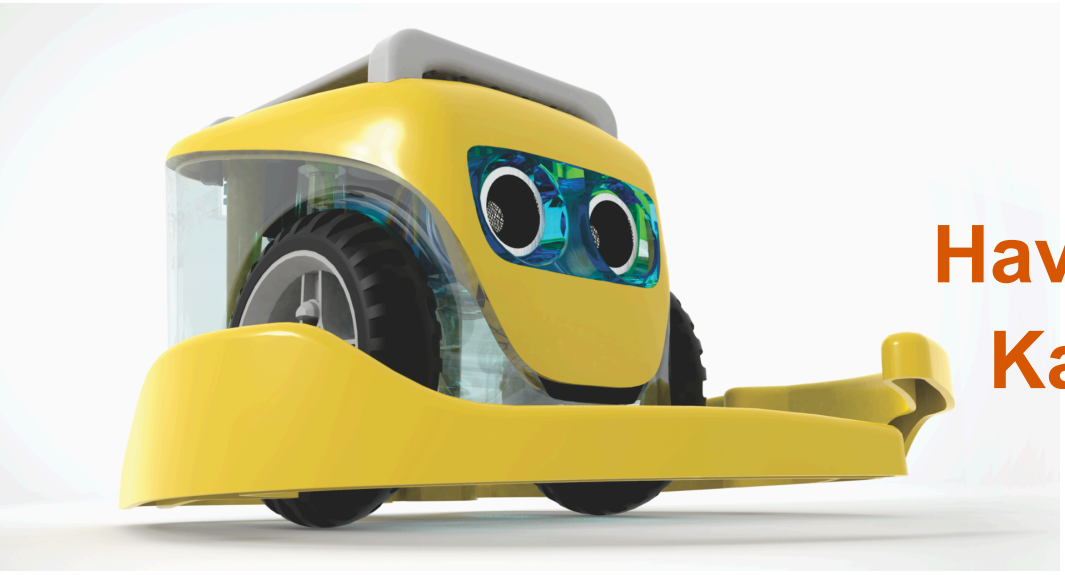
- Automated Warehouse
- Self-Driving

IoT

- Mars Discovery
- Plant Watering
- Sensors
- Advanced Sensors

AR + VR

- Trick or Treat
- The Battle of Hastings (adapt for use with Mars or Automated Warehouse Mat)



Have fun with Kai's Clan!!!