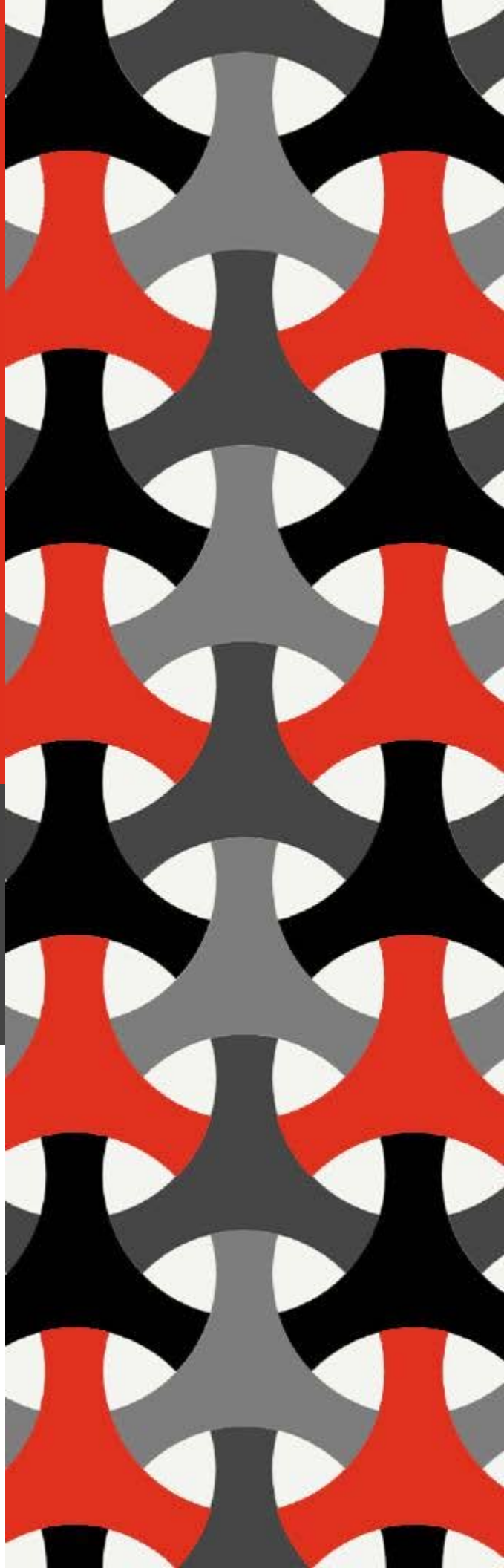
Access Your Potential® Essential Eight Tech Experiences

Internet of Things (IoT) - Lesson plan



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Internet of Things (IoT)—Lesson plan

Objective:

Students will explore the emerging technology of the Internet of Things. They will use creative thinking and teamwork to develop ways to expand the Internet of Things to make the world a happier, healthier, or safer place

Learn more about the Essential Eight here

Audience:

High school and older.

Essential question:

What is the Internet of Things and how can it be used to improve our lives?

Materials:

- "Internet of Things" visual handouts—1 copy per student
- "Expanding the Internet of Things" team design challenge handouts—1 copy per team of 3-4 students
- Whiteboard markers
- A YouTube video that helps students understand the key concepts of the Internet of Things. (**Note:** Provide any video links to the teacher ahead of time and ask the teacher about school video policies. See the "On showing videos in class" callout in Activity 1 for more information):
  - Consider sharing this introductory video on the Essential Eight Technologies (5:03 in length) Password is 'E8"
  - "What is the Internet of Things?"—(1:41 in length. A good overview of the basic concepts of the Internet of Things)

Pre-visit prep:

- Work with the teacher ahead of time to **figure out a room arrangement** where the students can gather into groups of 3-4. These groups will carry out the group design work together in Activity 2. Knowing their students, the teacher may also want to pre-compose the groups in order to get the most out of the activity and minimize disruptions
- Gather a few interesting **stories about the Internet of Things use from the news** that you can share with the students as quick real-world anecdotes (for use in Activity 1 if there is time)
- Print necessary **handouts**

