Lesson Plan >

INTERNET OF THINGS

SNAPSHOT:

This lesson introduces students to the connectivity associated with smart devices and the internet of things (IoT). Students will explore how these applications increase personal productivity and convenience. Students will investigate how communities, economies and governments are being impacted and redefined through the internet of things.

STUDENT LEARNING OBJECTIVES: **Students will be able to:**

• Define internet of things (IoT)
• Describe the three properties of an embedded device
• Demonstrate how smart devices are connected through the internet
• Debate the pros and cons of the internet of things
• Explore career opportunities related to the internet of things

SYNOPSIS:

Watch the video "Internet of Things" on the Future of Tech website	(5 minutes)
Interactive - "All Connected"	(20 minutes)
Teacher Input	(15 minutes)
Wrap Up	(5 minutes)
Assessment	

TEACHER'S GUIDE:

MATERIALS:
• KWL Worksheet
• Interactive: All Connected
• Internet of Things: Interesting Insights
• Internet of Things Assessment
• Internet of Things Assessment Answer Key
• 6 Balls of Yarn (different colors recommended)
• Scissors

You'll want to refer often to the Future of Tech Website: **futureoftech.org**

To receive the answer key to the assessment, please email Eric Larson at elarson@comptia.org

Ask the students what comes to their mind when they think about the internet of things. Record their responses on the board. Distribute the KWL Worksheet. Have the students complete the first column and write down what they know about the internet of things. Discuss their responses. Briefly explain that today's lesson will introduce them to a growing world known as the internet of things.

Show the video "Internet of Things" on the Future of Tech website. After watching the video, ask the students what smart devices they have in their home or are aware of in their communities. Record their responses on the board. Have the students complete the second column of Distribute the KWL Worksheet. What do they want to learn about the internet of things? Allow the students to share what they want to learn.

`INTERACTIVE:` **Divide students into groups of 5. Distribute "Interactive: All Connected" and materials.**

Directions: In groups of 5 using a ball of yarn or string, construct a web of connectivity for one of the assigned topics below. Standing or sitting in a circle with your group, hang onto the end of the string and toss the ball to someone else in the group. Have the individual identify a smart device related to their topic that collects/shares data. The receiving person does the same until everyone in the group has become part of the web. The resulting web symbolizes the connectedness of their branch of IoT.

Once the students have created the web of connectivity for their topic, encourage them to consider if their devices will connect to other groups' devices through the Internet. Allow the students to toss the ball of string to other groups. The receiving person does the same until every group has become part of the extended web. Remind the students how GPS connects many of the devices. The resulting second web symbolizes the connect-edness of the various topics and smart devices, which in turn symbolizes the internet of things. Ask the students to consider what might be done with data that is collected and/or shared through these embedded devices?

To close, use a pair of sharp scissors to cut several of the connecting strings inside the first web. Have the students discuss what occurs as a result of being separated from the web. How does it impact their device and the other devices?

Examples of Topics:

• Homes
• Environment
• Transportation
• Cities
• Agriculture
• Fashion
• Healthcare
• Convenience -Everyday Gadgets

TEACHER INPUT:

Remind the students of the 'Internet of Things' video. Explain how smart devices are connected through the Internet and this connectivity allows us to collect and share data easily as demonstrated in the Interactive: All Connected.

Refer back to the The Future of Tech website and explain from smart home devices to smart cities every aspect of the world around us is rapidly becoming connected to the Internet. All of these internet-enabled devices — and many, many more—transmit data and talk to each other. Utilizing this website will enable us to explore the internet of things from how it works to its impact on our lives and future communities.

Divide the students into pairs. Utilizing the Future of Tech website, ask each group to identify five interesting insights related to one of the following categories under the internet of things Learning Unit:

• What is the Internet of Things?
• The Technologies Behind IoT
• IoT Past and Present: A Timeline
• IoT in Your Home and in the World
• The Cost of Convenience: Pros and Cons of IoT
• The Future of IoT and Career Opportunities

Have the students record their insights on the "Internet of Things: Interesting Insights" worksheet and report theirinsights to the class.

WRAP-UP:

According to Geoff Mulgan, "As the internet of things advances, the very notion of a clear dividing line between reality and virtual reality becomes blurred, sometimes in creative ways." Ask students to reflect on this statement and consider creative ways in which the internet of things might impact their lives and/or the world in the next five years.

ASSESSMENT:

Have the students complete column 3 on their KWL Worksheet –
What did they learn about the internet of things?