Lesson length:

45 minutes

Considerations for facilitating virtually (via Google Hangout, WebEx, or Skype)

Much of this lesson can be delivered virtually via Google Hangout, WebEx, or Skype. The educator you are working with may have a preference on technology, so defer to them. Benefits of this include schedule flexibility for both the classroom and facilitator and elimination of travel time. Keep in mind the following elements when transitioning this lesson to a virtual format:

- Start off with a clear personal introduction - share with the students where you are (generally) geographically and some detail about your job and career journey. This will help develop a personal and engaging connection with the classroom. Consider teaching the class with a colleague as well!
- Make sure the video/sound is working well up-front!
- Share the printable handouts with the teacher in advance, as they will need to print and distribute on your behalf. Discuss with the teacher in advance what you will need and the timing on when to distribute the materials
- Don't be afraid to engage with the students by asking questions as you talk through the material!

Lesson outline

Introduction: (1 minute)

- Greet the students and introduce yourselves. Explain that you're from [Company]. [Insert quick sentence or two about the Company]. Explain that you're here to talk with them about some of the incredible emerging technologies that are changing all of our lives
- Let them know that today we're going to focus on **the exciting world of the Internet of Things**

Activity 1: "What is the Internet of Things?" (15 minutes, Large group activity)

- Overview: Engage the students in reflection and conversation to **explore what they know about the Internet of Things** and **build a working definition**
  - Begin by telling the students that you want to ask them a simple question – "What is the internet? We talk about it all the time, but what is it?" Take a few brief ideas, then help the students focus their definitions
  - **"The internet is an interconnected global network of computers and devices – the inter**connected **net**work. **It's millions of computers all over the world that are connected to each other, which enables us to access tons of different services, find almost any information, and communicate with almost anyone"**
  - Then ask the students, "How do we connect to the internet?" Again take a few ideas. Most likely the students will say things like, "with computers" and "with my phone!" These of course are correct. Ask them, "Can we only connect with those things? Could we, say, connect to the internet with a shoe? What about a basketball? How about a refrigerator?" Take more thoughts from the students. Some may already know that many more devices than computers and phones can connect to the internet. Draw out what they know

- **“In fact, all of these things and many, many more can actually be connected to the internet, not so that you can play games on your refrigerator or text your friends with your shoe, but so that these things can improve our lives. This is called the Internet of Things, also known as the IoT.”** Write this phrase on the whiteboard
- **“The IoT refers to computers, phones, refrigerators, cars, coffee makers, toasters, tennis rackets, mailboxes, streetlights, shoes, space satellites, and many, many other things that have sensors embedded in them and are connected to the internet. These objects collect data and send them to an IoT platform, where the data are analyzed and sent back out as useful information to apps”**
- Have the teacher show an **Internet of Things overview video** from YouTube. Sharing these types of videos with students is key to helping them form a concrete, real-world understanding of what these technologies are and can do

On showing videos in class:

Video policies vary from school to school. Check with the teacher ahead of time to make sure showing videos and using a channel such as YouTube are allowed at their school. Have the teacher preview and approve the videos ahead of time. Then have the teacher queue up the videos and play them on their equipment (rather than you showing them).

Also be mindful of ads and popups. Encourage the teacher to mute and block the video during any ads and turn off any popup ads as soon as they emerge or use a popup blocker.

YouTube overview video:

- “What is the Internet of Things?”—(1:41 in length. A good overview of the basic concepts of the Internet of Things)
  - Video talking points:
    - Now all kinds of objects can connect to the internet. This is the Internet of Things
    - Shoes, for example, can collect data about your fitness for you
    - The IoT is not just about consumer products. City trash cans can send alerts when they need to be emptied. Bridges can check themselves for damage
    - There are also examples in healthcare, manufacturing, and agriculture, among other industries
    - The IoT also presents new security concerns, such as hackers and privacy
    - The IoT could grow exponentially over the coming years, with new benefits and challenges

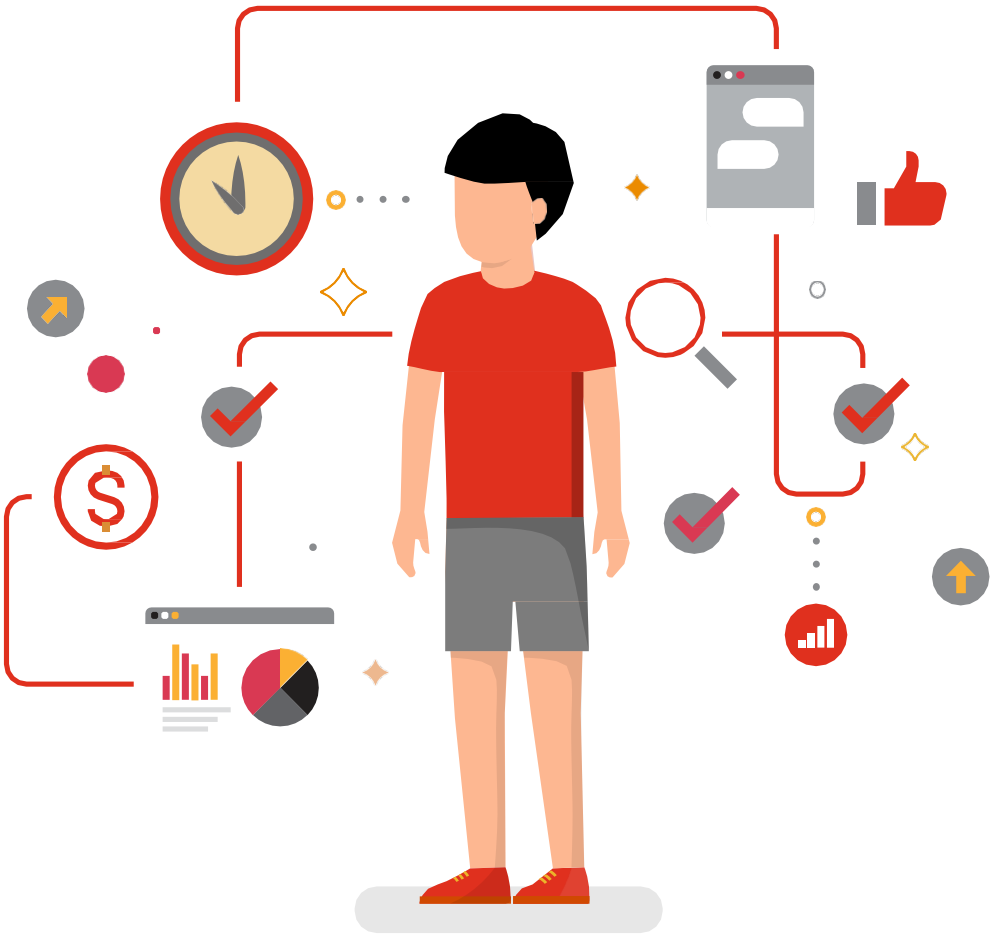
- Finally, pass out the **“Internet of Things” visual handout** and walk through it with the students. Quickly cover:
  - Definition of the Internet of Things
  - The basic process of how **devices embedded with sensors** send data to an **IoT platform**, which analyzes those data and sends **useful information to apps**
  - Example uses of the IoT

The Internet of Things

What is the Internet of Things?

Also known as IoT, the Internet of Things refers to devices, appliances, vehicles, and other objects that are embedded with sensors and are connected to the internet, sending useful data to a common platform.