EXTENDED LEARNING OPPORTUNITIES:

• Have students complete a Career Interest Survey to see where their interest lies and discuss how their interest
  may align with career opportunities associated with IoT.
• Occupational Outlook Handbook - Search Computer and Information Technology Occupations to learn more
  about careers associated with the internet of things.
• Invite guest speakers from the field to your class to discuss the role that IoT plays in building construction,
  marketing and/or product design.
• Search the Internet for age appropriate activities related to Arduinos, Coding, Micro bits, and Electronic
  Sensors to extend learning opportunities for your students.
• Smart Building Technology: Architectural Design Activity

WEBSITE RESOURCES:

Particle
Intel
Beyond predictive maintenance: The 'art of the possible' with IoT
CISCO
Morrison Foerster
GSMA
IoT for All

CSTA K-12 Computer Science Standards (2017)

• 1A-IC-16 Compare how people live and work before and after the implementation or adoption of new computing technology.
• 1B-NI-04 Model how information is broken down into smaller pieces, transmitted as packets through multiple devices over networks and the Internet, and reassembled at the destination.
• 1B-IC-18 Discuss computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices.
• 1B-IC-20 Seek diverse perspectives for the purpose of improving computational artifacts.
• 2-NI-04 Model the role of protocols in transmitting data across networks and the Internet.
• 2-IC-20 Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options.
• 2-IC-23 Describe tradeoffs between allowing information to be public and keeping information private and secure.
• 3A-CS-01 Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects.
• 3A-CS-02 Compare levels of abstraction and interactions between application software, system software, and hardware layers.
• 3A-NI-04 Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.
• 3A-NI-05 Give examples to illustrate how sensitive data can be affected by malware and other attacks.
• 3A-IC-24 Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
• 3B-AP-18 Explain security issues that might lead to compromised computer programs.
• 3B-IC-26 Evaluate the impact of equity, access, and influence on the distribution of computing resources in a global society.
• 3B-IC-27 Predict how computational innovations that have revolutionized aspects of our culture might evolve.

Next Generation Science Standards

• MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
• HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
• HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

K-W-L CHART

WHAT I KNOW OR THINK I KNOW ABOUT IoT

WHAT I WANT TO LEARN ABOUT IoT

WHAT I LEARNED ABOUT IoT

Directions: In groups of 5 using a ball of yarn or string, construct a web of connectivity for one of the assigned topics below. Standing or sitting in a circle with your group, hang onto the end of the string and toss the ball to someone else in the group. Have the individual identify a smart device that collects/shares data within the assigned topic. The receiving person does the same until everyone in the group has become part of the web. The resulting web symbolizes the connectedness smart devices within the assigned topic.

Once the students have created the web of connectivity for their topic encourage them to consider if their devices will connect to other topics within the room through the Internet, cellular towers, or other networks. Allow the students to toss the ball of string to other groups. The receiving person does the same until every group has become part of the extended web. Remind the students how GPS connects many of the devices. The resulting second web symbolizes the connectedness of the various topics and smart devices which in turn symbolizes the Internet of Things. Ask the students to consider what might be done with data that is collected and/or shared through these embedded devices?

To close, use a pair of sharp scissors to cut several of the connecting strings inside the first web. Have the students discuss what occurs as a result of being separated from the web. How does it impact their device and the other devices?

Examples of Smart Device Topics:

- **Homes**
- **Environment**
- **Transportation**
- **Cities**
- **Agriculture**
- **Fashion**
- **Healthcare**
- **Convenience - Everyday Gadgets**

INTERESTING INSIGHTS

Group Members:

In groups, select one of the following sections of the Future of Tech website (futureoftech.org) to review.

- **What is the Internet of Things?**
- **The Technologies Behind IoT**
- **IoT Past and Present: A Timeline**
- **IoT in Your Home and in the World**
- **The Cost of Convenience: Pros and Cons of IoT**
- **The Future of IoT and Career Opportunities**

Section our group chose:

Provide a brief overview of the section in two or three sentences:

List five interesting insights that your group learned while reviewing the section.

1.

2.

3.

4.

5.

Name: _____

Select the best response.

1. The worldwide network of computing sensors embedded in everyday objects that collect, transmit, and receive data is defined as:
a. Internet of Things
b. World Wide Web
c. Big Data
d. Facebook

2. Who coined the term "internet of things"?
a. Tim Berners-Lee
b. Kevin Ashton
c. Mark Zuckerberg
d. Bill Gates

3. When hackers infect a group of private computers with malicious software and then control the computers as a group without the owners' knowledge, they have created a(n):
a. Spam
b. Botnet
c. Virus
d. Bug

4. Connected sensors have three key properties. List the three properties.

5. Identify three devices that are connected to the internet of things that can be utilized in the home.

6. Identify three devices that are connected to the internet of things that are utilized in our communities.

7. List three pros of the internet of things.

8. List three cons of the internet of things.

9. In paragraph form, describe how the internet of things has impacted one of the following areas: Agriculture, Cities, Fashion, Homes, or Transportation