- A smarthome that allows you to control your lights, heat, and locks with your smartphone
- An electronic pill that is swallowed and monitors health conditions from inside the body
- A car that can drive itself and tell you where it's parked, what repairs it needs, and the closest place to get froyo
- A smartcity that can tell which trashcans are full, which parking garages have open spots, and which roads have potholes
- Farm sensors that monitor weather, soil quality, and crop health
- Workplace sensors that monitor safety conditions



Activity 2: “Expanding the Internet of Things”—Team Design Challenge

(18 minutes, Small group activity)

- Overview: Have the students work together to **think like inventors and engineers and come up with innovative ways to integrate specific objects into the IoT**
  - Remind the students that, as we saw before, many different types of objects can be embedded with sensors and connected to the IoT. Tell the students that it’s now time for them to **be IoT inventors and engineers**. Tell them that their challenge is to work in small teams to figure out **how to integrate certain objects into the IoT in useful ways**
  - Read the challenge out loud to the teams. Make sure to go over the **“toaster” example** on the back of the challenge sheet. Let them know that they will have only **15 minutes** to do their work
  - Pass out the **“Expanding the IoT”** handout (see below) as well as sheets of paper (or space on their whiteboard), pens, and markers for them to create their presentations. Then have them get to work!

Activity 3: “Expanded IoT Presentations”

(10 minutes, Large group activity)

- Overview: Have the students **share their IoT inventions**
  - Have the teams quickly **share their ideas.** If time is short, you can have teams share **only their favorite idea**
  - After each presentation, quickly **highlight** particularly innovative or creative ideas
  - Tell them that **all of their ideas** are creative and innovative

Wrap Up and Supplemental Activities (1 minutes)

- Point out that innovative companies are working with clients to **combine IoT technology with other emerging technologies** (the rest of the Essential Eight – Drones, Virtual Reality, Augmented Reality, AI, Blockchain, Robotics, 3D printing) to **solve big problems around the world**. This is called **convergence** when you're using more than one of these technologies together to solve a problem
- Remind the students that **the Internet of Things is already a part of their lives**. Their smartphones and computers are part of it, and there may be other objects that they use or see every day that are as well
- Remind them that the world of the IoT is only getting bigger, and it will **need clever designers like them**
- Also encourage them to **share at least two things** they learned or figured out today about IoT with friends or family
- **Thank the students** for contributing and working with you to explore the exciting world of the Internet of Things. Tell them that you're impressed by their ideas, their creative problem solving, and their teamwork
- If you have extra time, you can:
  - Work as a class on a few of the objects from the challenge activity that were not chosen often by teams. For example, if few teams chose "clouds" to work on, lead the class through a discussion of how clouds might be integrated into the IoT

Expanding the Internet of Things
Team Design Challenge

Your team's challenge:

You and your team are some of the world's most innovative Internet of Things inventors and engineers. Your challenge is to invent the next big wave of IoT-enabled objects.

1. As a team, choose 3 of the objects from the list below. Think through how that object could be embedded with sensors and integrated into the Internet of Things in order to make the world a happier, healthier, and/or safer place:

   - A comic book
   - A dinner plate
   - A dollar bill
   - A sidewalk
   - A dog collar
   - A tree
   - A cloud
   - The Moon
   - You

2. Fill out the table on **the other side of this sheet to tell us more about your inventions**

3. Be ready to share your IoT inventions. You will only have **2 minutes** to give your presentation, so be brief!

Bonus Challenge!

How could you usefully connect **3 or more** of these objects together and what could be the benefits?

	Example	IoT Object 1	IoT Object 2	IoT Object 3
What object are you adding to the IoT?	A toaster			
What needs will connecting this object to the IoT serve? What problems will it help solve?	I want to have toast waiting for me when I wake it. I also usually burn the toast.			
What will connecting this object to the IoT do?	The toaster will know what time my alarm is set for each day and it will begin toasting bread right before my alarm goes off. It will also sense whether the toast is beginning to burn and turn itself off if needed.			
What sort of useful information will the IoT platform send back?	It will tell me how many pieces of toast I eat each week, the nutritional value, suggestions for additions to my breakfast for a more balanced meal, and the toaster's energy usage and cost.			
How will this invention make the world a happier, healthier, or safer place?	It will help people make sure they eat a healthier breakfast and help avoid fires.			
What's a creative name for your IoT-enabled object?	"The Toastest with the Mostest"			

Thank you

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